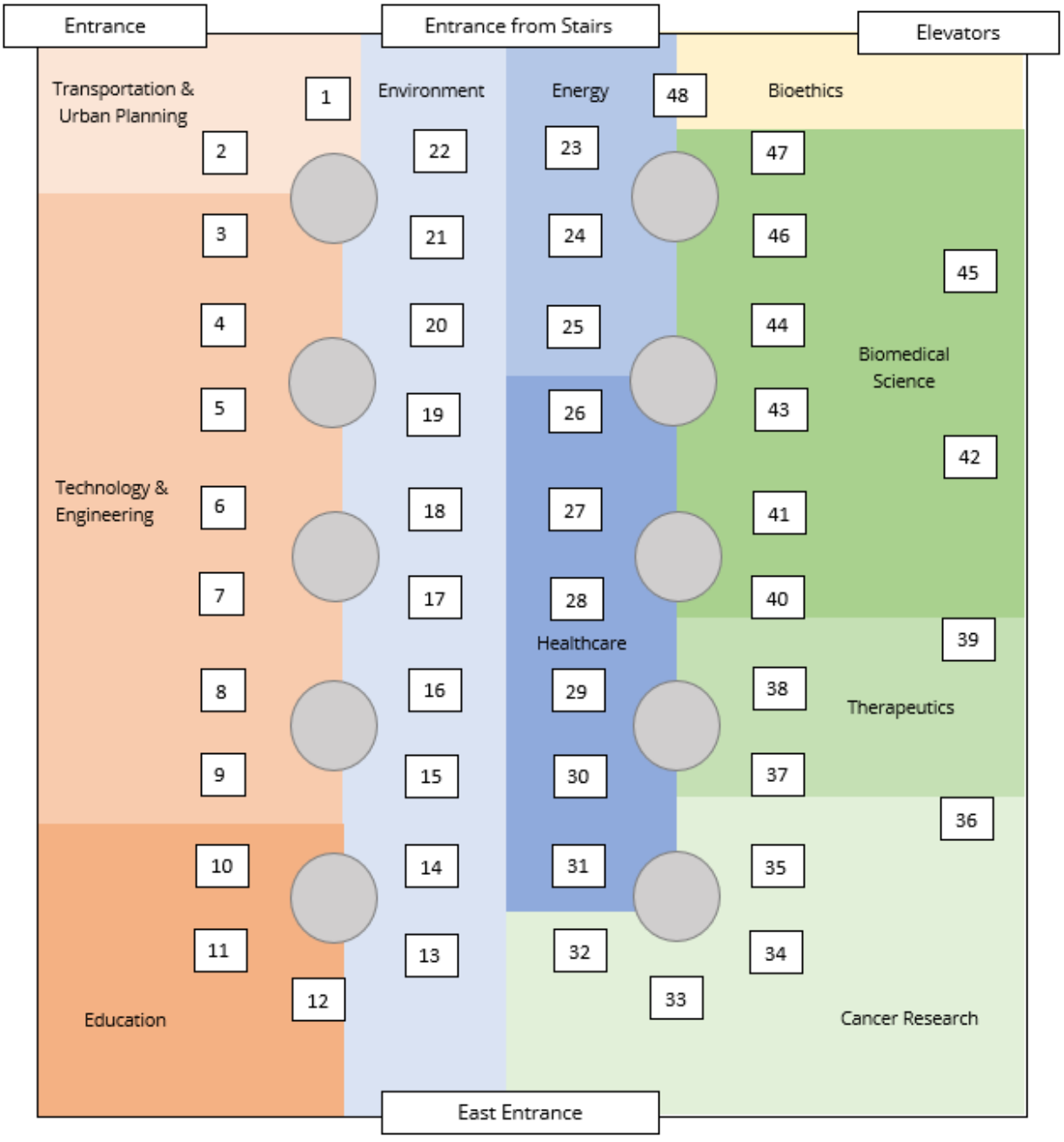
STEM Poster Day at the Colorado State Capitol

January 20, 2023

Map of Posters in 1st Floor West Foyer



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POSTER ABSTRACTS

(1) Is ADA Effective? An Assessment Based on Everyday Travel Experiences and Transportation Infrastructure Challenges

Molly Wagner, University of Colorado, Denver

Many argue that the transportation experiences of people with disabilities have improved dramatically since the passing of the Americans with Disabilities Act (ADA) in 1990. Though much progress has been made, many aspects of the current transportation system still limit people with disabilities from traveling safely and efficiently. Moreover, transportation planning and design efforts consistently lack people with disabilities representation.

This research seeks to address this disconnect via semi-structured interviews of twenty-eight people with disabilities stakeholders and nine government officials whose work intersects with the supply of infrastructure regulated under the ADA. One objective is to understand how attributes of transportation infrastructure impact the daily mobility of people with disabilities. A second is to understand how the programming and management of transportation assets impact navigation for people with disabilities.

Through a thematic and content analysis of interview data, we reveal the challenges faced by stakeholders through hard infrastructure issues and the programming/management of transportation facilities, which act together to diminish the quality of mobility options for people with disabilities. When working to create a transportation network that is universally accessible, it is critical for planners and engineers to work with people with disabilities when attempting to consider the design needs of individuals with different types of disabilities.

(2) How Considering Equity in Optimization Impacts Urban Planning

Drew Horton, University of Colorado, Denver

The urban design of our communities significantly impacts how burdens, such as exposure to pollution, and resources, like supermarkets, are distributed among residents. Studies consistently indicate that historically disadvantaged groups are exposed to larger burdens and have inferior access to resources, even in Colorado. The inequitable structure of our cities needs to be addressed, and the climate crisis has increased the urgency of this task. One key to reducing emissions is moving from automobile-oriented development to bring services back into neighborhoods. However, history shows that without careful planning, urban development only benefits the wealthy. Therefore, being proactive during the planning process is crucial.

To combat urban inequity, we use data from individual cities, including Denver. We have developed a mathematical model that, given a list of potential sites for building a new service facility, is able to compute which sites should be chosen. The chosen sites not only minimize how far the average individual must travel to their closest service but critically, also minimize the disparity in travel distances, informing us how to prioritize relief appropriately. We present results from a case study demonstrating how our model provides key information for policy-makers fighting food deserts in major U.S. cities.

(3) CyberRACE: A Framework for Cyber Range Automation to Support Cybersecurity Education

Ekzhin Ear, University of Colorado, Colorado Springs

The cyber range is an emerging, and perhaps the most effective, technology for training cybersecurity professionals. Cyber ranges mimic real-world cyber environments, similar to (for example) how the US Army's National Training Center provides a dynamic all-domain range where military units come to train, test, and be certified for combat (i.e., the range can mimic Afghanistan, Iraq, or other regions with high fidelity to allow units to gain exposure and experience ahead of actual deployment). The state-of-the-art is that there are several quality commercial cyber ranges, which are however extremely expensive and unsustainable by higher education institution budgets. This leads to the research question: How can we build quality and affordable cyber ranges for higher education purposes? This motivates us to propose a systematic framework, the Cyber Range Automation for Cybersecurity Education (CyberRACE), with accompanying innovative techniques, to guide cyber range design, development, and deployment. A salient feature of CyberRACE is that given one or multiple specific cybersecurity education objectives, it will automatically generate a corresponding cyber range environment. This supports an ongoing CU Next project, while our ultimate vision is to enable Colorado as a national leader in cybersecurity by supporting Colorado's and the Nation's cyber range requirements.

(4) Socially Assistive Robots for Seniors: Ryan CompanionBot

Hojjat Abdollahi, University of Denver

According to the National Institute on Aging, as many as 5.1 million Americans may have Alzheimer's Disease (AD), and the number is expected to rise as the population ages. Americans suffering from AD/ADRD are believed to cost the nation $236 billion annually with projected annual costs of over $1 trillion by 2050. At the University of Denver (DU) and in collaboration with DreamFace Technologies (DFT, a Denver-based startup), we have been developing a social Companion Robot, called Ryan, for assisting older adults in early-stage AD/ARD. Ryan is an intelligent conversational life-like social robot equipped with emotion recognition technology, designed to improve the well-being and quality of life of older adults with AD/DRD. We have conducted human pilot studies with a group of 40 older adults with early-stage AD/ADRD living in senior care facilities in the Denver metro. Overall, our research shows that social robots are effective and have the capabilities to transform the healthcare industry and provide better support for older adults, supplementing caregivers and addressing the need for nurses and caregivers.

(5) New Materials for Superconducting Quantum Computing
Sarah Jones, University of Colorado, Boulder

Quantum computing is an exciting new platform for computation that uses principles of quantum physics to exponentially speed up calculations. Progress in quantum computing could drastically improve our ability to model complex systems in finance, medicine, and materials, revolutionize cryptography, and more. Instead of using zeroes and ones (binary) like classical computers, quantum computers use a superposition of zeroes and ones to store more information per single quantum bit ("qubit"). In the Gyenis quantum lab, we design, fabricate, and measure our own qubits using one of the leading platforms for quantum computing: superconductors. Superconductors are unique metals that transport electrical current without energy loss due to heat and other fluctuations. The fundamental component of superconducting qubits is the Josephson junction, a nanometer-sized element where electrons use "quantum tunneling" (transmission through a barrier that ordinarily couldn't be crossed) to create superposition. However, JJ's are only half the story of a complete set of superconducting circuit elements. A second theorized element that could vastly expand qubit designs is a Quantum Phase Slip (QPS). My research focuses on fabrication and testing of the first ever QPS, which will complete the set of fundamental building blocks of superconducting qubits.

(6) Lithium Niobate-based Photonic Integrated Circuits for Next Generation Quantum Devices
Lauren Kennedy, University of Colorado, Boulder

Photonics is the science of generation and manipulation of photons, the particle of light. Photonic integrated circuits (PICs) are revolutionizing optics and photonics. PICs can accomplish tasks similar to large optical systems but with advantages in size, weight, power, and cost that are crucial for applications such as data transfer and communication, climate and agriculture, and navigation and sensing. Moreover, PICs hold a key advantage over large table-top optical systems--the ability to efficiently harness and manipulate optical nonlinearities which lies at the core of quantum sensing. PIC development has primarily occurred using silicon and silicon nitride due to established and mature fabrication processes; however, these materials lack sufficient nonlinearities to make them inefficient. A promising alternative is lithium niobate, which hosts a wide transparency window for interacting with a large range of wavelengths and strong nonlinearities for manipulating light. Boulder hosts some of the most advanced work on quantum sensors used in GPS and communications. The limitation in some of these sensors today is their size. Our work is largely focused on designing recipes for LN-base photonics for use in various quantum sensors, like optical atomic clocks, to make them accessible for use outside of the lab.

(7) Toward Unbiased Recognition of Human Facial Expression
Ali Pourramezan Fard, University of Denver

Automated Facial Expression Recognition (FER) is one of the most important visual recognition technologies to detect human emotions, a universal signal that is used by humans for non-verbal communication, with a wide range of applications including the identification of mental disorders, depression analysis, health forecasting, etc.
While the accuracy of automatic FER heavily relies on existing datasets such as AffectNet, most of these datasets are biased toward specific semantics, and facial features. Usually, a huge portion of samples in the existing dataset is white, while the dark skin color is so few. Consequently, the ultimate FER method is biased, meaning its performance for a human with white is much more than for dark skin color. To address this issue, there is a need for a dataset that is balanced in terms of gender, skin color, age, and emotions.
In our research, we proposed a deep-learning method for generating realistic human faces with controllable semantics and facial attributes. We propose a framework for the analysis, interpretation, and manipulation of the latent space of well-trained Generative Adversarial Networks. Thus, we created a balanced dataset which is essential for many other problems such as FER, age detection, race recognition, and psychological studies.

(8) MRI In Colorado
Alex McManus, University of Colorado, Boulder

Children's Hospital Colorado in Aurora is nationally ranked in 10 pediatric specialties. A rare but devastating condition treated there is Twin-to-Twin Transfusion Syndrome (TTTS). TTTS can be seen in identical twins that share a placenta. Connected fetal blood vessels in the placenta can lead to a net displacement of blood from one twin to the other; without intervention, both twins die. For treatment, surgeons use lasers to cauterize the connections. The success rate of the surgery and the survival rate of the twins is directly proportional to the percentage cauterized. With accurate imaging in advance of the surgery, the connections can be identified and provided as guidance.
We hope to use MRI to provide this guidance. The long scan time of fetal MRI can lead to motion artifacts corrupting the quality of the resulting image. Parallel imaging combines information from multiple antennas to accelerate MRI. While parallel imaging is routinely used, it can sometimes fail to produce an image of diagnostic quality. We have determined the reason for this failure and developed a mechanism to prevent the failures from occurring, bringing us one step closer to reliable fast MRI for placental imaging to address TTTS.

(9) Synthesis and Characterization of Biofriendly Pressure Sensitive Adhesives
Femke Janssen, University of Colorado, Boulder

Glucose, a kind of sugar, is an important source of energy. When multiple glucose molecules are joined to form a ring, they make “cyclodextrin”. This material looks like a lampshade, and we can change the “frills” of this lampshade to make cyclodextrin more useful. We mix it with lipoic acid, a dietary supplement found in Brussels sprouts. This process gives us an adhesive. A dime-sized speck of this adhesive can support the weight of a gallon of water! Unlike some other adhesives, this material doesn’t need a heat gun - the pressure of the thumb is enough. We are currently developing adhesives that work underwater. That can lead to medical applications as 70% of our body is water. We also make “molecular necklaces” out of cyclodextrin. Its rings are threaded onto polyethylene glycol - a polymeric material used in skin care products. These nano-necklaces can be tied together. The sliding of the rings makes them more flexible than their components. These components - coming from sugar and vegetables - are substantially friendly to our bodies. This could help us make an eco-friendly substitute for many plastic products. Such a material would aid the shift towards a more sustainable future.

(10) How to Address Underrepresentation in Colorado’s Gifted and Talented (GT) Programs
Vanessa Maybruck, University of Colorado, Boulder

Gifted and talented (GT) programs provide advanced learning support to students who are identified as gifted in one or more areas. In Colorado, GT programming and funding are protected under the Exceptional Children’s Education Act. Despite this, up to 22,000 Colorado students are missed for gifted identification each year, mostly in Title I schools and historically underserved populations. Here, we present a mathematical model for GT enrollment in Boulder Valley School District (BVSD). During the last four years, students of White, Asian, or two or more racial backgrounds in BVSD have been consistently represented in GT at higher rates than in the district population. Conversely, students of Latinx/Hispanic, Black, Native American, and Pacific Islander backgrounds have been consistently represented in GT at less than 50% of their representation in the district population. This trend is also seen in state-level data. Clearly, interventions are needed to increase representation of underserved students in GT programs in BVSD and other districts. We aim to use our model to motivate changes to gifted education policy in Colorado that promote equitable opportunities for gifted students, and to develop an app to provide schools with a better tool for measuring and improving their representation in GT.

(11) Engaging in research in an introductory physics laboratory class
Kristin Oliver, University of Colorado, Boulder

Participation in undergraduate research experiences (UREs) has been identified as an important way of increasing undergraduate retention, interest, and identity within the sciences. Course-based undergraduate research experiences (CUREs) have been shown to have similar outcomes to UREs, but can reach a larger number of students at one time and are accessible to any student simply through enrollment in a course. One key component of a CURE is that students must participate in authentic scientific discovery in which they answer a question where the answer is initially unknown to both students and the scientific community. Here, we present student experiences with authentic research in a large, introductory physics CURE conducted remotely during the COVID-19 pandemic. We use student responses to a closed-ended survey question, as well as written responses to an open-ended end-of-course assignment to investigate what aspects of real research students felt that they participated in and the extent to which students felt that they participated in authentic research. Most students in the course felt like they engaged in real-world research during the course and a large number of students highlighted their experience with authentic research when asked to describe their experience in the course more broadly. We discuss which elements of the course may have contributed to the students' experiences of authentic research.

(12) How Partnership & Purpose Affect Native American Veteran Housing and Military Construction Engineering Training
Janice Higuera, University of Colorado, Boulder

There is a long history between the U.S. military and the Native American nations. Military service demonstrates patriotism while also providing a steady income, skills training, and career opportunities under an equitable system of pay and promotions.
Native people have the highest per capita involvement of any population to serve in the U.S. military. The U.S. population is approximately 1.4 percent American Indian and Alaskan Native (AIAN) while the military is 1.7 percent. They also have the highest concentration of women service members. Nearly 20 percent of AIAN service members are women, while 15.6 percent identified other than AIAN.
Regrettably, many AIAN veterans leave their service honorably only to later experience homelessness. In 2020, 580,466 people experienced homelessness as defined by the government. Four percent or 23,218 identified as AIAN individuals and 4.8% or 27,862 were classified as homeless AIAN families. [1] Colorado reported 9619 homeless in the same year. This paper will analyze the Department of Defense, Innovative Readiness Training (IRT), program, as a Community Based Partnership Research opportunity. IRT approves partnerships with AIAN housing authorities to have National Guard and Reserve engineer units construct homes for veterans during their two-week annual training.

(13) How Can Battery Researchers Prove Their Work Has Positive Environmental Impacts?

Melodie Chen-Glasser, Colorado School of Mines

In recent years, battery research has been driven by regulations related to greenhouse gas emission reduction, which has created demand for high energy density batteries to increase the range of electrified transport. Extensive attention has been given to diverse battery materials and designs; however, little research has connected these variables with net reduction in lifecycle GHG emissions or other environmental impacts. My research demonstrates how life cycle analysis (LCA) during experimental design can be used in battery research to determine whether innovations will achieve regulatory goals.Net reduction of environmental impacts; however, should not be the only consideration when committing to electrification using lithium-based batteries.

While LCA is essential for determining net environmental impacts, supply chain impacts are more difficult to quantify, as they involve localized social impacts and regionalized inequity. To pre-empt these impacts, next generation battery research should have greater emphasis on sustainable extraction, the circular economy, and more rigorous selection.

This poster discusses how the field of battery research can be improved by more refined material selection, redefining metrics, and investment in a robust circular economy.

(14) Identifying Sources of Air Pollutants (VOCs) in Commerce City, CO

Caroline Frischmon, University of Colorado, Boulder

Air quality monitoring in Commerce City has expanded over the past three years in response to community health concerns, especially with regards to the Suncor refinery and Central 70 construction. Commerce City is a disproportionately impacted community containing many industrial facilities and major roads, which all emit volatile organic compounds (VOCs) that can impact human health. Given the high density of sources, it is difficult to discern from monitoring alone exactly how much each source is responsible for local air pollution.Positive matrix factorization (PMF) is an analytical technique that attributes pollution concentrations to individual sources. PMF can identify major sources and help the public understand how each contributes to local VOC levels. We applied PMF to four recent data sets gathered in Commerce City by Boulder AIR, Montrose Environmental Services, CDPHE, and DDPHE.

Vehicle exhaust, diesel combustion, and oil and natural gas processing were important sources across the data sets. Oil and natural gas related sources usually made up the largest portion of total VOCs. Diesel combustion was often the largest contributor of carcinogenic compounds known as BTEX. These findings can inform health officials and local advocates on how to prioritize targeted air quality mitigation efforts in Commerce City.

(15) Understanding Denver's Air Quality Using Low-Cost Sensors
Tehya Stockman, University of Colorado, Boulder

The Love My Air Network is a network of low-cost air quality sensors placed outside of schools across Denver. Schools were selected and invited by the Denver Department of Public Health and Environment (DDPHE) to participate in the Love My Air program based on a variety of factors including: student asthma rate, free-and reduced lunch rate, and school readiness. Many of the schools with these sensors are in environmental justice communities; some are located close to major roadways, while others are near larger green spaces. One challenge of low-cost sensors is that they are not as accurate as federal and state air monitoring equipment. My main goal for this research is making sure the sensors are reporting trustworthy data to the public. In addition, I analyze how particulate matter pollution (PM2.5) varies across the sensor network in Denver from 2018 to 2022. The outcomes from this research will help inform other cities across the state as they set up their own low-cost air quality sensor networks. We want to make sure that Coloradans have real-time, and trustworthy air quality information so that they can make decisions to protect their health, and the health of their friends and families.

(16) Home SOS: Indoor Pollution Following the Marshall Fire
Jonathan Silberstein, University of Colorado, Boulder

The Marshall Fire was one of the most destructive disasters in Colorado history, burning over 1000 homes and causing upwards of 2 billion dollars of damage to communities across the front range. However, after the fire, residents of affected communities were unsure if their homes were safe to return to, or if there were long-term impacts on air and soil resulting from the blaze. To assess the residual impacts of the Marshall Fire on impacted homes, we performed a combination of 2.5μm particulate matter (PM2.5) filter sampling, indoor dust collection, low-cost community scale measurements, and indoor particle number concentration measurements after the fire.
Following the fire, indoor PM2.5 (including its organic and elemental carbon components) and quantified semi-volatile organic species were found in low concentrations. Dust (a combination of wildfire ash and soil) speciation showed elevated concentrations of EPA priority toxic polycyclic aromatic hydrocarbons and metals when compared to samples collected outside the burn zone six months after the fire. While PM2.5 returned to ambient concentrations during our monitoring, dust samples collected after the fire contained greatly elevated concentrations of toxic organics, indicating the impact of the Marshall Fire on indoor dust may be more enduring.

(17) The Benefits of Ant Association to a Rare Butterfly Species
Abbey Swift, University of Colorado, Colorado Springs

Insects provide important ecosystem services such as pollination, seed dispersal & soil aeration. Given the significance of these services, declining insect populations are worrying. Species interactions can sometimes be beneficial to the organisms involved. Recent studies have shown that butterfly species which form interactions with ants as caterpillars may benefit from this relationship. In this study, I determined the benefits of the ant-caterpillar association to the Hops Blue butterfly (Celastrina humulus), a local species thought to be rare. The survival rate of the caterpillars was documented in plots where ants were excluded & in plots where ants were not excluded. The presence of ants did increase the survival rate of the caterpillars. The data collected from this study provides essential information for the conservation of this rare butterfly species. Furthermore, studies like these gather essential information about species interactions which can impact agriculture & even tourism.

(18) Removal of an invasive tree promotes diverse habitats for birds
Alexander Goetz, University of Denver

Wildlife habitat provisioning is an essential aspect of ecosystem function, especially in dryland riparian systems where relatively small patches of vegetation provide a disproportionately large amount of habitat. Morphological diversity of tree cover is of particular importance for avian biodiversity as heterogeneity of branching is needed to support birds with distinct nesting strategies (e.g., different nest heights or physical branching structures needed). Riparian systems are also susceptible to anthropogenic stressors such as invasive species and are often a target for restoration. However, restoration treatments may not necessarily improve habitat outcomes, and invasive vegetation may also contribute to available habitat that is lost if not replaced with functionally similar native vegetation.
This study examined response to removal of invasive Tamarix spp. in the American Southwest using metrics derived from publicly available airborne lidar point clouds to determine how vertical morphological diversity of the overstory is impacted by removal treatments. We found that increased cover of native overstory species is associated with higher morphological diversity at the pixel level and that morphological diversity significantly differs among Tamarix removal methods. Our results suggest that it is possible to increase heterogeneity of potential bird habitat through effective restoration of native tree species.

(19) Diet impacts insect survival under climate change
Claire Guzinski, University of Denver

Climate variability has increased in recent decades and this trend is predicted to continue, resulting in an increase in extreme temperatures worldwide. In particular, heatwaves are increasing in both intensity and frequency and as ectotherms, insects are especially impacted by temperature variation. As the most common terrestrial herbivores, insects are key members of most ecosystems; therefore, we must understand how temperature extremes affect insect herbivores and their interactions with their host plants. The fall webworm (*Hyphantria cunea*) is a generalist herbivore native to North America that feeds on dozens of different hosts. In this study, we evaluated the effects of elevated temperature regimes and heat wave conditions on fall webworm caterpillar performance. Additionally, we examined whether caterpillar mortality and development are mediated by different diets while under temperature extremes. Our results suggest that increased temperatures negatively impacted fall webworm performance but that some of these negative effects were mediated by diet. Further, fall webworm performance following a heatwave was dependent on the host plant. Our work adds to the growing body of evidence that heat waves have detrimental effects on insect populations but suggests that these effects may vary with diet.

(20) Combining Satellites and AI for Natural Hazard Detection
Teodora Mitroi, University of Colorado, Boulder

We develop an open-source, user-friendly tool named Satellite Landslide Identification and Detection (SLID) on Google Earth Engine (GEE) that locates landslides using Synthetic Aperture Radar (SAR), Enhanced Vegetation Index (EVI), and clustering (unsupervised machine learning) on the global level. Although there are many landslide detection methods, GEE facilitates cloud-based computing that allows for rapid processing without storage complications inside a user-friendly platform. For the analysis, we use SAR and optical data from the Sentinel-1 A/B and Sentinel-2 satellites, respectively. In addition, we use a Digital Elevation Model (DEM) from the Shuttle Radar Topography Mission to calculate slope and mask flat areas to reduce false positives. We compare our findings to five global landslides with different climates, triggers, and sizes: 2022 Praia de Itaguaçu (Brazil), 2022 Mount Talakmau (Indonesia), 2020 Pettimudi (India), and 2017 Santa Lucia (Chile).

(21) Where Does Wood Come From? Using Tree Rings and Isotopes to Identify the Origin of Wood in Streams and Floodplains
Sade Kylah Cromratie Clemons, University of Colorado, Boulder

Floods are of increasing concern to the state of Colorado. During floods, wood from the valley and from hills can get moved and placed in or near a stream, causing jams of wood to form. Logjams can destroy property, causing problems for the community. However, logjams are very beneficial to river management and carbon storage. Very few studies attempt to identify the source of wood from logjams, which can give insight into the water and carbon cycle connection between rivers and adjacent land during extreme events. We took tree ring samples from logjams created during the 2013 Colorado Front Range flood and compared them to trees still standing on the hill at different positions (valley bottom, middle slope, and upslope). We measured tree ring growth over time and compared trends in growth to figure out where the wood in the logjam comes from. Our results showed growth varied by position and it is possible that some of the wood came from both the valley and hill. Identifying the origin of logjam wood is very useful for understanding how weather events, like flooding, can spatially influence the forest and river landscape and how those responses affect the Colorado community.

(22) The Martian Atmosphere: A Pebble in a Stream of Solar Wind
Skylar Shaver, University of Colorado, Boulder

Colorado is a leader in the space industry, hosting many aerospace companies and having significant involvement in space research through its universities. The Laboratory for Atmospheric and Space Physics (LASP), the largest research institute at CU Boulder, is internationally recognized as a pioneer in planetary sciences.
On behalf of NASA, LASP manages the Mars Atmosphere and Volatile Evolution (MAVEN) mission, which has been orbiting Mars since 2014. Through MAVEN, LASP and CU Boulder have contributed significantly to the state's economy and workforce development, having integrated students in this large-scale mission.
MAVEN set out to discover how the Red Planet lost its once thick atmosphere, finding that the solar wind—a high-speed stream of charged particles from the Sun— was a main factor. Planets themselves interact with the solar wind much like a rock in a stream of water, diverting the charged particles around the planet. Planetary atmospheres can also interact with the solar wind through electromagnetic forces. This can cause loss of atmospheric particles, which can turn a water-world like Earth into a desert-world like Mars. Using MAVEN data, we study the

boundary between the solar wind and Mars' atmosphere and the ways in which the two regimes interact.

(23) Engineering nanoscale catalysts for clean hydrogen fuel production
Zek Kelly, Colorado School of Mines

High-entropy materials are a class of materials formed by configurational entropy. Configurational entropy is simply a measure of all the ways to arrange the chemical building blocks in a structure. High-entropy materials, by definition, are made of five or more elements. There are over 110 elements on the periodic table, there is an extremely large number of combinations of five elements. The most common method for making high-entropy materials involves a top-down approach. This is like making a brick by blowing up a building. This research focuses on a bottom-up approach to making high-entropy materials, which is like making a building from bricks. Expensive metals (platinum, palladium, and ruthenium) are commonly used in industry and the world for a variety of applications. But not only are these metals expensive, but they are also environmentally taxing; it takes two months to process two tons of ore to produce two ounces of platinum. This research uses common and cheap metals to make high-entropy materials. The end goal of these materials is to replace expensive metals in renewable energy applications, which will have a positive effect on the environment and the availability of renewable energy resources.

(24) Solar Energy Conversion Using Hot Electron Extraction
Rachelle Austin, Colorado State University

The largest efficiency loss process in commercial solar cells is the transfer of excess energy to heat, a process that results in a tremendous 33% loss of all available solar energy. The process occurs when the solar cell material absorbs light to excite electrons to very high energy states. These "hot" electrons will rapidly cool by converting their energy to heat before they are extracted. Extraction of the hot electrons before they cool can greatly improve solar energy device efficiencies. The three-atom-thick nanomaterial MoS2 is a promising active material for hot electron solar energy devices due to its intense visible light absorption, thin structure, and slow electron cooling. A crucial step towards the design of commercial hot carrier devices is understanding how operational device conditions affect hot electron dynamics. This poster discusses recent results showing for the first time hot electron extraction in an operational MoS2 electrochemical cell.

(25) Improving electric vehicle charging capability
Lydia Meyer, Colorado School of Mines

Electric vehicles (EVs) provide a bridge to a net-zero carbon transportation future. Though EV market share has continued to grow, EV adoption faces large disparities: limitations such as charging rate and vehicle range could preclude some consumers from purchasing EVs.

Accessible EV chargers are disproportionately located in more affluent neighborhoods, and limited EV range and charging speed can discourage low-to-moderate income households from purchasing an EV. While EV batteries have improved markedly, current battery chemistries face limitations. When pushed to their limits, cells can degrade. Though degradation has been studied, the exact molecular-scale mechanisms are not understood. Optically accessible Li-ion batteries, batteries with a viewing port for collecting data during cycling, offer insight into degradation behavior that occurs during extreme fast charging (0-80% charge in 10 minutes). The results of this research show that lithium ions pile up on one side of the cell and do not allow for the cell to charge quickly. They also form harmful dendritic structures that can reduce vehicle range. This research serves to inform policymakers of the limitations of current Li-ion batteries and the need for both technical and policy-based solutions to bring EVs for all to the market.

(26) The Struggle is Renal: Improving Kidney Disease Health Literacy
Jamie Cronin, University of Colorado, AMC

Chronic kidney disease (CKD) is a leading cause of mortality internationally and has very low rates of treatment compliance. Preventing disease progression and minimizing complications is vital to CKD management. Patients' active participation in their treatment regimen is critical but is often limited by the complex nature of the disease and exceedingly high treatment costs. Educational intervention of any kind has demonstrated improved patient and clinically reported outcomes. We aimed to evaluate the efficacy of a free, concise mobile application in improving CKD patient understanding and promoting participation in decision-making for their treatment. The application reviews the urinary system, causes of CKD, stages, lifestyle changes, nutrition, disease complications, and treatment methods. Built-in pre- and post-surveys utilized a Likert-type psychometric scale to measure the impact of the educational platform. Twenty-one (n=21) participants completed the survey assessments and learning module. Likert statements were compared between surveys and a two-tailed T-test and false-correction adjustment were used to analyze the platform's impact. Analyses showed that the application increased patient confidence and understanding in nearly every category. Providing a widely accessible, free application on CKD significantly improves health literacy and patient confidence, which can improve prognoses and alleviate healthcare burden on a large scale.

(27) Healthy Brain Aging in Colorado
Francesca Dino, University of Colorado, AMC

Alzheimer's Disease (AD) ranks among America's most feared diseases and is becoming increasingly common as the population ages. Earlier and more accurate diagnoses of Alzheimer's may save billions of healthcare dollars and improve quality of life for patients and their caregivers. However, while primary care providers are the front lines of dementia care, many report feeling underprepared to accurately diagnose and manage AD, particularly in rural areas, where AD is often misdiagnosed or only recognized in later disease stages. The

development of new Alzheimer's drugs, only indicated early in the disease, further highlights this urgent need.
To address these issues, our laboratory (https://csandlab.org/) is designing practical and rapidly deployable screening tools to assist in Alzheimer's diagnosis and management in diverse primary care settings. We are building a system that distributes validated electronic questionnaires before a medical visit and provides specifically tailored recommendations and resources based on responses. We're also innovating novel technology to screen for cognitive changes using conversational speech. We're working with traditionally underrepresented populations, including rural, African American, and Hispanic/Latino communities to ensure our tools work equitably in our diverse communities. Through these partnerships, we are supporting healthy brain aging throughout Colorado and beyond.

(28) School Nurse Electronic Health Record Access: Improving School-aged Children's Health Outcomes

Christina Baker, University of Colorado, AMC

An innovative program at Children's Hospital Colorado provides school nurses based in local urban area public schools access to a view-only version of the hospital-based EHR, EpicCare Link (Epic Systems, Verona, WI). With Internet access, the school nurses log into EpicCare Link and view the student's chart, including a plan of care page, current medications, school health care plans, immunizations, and clinic visit notes. The EHR access process includes school district and hospital signing a Health Information Sharing Agreement. School nurses complete an online EHR training, sign a Security User Agreement to address privacy and security of patients/students, and complete an in-person privacy and technical training. The study aimed to analyze the effect of school nurse access to medical records in a hospital-based EHR on patient outcomes. We hypothesized that EHR access would decrease emergency department (E.D.) visits and hospital inpatient admissions and that EHR access would be utilized more for patients with chronic conditions. For the 336 students in the study, there was a 33% decrease in E.D. visits from 190 visits before access to 126 ED visits after access. Hospital admissions decreased by 44% from 176 hospital admissions before access to 99 hospital admissions after access.

(29) The Long-Term Effect of Creative Arts Therapy to Reduce Burnout in Healthcare Workers

Rafaela Avallone Mantelli, University of Colorado, AMC

Creative Arts Therapy for Healthcare Professionals is Associated with Long Term Improvements in Psychological Distress. Creative arts therapy (CAT) is a potential intervention to mitigate health care professionals (HCP) burnout and build resilience. We identified that a 12-week CAT program reduced psychological distress (anxiety, depression, PTSD, and burnout) and job turnover intention in HCP. We now report the long-term impact up to one year after the intervention. We asked clinical trial participants from September 2020 until July 2021 to

complete surveys evaluating symptoms of anxiety, depression, burnout, and posttraumatic stress disorder (PTSD), and positive and negative effects. Participants in the intervention groups (4 modalities of creative arts therapy) completed similar surveys after 4 months, 8 months, and 1 year from the intervention. The participants in the control group completed surveys at the one-year mark only. Participants in the intervention groups showed sustained improvement in anxiety, depression, total PTSD score, emotional exhaustion, resilience, wellness, social support, and negative coping skills at 4 and 8 months after the intervention. Compared to control participants, the intervention group showed improvements at one year in anxiety, depression, positive affect, negative affect, social support, and wellness. Many effects of CAT remained up to one year after the conclusion of the intervention, with persistent improvements. This research not only shows that CAT is a valuable tool in helping mitigate HCP burnout, but also that the results are sustainable through time. Further investigation should aim at how to effectively disseminate and implement CAT programs for HCPs.

(30) Innovative Big Data Approaches to Address Diverse Health Issues Facing Colorado
Kathleen Mullen, University of Colorado, Anschutz Medical Campus

The Need: Mental health, opioid use, and rare diseases have a significant impact on our Colorado community. Innovative approaches and techniques are critical to address these complex issues by harnessing the power of Big Data, and the art of scientific collaboration. The expanding amount of data provides exceptional opportunities for scientific advancement utilizing artificial intelligence (AI), machine learning, and digital technology. New advancements require breaking down silos, as we join together with experts across fields of biology, medicine, computer science, informatics, and environmental science to solve Colorado's pressing issues.
Who We Are: The Translational and Integrated Science Lab joined the University of Colorado Anschutz's newly formed Department of Biomedical Informatics. We are a diverse group of scientists, public health researchers, technologists, project managers, and veterinarians. Our various backgrounds and disciplines provide unique perspectives to address critical health issues.
Our Projects: We leverage existing clinical, research, and technological resources to improve disease diagnosis, progression, and outcomes. We utilize AI and other deep learning methods conducted on large data pools to find answers to problems faster and with fewer manual resources than traditional methods. Our team science approach is harnessing Big Data to address local and global issues!

(31) Marijuana for morning sickness? Marijuana consumption during pregnancy in Colorado
Karli Swenson, University of Colorado, AMC

Marijuana for morning sickness? The landscape of marijuana consumption during pregnancy in Colorado. Marijuana consumption during pregnancy is rapidly increasing in the United States, in tandem with increased access and legality. Many pregnant patients consume marijuana to ease

their nausea, vomiting, anxiety, and pain. In Colorado, 22.5% of pregnant patients 25 or younger test positive for marijuana at delivery. While it is legal to consume marijuana during pregnancy, much like alcohol or nicotine, there are consequences for fetal development and potential child protective services involvement. Herein, I highlight the major gaps in data collection, information sharing, public health messaging, and research restrictions that hinder professionals in this field. These include hospital data burden where birthing hospitals are not screening for marijuana consumption, reliance of pregnant patients on social media for obtaining information on the perceived safety of marijuana, and federal restrictions on preclinical (animal model) marijuana research. Additionally, I show new data highlighting the risks to offspring cognition and metabolism following cannabidiol (CBD) exposure during pregnancy in a mouse model. The legislature has the ability to diminish these burdens by advocating for the rescheduling of marijuana for research and for increased funding for perinatal substance use research and intervention.

(32) Evaluation of Exercise-Based Prescription For Cancer Patients Undergoing Treatment

Buck Covington, University of Northern Colorado

Purpose: Exercise has been well-established as a therapeutic intervention in alleviating and resolving many cancer-related treatment side effects. However, the adoption of this rehabilitation has not been sufficiently recognized within the legislative field. Many speculate this field will eventually be adopted as a rehabilitation method like that of cardiac rehabilitation, however, this remains to be seen within legislation and insurance coverage leaving thousands of cancer survivors in Colorado and around the US to find ways to afford this type of necessary rehabilitation.
Methods: A total of 306 cancer patients undergoing chemotherapy and/or radiation (Phase 1) were included in this study. Per the Phase Program, the intervention was 12-wks in duration, 3 days a week, for 60 minutes each day. Data outcomes were assessed and grouped according to treatment as Chemotherapy (n = 118), Radiation (n = 74), or Chemotherapy and Radiation (n = 114).
Results: Exercise resulted in significant physiological improvements in cardiovascular health and relative muscular strength. Exercise also resulted in significant psychological improvements in fatigue, quality of life, and depression.
Discussion: Exercise-based interventions often are considered as a method to mediate or resolve cancer-related treatment side effects. However, this study aims to show the importance of cancer rehabilitation and provide the necessary guidelines for this treatment.

(33) Engineering of Designer Materials to Study Intestinal Cancer
Engineering of Designer Materials to Study Intestinal Cancer

Kaustav Bera, University of Colorado, Boulder

The inner lining of the intestine contains microscopic finger-like projections composed of specialized cell types, which carry out intestinal functions, including digestion and nutrient absorption. In addition to their complex structure, the lining sheds cells that need continuous renewal and regeneration to remain healthy. Studies have shown that the tissue shape controls how different cell types convert into each other, and thus their function. Anomalies in this regulation can cause pathological conditions like inflammatory bowel disease (IBD) and colorectal cancer (CRC). Of the 149,000 annual CRC cases in the US, 2,100 occur in Colorado alone, and an estimated 3.1 million adults nationally suffer from IBD. However, there are few laboratory models to study intestinal cells in the context of their tissue structure. We have developed polymer substrates to grow intestinal tissues, mimicking their physiological structure. Additionally, our designer polymer substrate allows microscopic control of the intestinal tissue structure, imitating different bodily processes. We have found that cell nuclei can sense and respond to distinct shapes of the tissue, which explains why colorectal cancer patients have abnormal nuclear protein levels. Thus, our research can shed light on intestinal disease progression and potentially lead to the discovery of novel treatment strategies.

(34) A<u>SO</u>: You want to treat Breast Cancer?
Gabriela Padilla, University of Colorado, AMC

Aproximately 10-15% of all breast cancers are categorized as triple-negative breast cancer (TNBC). This type of cancer is infamous for being hard to treat, due to its lack of three receptors that are commonly targeted by most cancer drugs. TNBC is associated with lower 5-year survival rates and higher metastasis than other types of cancers. A long non-coding RNA, Hox Transcript Antisense RNA (commonly known as HOTAIR), has been shown to increase the growth and invasion abilities of TNBC by turning important tumor suppressor genes off. Previous studies have identified a specific site of methylation in HOTAIR that when mutated inhibits HOTAIR's ability to promote cancer aggressivness. I have been using Anti-sense Oligonucleotides (ASOs) that target the methylation site in HOTAIR. Preliminary results suggest that the ASOs have effects on TNBC growth. Further testing will be conducted to test the effects on cell invasion. Ultimately, if ASOs are shown to effectively block HOTAIR's ability to promote cancer aggressiveness, they may have therapeutic potential.

(35) Using Novel Vanadium-Based Solutions to Treat Aggressive Forms of Brain Cancer
Kate Kostenkova, Colorado State University

Aggressive forms of brain cancer called glioblastoma present a significant healthcare challenge in the U.S. Half of glioblastoma patients will die within 8 months since the diagnosis, and only 6.8 percent of patients will survive after 5 years. Current treatments for glioblastoma include surgery and chemotherapy which put patients through incredible stresses and cause damage to patients' health, as chemotherapy destroys cancerous and healthy tissues. My research takes a novel approach to treat glioblastoma by injecting vanadium-based solutions into brain tumors. Vanadium is a versatile metal best known for the treatment of diabetes, with unique properties to

destroy cancerous tumors. Active clinical trials use the strategy of injecting treatments into tumors which reduces side effects common in traditional chemotherapies. My research in the Crans lab has contributed to understanding the properties necessary for a successful drug against glioblastoma. The Crans lab has developed over 100 vanadium-based treatments and collaborates with the University of Sydney to test their efficacy in brain cancer cells. If proven effective, our treatment will be brought into clinical trials to potentially replace existing chemotherapies. Our treatment will benefit the State of Colorado by extending life expectancy of glioblastoma patients and causing minimal damage to patients' health.

(36) Cancer: When Cells Forget Who They Are
Giovana Maria Breda Veronezi, University of Colorado, AMC

The human body is made up of microscopic building blocks known as cells. All cells carry inside them a genome, a complete set of encyclopedias on how to make any cell in the body and perform specific functions. Stomach cells, for example, are constantly reading about how to digest food, but how to make a brain is not useful for them. In fact, if stomach cells read instructions for being any other cell, this can cause disease. Most cells make copies of themselves to keep the body functioning. In this process, they must make an additional copy of the whole encyclopedia set and label what the new cell should and should not read. Although we know a lot about how new copies of the encyclopedias are made, we have no clue how they label what "to read " or "not to read". However, we know that when this labeling system fails, it has severe consequences for human health, like a very aggressive brain cancer type in children with very limited treatment options. If we understand how this labeling system works, we can progress to make therapeutic options for this cancer type and make Colorado a leading state in this field.

(37) Tabernanthalog: A non-hallucinogenic psychedelic analog with therapeutic potential for heroin and alcohol addictions
Joel Bonilla, University of Colorado, AMC

The opioid epidemic in the United States has come under the spotlight, as access to fentanyl has caused an increase in overdoses nationwide. The CDC reports that almost 100,000 lives were lost due to opioid overdoses in 2021. This problem has also found a home in Colorado, as 25 out of every 100,000 people in the state overdosed in 2020. Increasing availability to mental health centers and addiction clinics have surely helped people struggling from a variety of addictions, however relapse rates remain high, and the interest in alternative routes to treating addiction have caused psychedelic therapies to share that spotlight. // We have been researching a novel therapeutic, a non-hallucinogenic psychedelic called Tabernanthalog (TBG), which has long-term protection from relapse in preclinical models of heroin and alcohol addictions after just one dose. Although TBG is not FDA approved yet, the non-hallucinogenic aspect of this compound increases the therapeutic accessibility when compared to other psychedelics such as psilocybin. As the public interest in psychedelics and their therapeutic

potential increases, TBG can be seen as a promising candidate to helping Coloradans struggling with addictions, and as a cost-efficient alternative to combating an epidemic.

(38) Informing the Development of Parkinson's Disease Therapeutics
Dustin Heiden, University of Colorado, AMC

Parkinson's Disease (PD) is a neurodegenerative disease that impacts about 1 million people in the US alone, with cases projected to double by the year 2030. PD is caused by a genetic predisposition for the disease and by environmental aggravators, such as viral infections and inflammation. The pathological hallmarks of PD are the accumulation and misfolding of the neuron-specific protein, alpha synuclein (Asyn), in the central nervous system (CNS). The Beckham lab has shown that RNA viral infections induce Asyn misfolding. Additional work by our lab shows that Asyn supports anti-viral, pro-inflammatory responses in the CNS. Currently, the economic burden of PD in the US is $52 billion per year with non-medical care costing $10,000 (not covered by insurance) and medical intervention costing $40,000 annually per individual. There is no cure for PD and current therapeutics only provide temporary relief of symptoms. My research will create understanding about how Asyn supports anti-viral, inflammatory responses in neurons and how these responses contribute to the development of PD. Knowing how Asyn contributes to inflammation in CNS will allow us to develop therapeutics that target the underlying cause of PD, thus preventing or curing PD.

(39) New Ways to Maintain Healthy Blood Vessels Throughout Life
Austin Jolly, University of Colorado, AMC

Cardiovascular diseases lead to long-term stiffening of blood vessels. When blood vessels become too stiff, their function becomes compromised, and this negatively impacts quality of life and exercise capacity. My PhD thesis work focuses on discovering ways to make our blood vessels stay healthy throughout life and not become too stiff. We discovered a population of stem cells that reside in the wall of the blood vessel that drive vascular stiffening. These stem cells can give rise to myofibroblasts which are cell types that can cause vascular stiffening. We identified a protein called Brg1 as a key factor in facilitating the progression of the stem cells turning into myofibroblasts. We hypothesize that Brg1 manipulates DNA to turn on the underlying genes associated with stiffening, ultimately driving the differentiation of stem cells to become myofibroblasts. My results show that blocking Brg1 activity with the small molecule inhibitor PFI-3 leads to healthier blood vessels in mice. As compared to control mice, mice that receive PFI-3 exhibit decreased stiffening. These data shed insight into new avenues for drug development focused on the health and longevity of blood vessels that will positively impact Coloradans lifestyle who suffer from cardiovascular diseases.

(40) 2a Peptides in Translation
Erica Sterling, Metropolitan State University & CU-AMC

My research aims to understand how RNA translation processes work and how our genes are regulated. Many viruses have learned how to hack these biological processes to take over our cells as machinery for replicating themselves; making it essential to understand RNA translation and gene regulation. This information could be important for vaccine development as well as many medical and industrial advancements.

(41) Understanding the changes occurring in the brain after cerebellar stroke
Genevieve Hunn, University of Colorado, AMC

Animal research conducted by scientists provides information that leads to the safe advancement of medical knowledge. This benefits the population because we can have models of human disease and dysfunction that improve our understanding and current treatments. A largely experienced disease seen in humans is ischemic stroke. Brain ischemia occurs when there is an insufficient blood supply to the brain, which consequently reduces oxygen supply. Around 3-6% of strokes occur in the cerebellum, a region of the brain responsible for balance, fine coordination, and cognition. Clearly ischemia in this region is detrimental, which provides more reason to investigate the systems involved. Therefore, I use a rodent model to examine how brain ischemia in the cerebellum affects behavior, cognition, and brain circuitry that can be safely and effectively translated to humans. Not only is this research important for studying the brain but it can be expanded to research on the whole body. From a policy perspective, it is crucial to keep animal research funded so solid data can be collected that guides us through public health obstacles. It should also be supported in terms of media and communication, so more people understand the rigor and validity in research statistics.

(42) Investigating Novel Approaches to Improve VCA Transplant Outcomes
Po'okela Ng, University of Colorado, AMC

Over half of all combat related casualties in the US military since 2006 were sustained in improvised explosive device (IED) related incidents. Up to 80% of those involved wounds to the hands and or face. Victims of such attacks are often left permanently disfigured and in some cases with extremities and/or portions of their face missing. The current surgical approaches to reconstruct this type of damage are often inadequate to restore function. One solution is vascularized composite tissue allograft (VCA) transplantation; a transplant that includes multiple tissue types such as bone, tendon, muscle, and skin together with the vasculature that supplies blood to these tissues. There have been over 100 upper extremity and face transplants performed world-wide with the longest follow-up now out to 23 years. Although clinical VCA transplantation has resulted in successful outcomes, the high rates of acute rejection and increased requirements for immunosuppression have led to significant long-term complications. The goal of our research is to improve VCA outcomes. We are investigating ways to reduce the need for extensive immunosuppression by preventing tissue damage associated with prolonged

storage prior to transplantation, by blocking inflammation post-transplantation, and by improving non-invasive approaches to detect early signs of tissue rejection.

(43) Why does HIV kill more CD4 T-cells than others?
Kaylee Mickens, University of Colorado, AMC

Globally there are 37 million people with HIV (Human Immunodeficiency Virus). In Colorado 13,000 people are living with HIV. HIV infects and kills CD4 T cells, immune cells that are important for protection against other infections and diseases. During HIV infection, CD4 T cells in the gut are killed faster and in greater numbers than those from other body sites. Once a person is on treatment for the virus, gut CD4 T cells do not come back—as they do in other areas of the body. The initial loss and continued lack of these gut CD4 T cells cause problems in the gut that lead to an increase of other symptoms/diseases. Because the loss of gut CD4 T cells leads to continued negative effects for people with HIV, our main question is: why do gut CD4 T cells die in higher numbers when compared to other body sites? We know that when gut CD4 T cells see bacteria they produce a protein, called Granzyme B, that can kill other cells, including CD4 T cells. This research examines if Granzyme B produced by gut CD4 T cells increases HIV-killing of gut CD4 T cells and how the protein is produced.

(44) Modeling Cardiovascular Disease to Improve Human Health
Melissa Henckel, University of Colorado, AMC

Cardiovascular disease (CVD) is one of the world's primary causes of death. CVD was the leading cause of death in the United States, second only to cancer, in the state of Colorado in 2020. CVD includes various pathologies, including vascular impairment, coronary artery disease, heart attack, and stroke. CVD progresses differently between women and men and is the leading cause of death in women. These sex differences in CVD, of paramount importance, are not well understood. Rodent models of disease are critical to CVD research and are only beginning to include females as well as males. In our work we investigate how variations in housing temperature impacts the development of CVD and how the adipose tissue surrounding blood vessels may be playing a role in disease progression. In an animal model, we show that these temperature-driven perturbations in adipose tissue impact vessel dilation and constriction, the movement that modulates blood pressure, differentially between the sexes. These changes are also seen at the cellular level, indicating this adipose tissue as a target for future sex-based CVD therapies. The overall goal of our work is to contribute to CVD alleviation and prevention for all people.

(45) Measuring the Contribution of Specific Tissue Components to Tendon Strength and Resilience
Hannah Larson, University of Colorado, Boulder

Tendons serve a critical role by connecting and transmitting forces from muscles to bones, helping the body move and bear weight. When tendons are overused, they can accumulate microstructural damage that can lead to disease, such as tendinopathy, or injury, such as tendon rupture. The intrinsic healing ability of the tendon is poor, leaving a clinical need for treatments to resolve disease and aid in healing. My research as a mechanical engineer is investigating whether certain types of molecules in tendons provide resilience to damage. This work has a broad importance for human health, especially in the state of Colorado. Understanding how specific molecules reduce damage offers insight into how to prevent tendinopathy, which has an incidence rate of 24% in competitive athletes, such as the 15,000 athletes that train at the U.S. Olympic & Paralympic Training Center in Colorado Springs each year. Further, this work carries economic impact for Colorado's ski industry, drawing on average 12 million people every year, by providing necessary insight into treating injuries often found in skiing. Last, because increased age is a risk factor for tendinopathy and injury, this research works to improve quality of life for society's aging population.

(46) Combatting Diabetic Wound Infections in Colorado
Rebecca Keogh, University of Colorado, AMC

Diabetes is a major public health concern in the state of Colorado, where more than 300,000 individuals or 7% of the adult population are living with diabetes. A major complication of diabetes is the potential development of wound infections, which do not heal due to the presence of dangerous bacteria coupled with an improper immune response. Diabetic wounds are the leading cause of non-traumatic amputations in the US, accounting for approximately $10 billion dollars in medical expenses annually. Here, we have focused on a species of bacteria called Group B Streptococcus (GBS) which is one of the most frequently isolated bacterial species from diabetic wound infections, and is notoriously absent from non-diabetic wounds. We found that GBS infection of diabetic wounds leads to increased inflammation during infection, which stalls wound healing, as new, healthy tissue cannot form. In addition, neutrophils, one of our most common immune cells, are less effective against GBS in diabetic individuals in comparison to non-diabetic. We hypothesize that the diabetic environment is unable to clear GBS due to increased inflammation and an improper neutrophil response. These data can inform treatments of diabetic wounds which may include using anti-inflammatory drugs or targeting neutrophils to combat infection.

(47) Sex-based Differences of Circulatory Galectin-3 in Cirrhotic Patients
Nathaly Limon de la Rosa, University of Colorado, AMC

Orthotopic liver transplant (OLT) is usually the only curative therapeutic option for patients with acute and chronic liver failure. Deceased donor liver transplantation organ allocation system is mainly based on the evaluation of disease severity by the model for end-stage liver disease (MELD) score as well as geographic proximity to available organs. Despite the implementation of the MELD score, sex disparities in OLT for chronic liver diseases are very well documented, with women with cirrhosis being less likely to receive a LT and more likely to die on the waitlist.

Current transplantation rates are based on scores that use laboratory values to predict 90-day survival. This has proven to be problematic, as scoring is influenced by serum creatinine concentrations unadjusted for gender on MELD scores, leaving the female population at disadvantage due to lower serum creatinine values. Galectin-3 is a molecule with potential clinical application in cirrhosis as it has been identified as an essential mediator in the activation of hepatic stellate cells and liver fibrosis. The aim of this study was to determine the relationship of galectin-3 with patient sex and to investigate sex-based differences in various disease stages of cirrhosis.

(48) Ethical Concerns from Indigenous Perspectives on Ancient DNA Research
F. Leah Nez, University of Colorado, AMC

Paleogenomics refers to the collection and analysis of genomic data from ancient DNA (aDNA). Ethical worries arise when there is lack of connection between communities and researchers, culturally inaccurate depictions, and numerous other factors. Paleogenomic researchers must independently create ethical guidelines for their work, because legal guidance is insufficient. Insight into experiences of aDNA researchers and Indigenous community members is critical for the proactive development of guidelines. Robust guidelines can preclude the use of reactive interventions, which are implemented only once research has harmed a community. Therefore, to better understand perceptions of Indigenous communities in the context of aDNA research, we implemented a mixed-methods approach, in collaboration with several anthropological professionals, that utilized an online survey made within RedCap. Exclusively Indigenous participants completed our survey (n = 107). Multiple choice and open-ended questions were analyzed using Excel and R, and emergent thematic analysis, respectively. Major themes regarding challenges to identity and origins, historical trauma, cultural considerations, and community engagement arose. Our findings revealed these ethical concerns need to be addressed when conducting aDNA research with Indigenous communities. Compiling these perspectives will help to build proactive guidelines for doing ethical aDNA research with Indigenous communities.