Guide to this Document:

Demo Day Posters are listed in order by their Poster Number. The poster number is colored either Blue or Gold depending on which session the poster is in. Posters in the Blue Session are presenting from 10:30am – 11:45am and the Gold Session are presenting from 11:45am – 1:00pm.

Poster Number: 1

Title: PEMF Therapy Mitigates Endometrial Inflammation Associated with Persistent Breeding-Induced Endometritis in Horses

Presenter: Isabella Hamner

Abstract:

Persistent breeding-induced endometritis (PBIE) affects ~15% of broodmares, causing prolonged uterine neutrophilic inflammation, dysregulated immune signaling, and early embryonic loss. Current therapies focus on mechanical fluid clearance without correcting underlying immune dysfunction. We evaluated pulsed electromagnetic field (PEMF) therapy as a non-invasive, mechanism-based approach to modulate uterine inflammation. Six PBIE-susceptible mares received a single post-breeding PEMF treatment (40 Hz, 30 min). PEMF significantly reduced neutrophilia ($p<0.01$) and reprogrammed the endometrial transcriptome (1,172 DEGs), downregulating neutrophil chemokines CXCL1/CXCL8 and nitric oxide signaling while enriching immune resolution pathways. Unlike mechanical clearance, PEMF directly modulates immune signaling to restore uterine homeostasis, a novel, mechanism-based innovation. These findings are relevant to equine veterinarians, reproductive specialists, breeders, and broodmare managers seeking improved fertility management tools.

Poster Number: 2

Title: Evolutionary Optimization Algorithm for Adaptive Livestock Grazing Management Using Virtual Fencing

Presenter: Spencer Burkhart

Abstract:

Ranchers face increasing difficulty designing grazing plans due to growing spatial and temporal variability in forage production. While virtual fencing (VF) technologies allow flexible control of livestock movement, they do not provide decision-support tools to determine optimal pasture placement, timing, or stocking strategies, making manual planning difficult. This project presents FREE-Graze, an innovation that leverages machine learning via evolutionary programming to generate adaptive grazing plans using spatially and temporally explicit forage modeling data. The algorithm simulates an upcoming grazing season and evolves grazing plans that maximize forage acquisition and economic performance while enforcing sustainability rules that prevent overgrazing and protect animal health. Unlike existing tools that rely on manual interpretation or reactive management, FREE-Graze proactively evaluates thousands of grazing configurations and demonstrates that grazing plans evolve and improve forage acquisition over time. The innovation integrates forage forecasting, optimization, and VF compatibility into a single framework. The solution is intended for ranchers, rangeland managers, researchers, and technology partners, particularly those using or considering virtual fencing and data-driven grazing management tools.

Poster Number: 3

Title: Creasti: A Behavioral Financial Wellness Platform

Presenter: Dieulin Napoleon

Abstract:

Many individuals and families find it hard to develop consistent savings habits, not because they lack financial knowledge, but because traditional tools don't address how humans behave. Most budgeting apps track spending but don't help users change their habits.

Creasti is a behavioral financial wellness platform that combines AI-powered coaching, gamification, and social accountability to help users establish lasting savings habits. Through personalized nudges, goal-based streaks, and family challenges, Creasti turns saving from a passive task into an engaging daily activity.

Unlike traditional finance apps, Creasti emphasizes behavior change over transaction tracking, fostering greater engagement and long-term financial resilience. Potential users include individuals, families, employers, and financial institutions who want to improve financial wellness.

Poster Number: 4

Title: Environmental Removal of CO2 with Green Electrochemistry

Presenter: Aaron Phillips

Abstract:

Industrial advances have led to ever increasing levels of Carbon Dioxide (CO2) in the atmosphere. Current efforts on capturing CO2 remain highly energy intensive and add unavoidable operational costs for industries attempting to employ these methods. Electrochemical reduction of CO2 allows for the captured CO2 from factories and power plants to be converted back into more valuable hydrocarbons which can then be sold or reused for chemical production or burnt as a fuel. Powered by solar, CO2 electrolyzers can be run using clean energy to create a unique net negative and potentially profitable pathway for the offset of carbon emissions. Scaling this technology up using additive manufacturing for electrolyzer design allows for even further optimization and cost-effective methods to produce expensive cell components. Here we combine 3D printing technologies, renewable energy, and catalyst design to directly convert CO2 into methane (CH4) and hydrogen for use as a fuel mixture.

Poster Number: 5

Title: Rapid LAMP-based African Swine Fever virus detection for airport biosecurity

Presenter: Gamze Badakul

Abstract:

African Swine Fever (ASF) is a lethal pig disease caused by ASFV, which survives on surfaces like shoes, clothing, and equipment, enabling humans to act as mechanical vectors. Current PCR-based detection is slow, lab-dependent, and limited to animal samples. There is not current method to detect contamination surface, so it is leaving a critical biosecurity gap. We developed a rapid, field-deployable ASFV detection platform combining wipe-based sampling with LAMP, using our newly designed primers for high specificity for ASFV. The system detects viral DNA on human-mediated surfaces in 30–60 minutes, offering portable, colorimetric results. PCR validation confirms reliability. This innovation enables early ASFV contamination detection before animal exposure. Potential users include airports, customs, veterinary agencies, and livestock producers because this technique is based on color change (from pink to yellow means contamination), and anyone can do it. Commercial deployment could prevent outbreaks, protect supply chains, and strengthen global biosecurity.

Poster Number: 6

Title: Rethinking Fat: Turning Cattle Nutrition into a Climate and Performance Tool

Presenter: Erin Burke

Abstract:

Beef production faces a dual challenge: increasing efficiency while reducing environmental impact. Yet producers are often given fragmented recommendations, optimize growth or cut methane, rarely both, creating uncertainty in decision-making. This project reframes dietary fat as a precision management strategy rather than simply an energy source. By integrating real-time intake systems with automated methane monitoring in a commercial-scale research feedlot, we evaluate how fat source influences growth, carcass value, and methane intensity simultaneously. The innovation is not the ingredient, it is the system: merging nutrition, technology, and business metrics into one actionable framework. Feedlot operators, nutrition companies, and sustainability programs can use these data-driven insights to improve returns while delivering measurable climate outcomes. Smarter nutrition becomes a measurable sustainability solution.

Poster Number: 7

Title: Manualization of the Merging Yoga and Education (MY-Ed) program for Adults With Brain Injury

Presenter: Emily Tull

Abstract:

Individuals with brain injury often experience long-term physical, cognitive, and emotional challenges that require ongoing rehabilitation and self-management. However, structured programs that combine exercise and self-management education specifically for this population remain limited. Merging Yoga and Education (MY-Ed) adapts an evidence-based yoga and education program originally developed for chronic pain into a brain injury–specific intervention. Through literature review, partner surveys, and focus groups with individuals with brain injury, caregivers, and rehabilitation professionals, Stage 1 facilitator and participant manuals were developed to guide program delivery. MY-Ed is innovative because it translates evidence-based rehabilitation strategies into a structured, manualized program designed to reduce cognitive load and support peer engagement. The program has potential for use by rehabilitation professionals and community programs to support long-term recovery following brain injury.

Poster Number: 8

Title: Earth-to-Mars on Electric Rockets: Enabling Nuclear-Electric Propulsion with High Power Cathodes

Presenter: Roberto Martelli

Abstract:

NASA-developed architectures for earth-to-mars transportation systems include space nuclear reactors with electric power outputs in the multi-megawatt range. This enables high-power electric thrusters, which use one tenth the propellant of conventional chemical thrusters. The highest power of flown electric thrusters, however, is solar-powered and in the 10-kilowatt range. For nuclear-electric thrusters, operating at hundreds of kilowatts, significant development is needed, and a critical aspect of this is the thruster's cathode. Cathodes in electric thrusters supply electrons, which ionize the propellant gas and neutralize the ion beam leaving the thruster – both crucial to the thruster's operation. We have designed, built, and demonstrated a 600-Amp cathode, which would be sufficient for thrusters operating around 200 kilowatts. The few other hundred-amp class cathodes have used a different emitter material, which requires significantly higher operating temperatures.

Poster Number: 9

Title: DayView: A Generative Transformer Framework for Diurnal Patterns of Land Surface Temperature Using GOES-R Satellite Observations

Presenter: Srivarshini Ksheerasagar

Abstract:

Diurnal cycles, the recurring 24–hour patterns produced by Earth's rotation shape a wide range of environmental processes including temperature variation, evapotranspiration, and soil thermal dynamics. Land surface temperature (LST), one of the 54 Essential Climate Variables defined by the Global Climate Observing System. However, obtaining complete diurnal LST patterns remains difficult.

This study introduces DAYVIEW, a spatiotemporal deep learning framework designed to reconstruct full diurnal cycles of LST from a single satellite observation, regardless of acquisition time. The methodology draws on hourly products from the GOES–R satellite series over the contiguous United States and integrates ancillary information such as climatic zones and elevation. Built on a Vision Transformer (ViT) architecture with a Masked Autoencoder strategy, DAYVIEW directly addresses three core challenges: (1) estimating diurnal cycles from sparse observations, (2) incorporating environmental context to refine fluctuation modeling, and (3) extending predictions reliably across continental scales.

Poster Number: 10

Title: Chromehound: Adaptive Multimodal (Aerial–Aquatic–Ground) Robot for Disaster Response

Presenter: Stephen Daire

Abstract:

Problem: Disaster environments are hazardous and often inaccessible to conventional robots. Aerial drones lack ground manipulation and water capability, ground robots cannot cross obstacles or flooded areas, and aquatic systems lack ground or aerial reconnaissance. These gaps slow response and increase risk for first responders.

Solution: Chromehound is a multimodal prototype robot that operates across air, land, and water. It integrates quadcopter flight, ground mobility, and a sealed buoyant frame with water thrusters. Multiple sensors, manipulators, and wireless communication provide real-time situational awareness. Chromehound supports payload delivery such as extinguishing agents or first-aid kits for faster, safer emergency response. A provisional patent has been filed ("Transforming Modular Multi-Environmental Robot," 63/784,222).

Audience: The transforming modular design expands operational reach while reducing logistical complexity. Target users include fire departments, police departments, defense organizations, disaster relief agencies, and industrial safety operators.

Poster Number: 11

Title: A Bayesian Decision-Theoretic Approach to Multiple Testing in Basket Trials

Presenter: Amartya Kumar Maulik

Abstract:

Basket trials test one treatment across multiple disease subpopulations, creating multiplicity challenges: controlling false discoveries while finding truly responsive baskets. Hierarchical borrowing can be slow, opaque, and may over-share. We propose a Bayesian decision-theoretic method that adjusts multiplicity by borrowing at the decision level via a tunable loss function, while keeping per-basket effect estimation

independent. The resulting rule is transparent, calibratable to weak Family-Wise Error Rate targets, and computationally fast because it needs only independent per-basket posterior summaries. Simulations and a vemurafenib basket trial show nominal weak FWER control, comparable or higher power to EXNEX/MEM, and substantial runtime savings. Unlike many alternatives, the method generalizes cleanly to binary and continuous endpoints and supports reproducible calibration. This tool is for trial designers, biostatisticians, sponsors, and regulators who need scalable, defensible decisions in basket trials.

Poster Number: 12
Title: Filling the Gap: Biopolymer Foam for Targeted Local Antibiotic Delivery
Presenter: Olivia Pyke
Abstract:
Trauma induced fracture-related infection following open fractures remains the most common and devastating complication, in up to 40% of cases. Standard of care remains systemic antibiotics and surgical irrigation/debridement. However, systemic antibiotic penetration to injured tissues may not achieve therapeutic levels due to devascularization. Local antibiotic delivery to the wound bed as a topical powder achieves rapid, high local antibiotic concentrations. Powders present clinical challenges as they are easily suctioned from incisions and have uneven distribution in complex wounds. To overcome these limitations, we developed a flowable, non-solidifying, engineered biopolymer (Chitosan, PF127, and PHMB) Medical Foam (MF) for effective in situ antibiotic delivery. The MF is aimed at filling and conforming to the wound site while providing a temporal release of the antibiotic. This innovation is designed for a variety of trauma-care applications, especially in surgical environments.

Poster Number: 13
Title: Ammonia for Clean Energy Storage
Presenter: Ojo Abraham
Abstract:
The transition to a carbon-neutral energy system requires scalable methods for storing and transporting renewable energy, with ammonia offering a compelling solution as a clean energy carrier. This project investigates lithium-mediated electrochemical ammonia synthesis as a sustainable process under ambient conditions. The purpose is to develop and optimize an electrochemical pathway that couples nitrogen reduction with lithium chemistry, enabling efficient ammonia production powered by renewable electricity. Preliminary results demonstrate high activity and Faradaic efficiency exceeding 18% under ambient pressure and temperature. Future efforts will focus on improving selectivity through advanced electrode designs, solid-electrolyte interphase stabilization, and integration of nanostructured catalytic materials. The expected impact is to advance Li-mediated ammonia synthesis from proof-of-concept toward a viable strategy for clean energy conversion and storage for a circular economy.

Poster Number: 14
Title: qPCR Detection of Lactobacillus in Murine Fecal Samples
Presenter: Sophie Downing
Abstract:
Traditional 16S rRNA sequencing provides detailed gut microbiome profiles but is time-consuming, expensive, and reports only relative abundance. Researchers studying Lactobacillus spp., beneficial gut bacteria involved in immune support and infection prevention, need faster methods to analyze large sample sets and track population changes. To address this, we developed a Lactobacillus-specific quantitative PCR (qPCR) assay for murine fecal samples using SYBR Green chemistry and targeted

primers. DNA from 29 mouse fecal samples was analyzed in triplicate to assess sensitivity and reproducibility. The assay consistently detected Lactobacillus DNA (Ct 11.38–14.08; mean 12.96) with high precision (0.56% average variation) and confirmed single-product amplification via melting curves (81.84 °C). Compared with sequencing, this method provides rapid, sensitive, and cost-effective quantification of bacterial abundance. This tool is valuable for microbiome researchers studying gut health, probiotic effects, dietary interventions, and validating sequencing results.

Poster Number: 15
Title: A 3D printed Chondrograft implant for cartilage repair in an equine preclinical model.
Presenter: Charlotte Barton
Abstract:
Osteoarthritis (OA) is a debilitating joint disease with both quality of life and economic impacts. There is no treatment for OA associated cartilage damage that restores the joint surface with tissue biomechanically identical to healthy cartilage.

ChondrograftTM is a porous 3D printed implant for cartilage defects, with a nano-microstructure that mimics collagen fibers and a microporous structure that enhances tissue integration. In the horse pre-clinical model, ChondrograftTM repair tissue had similar biomechanics to healthy cartilage.

Current gold standard implants like MACI rely on innate healing and produce repair tissue inferior to healthy cartilage. OCA implants require advanced planning to obtain donor tissue and have a narrow window of implantation. ChondrograftTM is off-the-shelf, doesn't rely on innate repair and costs ~30 times less than MACI or OCAs.

With more than 528 million people worldwide with OA, this represents a substantial target population for the implant.

Poster Number: 16
Title: The Development and Validation of a Simple Cost Effective Colorimetric Rapid Field Test Kit for Cannabinoid Detection
Presenter: Trevor Farmer
Abstract:
Colorimetric tests for cannabinoids are rapid, presumptive, and in some cases semi-quantitative screening methods used primarily by Law Enforcement to distinguish between marijuana-type (high THC) and hemp-type (high CBD) cannabis. Current field testing kits largely rely on Fast Blue (FBB), 4-aminophenol (4-AP), or Ehrlich Reagent as the primary reagent, producing specific identifiable colors within minutes. Our current research project, while having a completely different aim, has serendipitously unveiled a new colorimetric test for cannabinoids. The new method is very simple to perform, completely eliminates the use of toxic reagents, and is over 200 times cheaper to produce than current field test kits. The new colorimetric test kit for presumptive cannabinoid verification offers a rapid, cost-effective, and portable test kit that can be easily and cheaply manufactured for use by Law Enforcement and consumers of cannabinoid containing commercial products.

Poster Number: 17
Title: Adaptive Mobile Sensing for Natural Gas Emission Quantification
Presenter: Ezekiel Alaba

Abstract:
Methane emissions from oil and gas facilities contribute significantly to climate change and energy loss, yet accurately detecting and quantifying these emissions remains difficult due to complex plume behavior and uncertain atmospheric conditions. This research develops a mobile sensing system that integrates gas analyzers and wind measurement instruments on unmanned aerial platforms to detect and quantify methane emissions directly around industrial sources. By combining optimized plume sampling strategies with evaluation of established quantification methods such as tracer flux ratio, mass balance, and flux plane approaches, the system improves the reliability of emission estimates from mobile measurements. Unlike traditional monitoring approaches that rely on fixed sensors or large aircraft, this platform provides flexible, high resolution measurements while enabling new methods to isolate and quantify emission sources. This innovation is relevant to oil and gas operators, environmental regulators, researchers, and organizations working to monitor and reduce methane emissions.

Poster Number: 18
Title: Improving laboratory vector models for Rift Valley Virus studies using a cryoprotectant
Presenter: Faustus Azerigyik
Abstract:
We tackled a critical technical challenge in mosquito-borne virus research using Rift Valley fever virus (RVFV), a pathogen with severe health complications. The twist: we observed frozen RVFV stocks exhibit reduced mosquito infectivity, whereas freshly cultured virus restore transmission but introduces variable blood-meal titers that compromise experimental consistency and reproducibility. To address this, we evaluated trehalose dihydrate (TreH), supplementation which revealed a sweet spot: 0.5M TreH stabilizes RVFV frozen stocks with no observable baseline toxicity, maintained infectivity, and ensured consistent viral dosing. By incorporating TreH into artificial blood meals to infect mosquito vectors, Culex tarsalis showed higher infection and dissemination rates with stabilized virus, whereas Cx. quinquefasciatus responses were less pronounced. By reducing titer variability and improving dosing consistency, we transform a technical bottleneck into a robust experimental solution.

Poster Number: 19
Title: What's in Your Forecast? Following Raindrops to Predict Precipitation
Presenter: Lauren Beard
Abstract:
Weather forecasts struggle to distinguish between storms bringing needed rain versus destructive hail, and the difference can mean millions of dollars in crop damage or a family caught unprepared. Current models miss what's happening inside storms, where strong upward air determines water droplet development.

Using a coordinated network of radars in Houston Texas, we captured 3D snapshots of storm motion and evolution, something a traditional single radar can’t do.

We found that hail formed just before the storm reached peak intensity, when strong upward motion reaches into the freezing zone. As the storm weakens, the upward motion no longer supports large ice, and they melt into rain on the way down.

Our observations give forecast modelers a clearer picture of these processes, helping them improve tools for farmers and families. The next time you check your weather app, remember it started with scientists tracking individual raindrops through thunderstorms, one observation at a time.

Poster Number: 20

Title: A Chemocatalytic Route to Stereoregular Poly(3-hydroxyhexanoate) and Its Statistical and Tri-Block Copolymers.

Presenter: Maëlle Gace

Abstract:

Persistent plastic waste has created an urgent need for biodegradable alternatives. Poly(3-hydroxybutyrate-co-3-hydroxyhexanoate) (P3HBHx) is a commercially implemented poly(3-hydroxyalkanoate) (PHA), yet little is known in the open literature about their structure-property relationships of discrete poly(3-hydroxyhexanoate) (P3HHx) and its copolymers with poly(3-hydroxybutyrate) (P3HB). We address this gap by developing a chemocatalytic route to stereoregular P3HHx and PHA copolymers with P3HB, including statistical P3HBHx and triblock P3HB-b-P3HHx-b-P3HB. This one-pot polymerization of eight-membered diolides using chiral molecular catalysts produces high-molar-mass materials with tunable mechanical and thermal properties, including high modulus, high ductility, and broad application temperature windows. This work enables systematic structure-property characterization of P3HBHx-based materials and provides guidance for designing biodegradable plastics with improved performance.

Poster Number: 21

Title: A New Engine for Precision Canine Cancer Care

Presenter: Olivia Garvin

Abstract:

Cancer is the leading cause of death in dogs, yet most cancer types lack effective therapies. Precision medicine platforms adapted from human genomics are widely available but remain unsupported by evidence, and drug–gene matching has failed to deliver meaningful benefit in large-scale human oncology trials. This highlights the need for alternative, functional approaches rather than repurpose unsuccessful strategies. We are developing a canine tissue organoid (CTO) system that enables real time drug response testing while preserving key features of the primary tumor in culture. Unlike genomic prediction tools, CTOs can provide direct functional evidence to guide therapy decisions. This innovation offers veterinarians a practical platform to personalize treatment for dogs with cancer and establishes a translational model with relevance across species.

Poster Number: 22

Title: From Weeks to Minutes: Novel High-Throughput Single-Cell Morphometric Quantification Approach

Presenter: Megan Hager

Abstract:

Cells are the fundamental units of life, yet accurately quantifying how cell numbers or morphology change during injury or disease remains a major technical bottleneck. Most laboratories still rely on manual cell classification—methods that are slow and subjective. We developed a novel, high-throughput analytical approach that replaces manual scoring with rapid, unbiased, quantitative assessment of cell morphology across entire tissue sections and large cohorts. Our pipeline delivers reproducible, single-cell–level measurements at a scale not achievable with existing manual or semi-

automated techniques. This approach shrinks hands-on time, enabling analysis of thousands of cells per experiment, providing statistically robust data that were previously unattainable. As an academic laboratory, we prioritize collaboration and accessibility, working with researchers and clinicians alike. Our approach generates fast, objective, and high-content data, accelerating discovery and translation.

Poster Number: 23
Title: Microfluidic Electrochemical Cartridge for At-Home Early HIV Detection
Presenter: Thaisa Baldo
Abstract:
Human immunodeficiency virus (HIV) remains a major health challenge. Current antibody/p24 antigen tests require centralized labs, while antibody-only self-tests often miss early infection. We address this by integrating a magnetic bead–based electrochemical immunoassay for p24 antigen into a capillary-driven microfluidic cartridge designed for at-home use. Magnetic bead–bound immunocomplexes capturing p24 are preconcentrated on electrodes, where tetramethylbenzidine oxidation produces a measurable reduction current. The device achieved pg/mL detection limits, a broad dynamic range in spiked serum, and validated performance with inactivated virus. The cartridge automates sample handling, immunomagnetic capture, washing, and electrochemical readout using minimally processed fingerprick blood. Preliminary results confirm efficient bead transport, preconcentration, and p24-correlated signals. Future work focuses on full on-cartridge automation and multiplexed detection of p24 and antibodies, enabling early, private, and lab-quality at-home HIV testing for high-risk populations.

Poster Number: 24
Title: Multi-View Deep Learning Framework for Automated Behavioral Seizure Detection
Presenter: Hannah Kim
Abstract:
Epilepsy affects nearly 50 million people worldwide and is characterized by recurrent seizures caused by abnormal synchronous neural activity. In preclinical mouse models, behavioral seizures are typically scored manually through visual inspection of video recordings. This process is labor-intensive, subjective, and difficult to scale. We are developing a multi-view deep learning framework to automate behavioral seizure detection using synchronized home-cage video recordings from kainate-induced mouse seizure models. Our approach integrates top and side camera views and applies convolutional neural networks (CNNs) combined with temporal sequence modeling to capture seizure dynamics. We are currently investigating the impact of temporal window length and stride on detection performance. Ongoing work focuses on improving cross-session robustness and enhancing detection of short-duration seizures. This project aims to provide a scalable, non-invasive, and standardized platform for automated seizure quantification, supporting future research in epileptogenesis and therapeutic discovery.

Poster Number: 25
Title: Improving Wheat Resistance to Fusarium Head Blight Using Genomic Prediction
Presenter: Emily Billow
Abstract:
Fusarium Head Blight (FHB) is a major wheat disease that reduces yields and contaminates grain with toxins that threaten food safety. Warmer, wetter conditions driven by climate changes are increasing the frequency and severity of FHB outbreaks, making it harder for breeders to stay ahead. This project uses DNA markers and historical field data to predict which wheat lines are most likely to resist FHB, giving

breeders clearer, earlier insight than traditional methods. Unlike approaches that focus on a single gene, this strategy captures the full genetic complexity of resistance and helps breeders respond to shifting disease pressure. Wheat breeding programs across the Great Plains can use this pipeline to accelerate the development of resilient, climate-ready varieties as FHB pressure intensifies.

Poster Number: 26

Title: Wildfire Smoke and Temperature Influence Volatility in Financial Markets

Presenter: Karthick Mohan Kumar

Abstract:

Wildfire smoke increasingly degrades air quality in the United States and may influence economic activity. While prior studies link poor air quality to stock market performance, the specific impact of wildfire smoke remains unclear. This study examines how smoke-related PM2.5 affects returns and volatility of major U.S. stock indices. We integrate wildfire smoke data from the NOAA Hazard Mapping System, PM2.5 measurements from the EPA Air Quality System, and financial market data. Using Ordinary Least Squares regression with economic and weather controls, along with machine learning methods, we analyze environmental impacts on market behavior. Results show lower volatility on high-smoke days, while temperature has the strongest effect on the financial market. This approach uniquely combines environmental and financial data to quantify climate-related market impacts. These data may benefit and could be purchased by financial institutions, hedge funds, risk management firms, and environmental analytics companies.

Poster Number: 27

Title: Grid-Based Trajectory Planning for Equine Fracture Repair

Presenter: Andres Bonilla

Abstract:

Precise screw placement for distal phalanx (P3) fractures in horses often relies on Computed Tomography (CT) guided trial-and-error marker placement, requiring multiple scans, prolonged anesthesia, increased cost, and higher radiation exposure. We developed a low-cost adhesive grid containing radiopaque markers that creates a visible coordinate system on CT. With a single preoperative scan, surgeons can plan the optimal trajectory using grid coordinates and accurately reproduce it in the surgical field with standard instruments. Unlike current methods, this approach replaces subjective marker adjustments with an objective coordinate system, reducing the number of scans, radiation exposure, and procedural time while requiring no specialized navigation equipment. The technology is intended for veterinary orthopedic surgeons worldwide, particularly in settings with limited access to advanced surgical navigation systems, and may also have applications in human minimally invasive orthopedic procedures.

Poster Number: 28

Title: Development of Aqueous Zinc Antimonide Electrodeposited Alloys for Sodium-Ion Batteries

Presenter: Monika Perez

Abstract:

Sodium-ion batteries are a promising energy storage solution to supplement existing lithium-ion technology. While the working principle is the same, not all materials that work for lithium are suitable for sodium and materials development is needed. Alloying anodes, like antimony, are attractive electrode materials for sodium capable of higher capacities than carbon anodes, but suffer from large volume changes upon sodiation resulting in short cycle lifetimes. One way to alleviate volume changes is

by alloying antimony with another metal, like zinc, to act as a buffer material. Here we describe an approach to use aqueous baths and milder, more positive deposition potentials to electrodeposit zinc antimonide alloys onto current collectors. This approach will enable the development of sodium-ion technologies to expand the library of energy storage options for applications from ranging from electric vehicles to stationary storage for renewable energy.

Poster Number: 29
Title: Taking Out the Trash: A Viral Approach to Treat Alzheimer's Disease
Presenter: David Crosby
Abstract:
Alzheimer's Disease (AD) affects 7.2 million Americans, driven largely by the toxic buildup of tau protein inside neurons. Current therapies target tau outside the cell, leaving the most damaging internal aggregates untouched. Our innovation is a virus that increases the abundance of a natural protein in neurons. This revives the cell's ability to package and expel harmful tau, an ability lost with AD progression.

Unlike traditional drugs that struggle to penetrate cells and provide lasting effects, our genetic approach restores the neuron's innate waste-management machinery, solving the problem from the inside out. Immediate stakeholders would be pharmaceutical companies to develop our innovation as a therapy and execute the necessary clinical trials to ensure safety and effectiveness. Ultimately, the market for our innovation is the millions of people and their families suffering from AD, as an alternative or complement to existing treatments.

Poster Number: 30
Title: Lipid TLR Nanoparticle Immunotherapy for Treatment of Squamous Cell Carcinoma
Presenter: Haylee Smith
Abstract:
Squamous cell carcinoma (SCC) is an aggressive skin cancer, which can be triggered by UV exposure or by papillomavirus infection. Early surgical excision can be curative, but treatment options are limited for more advanced SCC. Thus, there is a large unmet need for new treatments for advanced SCC, without inducing toxicity

Our laboratory has developed a novel liposome-Toll-like receptor nanoparticle (LTN) that potently activates innate immune responses. LTN immunotherapy is being evaluated in trials in horses with two types of SCC (eyes, genitals) to assess efficacy for SCC in horses and humans. We have observed a high tumor response rate (complete or partial tumor regression) to LTN injections in both trials and tumor responses have been durable, with minimal local reaction.

To our knowledge this is the first injectable immunotherapy to demonstrate strong antitumor activity against SCC. We conclude therefore that LTN immunotherapy has considerable promise as a new cancer immunotherapy for treatment of human and animal SCC, particularly in locations where surgical excision may not be possible.

Poster Number: 31
Title: Rapid Inactivation of Pathogens on Microscope Slides: A Platform for Improving Mass Spectrometry for Imaging of Samples from Infected Tissue

Presenter: Yvette Cruz

Abstract:

Molecular Imaging using Mass Spectrometry (MSI) enables identification of the changes in diseased versus healthy neighboring cells within a tissue sample, including demonstrating delays in drug delivery to sites of need for effective treatment. Despite this, MSI for infectious disease research is hampered by the need to inactivate pathogens within tissue samples before analysis. Current inactivation techniques utilize a stepwise process of freezing excised tissues, inactivation via UV, X-ray, or gamma irradiation, then processing samples for MSI. This is a laborious and time-consuming process and is not efficient for studying dynamic cellular interactions during time of tissue harvest. We hypothesize that alternate inactivation strategies can be conducted "on-slide" reducing the delay from tissue sample collection to MSI and improving the capture of dynamic interactions. In this study, we used Mycobacterium bovis Bacillus Calmette-Guérin (BCG), an attenuated M. bovis strain that can be manipulated in standard laboratory conditions to test our hypothesis. We tested UV radiation and Vaporized Hydrogen Peroxide (VHP) on slide inactivation methods and found that UV and VHP treatment sterilized the prepared slides. Our aim is to expand its application using virulent M. tuberculosis-infected tissue samples and ultimately other high containment pathogens.

Poster Number: 32

Title: FreshAir Calf Hutches: Enhanced Ventilation Dairy Calf Housing

Presenter: Caleb Tessely

Abstract:

Dairy calves typically spend their first 60-90 days in calf hutches, this time is critical for their healthy development and to ensure future productivity. The main risk they face is high heat stress and moisture, these can lead to heat stroke and disease. To improve calf well being, it is necessary to address these challenges. Our team, building on the work of the 24/25 team, has worked to ensure increased airflow through the hutch, while also improving the overall strength and manufacturability of the hutches. A series of prototypes were created and tested to evaluate a range of design features. The selected design showed significant gains in strength and ventilation performance. It includes large, round, sealable vents along with a fully removable rear door to maximize airflow. Separating these vents are large corrugations to improve snow and wind load performance. On-market hutches often only have small vents and one open door, our design improves on this massively. The primary group that would be interested in this innovation is North American dairy farmers.

Poster Number: 33

Title: Smart Water-Based Gels with Programmable Softness and Flow

Presenter: Alexander Claiborne

Abstract:

Hydrogels are widely used in biomedical products because they closely resemble the body's soft tissues, but their use is often limited by mechanical properties. For example, a gel may be ideal for drug delivery yet too stiff to easily inject through a syringe. This project addresses the challenge of designing gels that are both easy to handle and effective once delivered. My research introduces a new way to independently control two key gel properties: softness and flow behavior. Softness is adjusted by adding a competing molecule, while flow is controlled by changing the surrounding pH. Unlike traditional approaches, where these properties are tightly linked, this method allows them to be tuned separately. This makes it possible to design gels that are stiff yet flow easily, or soft but resist flow. This innovation enables greater flexibility in material design and could benefit applications such as injectable drug

delivery as well as design of in vitro tissue, where materials must be easy to administer or fabricate while performing reliably.

Poster Number: 34

Title: A Deep-Learning Approach for High-Throughput Microglial Phenotyping

Presenter: Omar Yanouri

Abstract:

Advances in high-throughput imaging and multiplex staining methods have enabled researchers to probe intricate biological processes and link cellular phenotypes linked with disease-associated states. Despite these innovations, current image analysis methods remain a bottleneck in the identification and characterization of cellular states at scale. To address these challenges, we have developed a set of deep-learning neural networks and image analysis pipelines for VISIOPHARM Oncoplex image analysis suite which allows for high-throughput identification of microglia, the primary immune cell of the brain, and cell-specific quantification of over a dozen morphometric and phenotypic features from both immunohistochemical- and immunofluorescence-labeled section. These pipelines have been employed in interrogating microglial states and reactivity in models of neurodegenerative disease, transforming a process that once required weeks for the manual annotation of hundreds of cells into one which can be accomplished in days while profiling thousands of cells.

Poster Number: 35

Title: Hydrodynamics-informed remote sensing monitoring of restoration in the transboundary wetlands

Presenter: Ajay Devda

Abstract:

Coastal wetlands with high tidal variation hamper the accuracy of universal remote sensing products, often leading to over- or underestimation of key ecological parameters. Hydrodynamics is crucial to the accurate estimation of ecological parameters for wetland monitoring. Recognizing that existing biomass and GPP estimates often neglect hydrodynamic variation that disproportionately affects NIR reflectance, we propose novel correction strategies. Our study aims to evaluate landscape-scale restoration impacts and carbon flux dynamics, considering hydrodynamic changes across a transboundary wetland incorporating remote sensing, in situ data, and machine learning-based modeling approaches. To assess vegetative recovery and landscape transformation, we compiled geospatial datasets from carbon-credit-oriented restoration efforts, including high-resolution shapefiles, time series of remote sensing indices, and elevation data. We leveraged high-frequency (30-minute interval) water level data from multiple monitoring stations.

Poster Number: 36

Title: Automated Bone Transport for Optimization of Bone Regeneration

Presenter: Chloe Brekhus

Abstract:

Segmental bone defects from trauma, tumor resection, or infection are difficult to treat. Distraction osteogenesis is a common but lengthy treatment method that involves gradually transporting a bone segment to stimulate new bone formation. Current methods rely on manual adjustments, limiting transport frequency and providing no real-time feedback on tissue mechanics, preventing patient-specific optimization and prolonging recovery.

We are developing a motorized bone transport system that automatically adjusts transport rates based on forces measured within the defect. Stepper motors enable precise, high-frequency transport, while

integrated strain gauges monitor tissue mechanics to guide real-time optimization. Unlike existing devices, our system couples automated actuation with biomechanical feedback to tailor therapy to each patient. Orthopedic device companies and surgeons treating severe bone injuries are key stakeholders, with patients as the ultimate beneficiaries.

Poster Number: 37

Title: How Vulnerable Are Our Coastal Communities to Hurricanes?

Presenter: Mohamad Habibnia

Abstract:

Hurricane storm surge causes severe damage to coastal buildings, yet existing loss assessment models either oversimplify uncertainties or are too computationally demanding for large-scale use. This study develops a probabilistic, building-specific loss modeling framework that integrates probabilistic approaches with machine learning acceleration. The innovation dynamically adjusts building models using exclusively publicly available datasets and propagates uncertainty while enabling fully scalable national-scale analysis without reliance on proprietary data. This approach captures nonlinear relationships and produces annualized loss risk maps from the individual building to state scale. Policymakers, insurers, planners, and resilience researchers can use this tool to support risk-informed decisions and resource allocation.

Poster Number: 38

Title: Redesigning Dairy Workforce Training for Safety, Performance, and Sustainability

Presenter: Rhyse Campion

Abstract:

Commercial dairies face persistent workforce training challenges driven by language barriers, high turnover, and limited time for standardized instruction, leading to variability in animal care and operational performance. Our innovation is a culturally and linguistically accessible, asynchronous bilingual digital training platform co-developed with dairy producers and workers to address real on-farm needs. It transforms routine task instruction into concept-based learning, teaching not only how tasks are performed but why they matter for animal welfare, milk quality, and sustainability. Unlike traditional compliance-focused programs, our modules are science-based training powered by biometric engagement data, using neuromarketing-informed design to optimize attention, retention, and behavior change. The platform is designed for integration into current dairy onboarding programs, with opportunity for nationwide industry adoption.

Poster Number: 39

Title: Canine Whiskers: An assistive device for visually impaired dogs

Presenter: Heidi Hamilton

Abstract:

Over half of households in the United States own a pet dog, making canine health and well-being a widespread concern. Approximately 10% of dogs experience vision impairment which reduces safe and independent navigation of the environment, increases risk of injury, limits mobility, and creates stress for both dogs and their caregivers. To address this, we developed Canine Whiskers. It uses mechanosensation from eight distributed whiskers that detect nearby obstacles, allowing dogs to “feel” their environment. By providing tactile feedback, Canine Whiskers supports safer navigation and greater independence in visually impaired dogs. Unlike existing products, our design minimizes issues like snagging on furniture, excessive neck pressure, or skin irritation. The lightweight, low-profile structure

prioritizes comfort, safety, and usability while remaining cost-effective. By improving mobility and reducing injury risk, Canine Whiskers enhances quality of life for both dogs and their owners.

Poster Number: 40
Title: Topological universal dynamic compatibilization enhances recycling of mixed plastics
Presenter: Xavier Westworth
Abstract:
Mechanical recycling of post-consumer plastics, especially incompatible mixed plastics, is often a downcycling process, resulting in brittle materials. Here we introduce a multi-arm universal dynamic crosslinker (UDC) platform to enable mechanical upcycling of incompatible mixed plastics. It creates in situ star-like multiblock copolymer compatibilizing architectures from mixed plastics, irrespective of polymer types, and is compatible with reactive extrusion re/processing. While previous compatibilizers require mechanical sorting or demonstrate moderate improvement in material properties, these architectures are credited for not only drastically enhancing creep resistance by two to four orders of magnitude but also improving the extensibility of polymer blends by up to 100-fold. By adjusting the topological UDC architecture and loading, broad property tunability between thermoset- and thermoplastic-like materials is achieved from mechanical upcycling of mixed apolar/polar plastics. This work provides a viable approach to improve the circularity of plastics for industrial recycling.

Poster Number: 41
Title: Enhancing the MEMS Model to Incorporate Pyrogenic Organic Matter Dynamics
Presenter: Emma Hamilton
Abstract:
Pyrogenic organic matter (PyOM) is an important but understudied component of the terrestrial carbon (C) cycle, particularly in fire-affected ecosystems and biochar-amended landscapes. Despite its role in long-term C storage, PyOM is poorly represented in mechanistic models due to its chemical complexity. To address this gap, we developed a PyOM-specific submodule for the MEMS model, a process-based ecosystem model that simulates soil organic matter (SOM) dynamics across soil depths. The submodule represents PyOM using pools defined by chemical characteristics influenced by feedstock and pyrolysis temperature, allowing PyOM composition to influence persistence and interactions with SOM pools. This approach improves on models that treat PyOM as a single inert pool and is applicable to wildfire and biochar systems. The model is intended for use by ecosystem modelers, soil scientists, and land managers.

Poster Number: 42
Title: Gene panel diagnostic test predictive of equine osteoarthritis severity
Presenter: Hannah Chernavsky
Abstract:
Osteoarthritis (OA)-induced lameness is a leading cause of early retirement in equine athletes yet current diagnostics such as subjective evaluation and imaging fail to reflect disease severity. Improved characterization would enhance disease and pain management. Emerging research indicates differential gene expression may objectively assess OA progression, but no molecular tests for equine OA exist. Developing a multi-gene diagnostic panel of validated OA-associated genes to objectively predict severity from a synovial fluid sample could positively impact diagnosis. Unlike existing methods relying on clinical signs and imaging alone, this lab-based test quantifies underlying molecular activity driving structural progression. With companies seeking diagnostics to better stage disease and tailor therapies,

this panel will enable veterinarians to stage OA accurately, guide treatment, monitor progression, and reduce reliance on costly diagnostics, with translational potential to human OA.

Poster Number: 43
Title: At-Home Detection of Pesticide Residues
Presenter: Claire Hefner
Abstract:
Over 3.7 million tons of pesticides are applied yearly to sustain crop yields, yet the mixing, loading, and spraying of these chemicals place agricultural workers at substantial risk of direct exposure. Contaminated clothing, gloves, and tools can then transfer residues into vehicles and homes, introducing “take-home” exposure among family members, especially vulnerable children. Pesticide exposure can cause nausea, respiratory distress, and neurological impairment, highlighting the need for simple tools to monitor contamination where people live and work. Conventional methods requiring experts and expensive equipment are impractical for rapid on-site testing. Here, we introduce the Home Pesticide Exposure (HoPE) kit, which contains a dual-enzyme microfluidic device for simultaneous colorimetric detection of organophosphates and dithiocarbamates from fabric swabs, plus a smartphone app for guided imaging, automated quantification, and exposure risk assessment. Ideally, we can empower non-trained users with this simple, low-cost platform to drive real-time prevention and safer homes.

Poster Number: 44
Title: Re-Engineering Wheat for Lower-Carcinogen Foods
Presenter: Forrest Wold-McGimsey
Abstract:
Acrylamide, a toxic, carcinogenic compound, forms when starchy foods like bread are baked. Its formation is driven by free asparagine in wheat grains and growing regulatory limits on acrylamide creates a major challenge for the food and grain industries. We used CRISPR/Cas9 genome editing to knock out all three copies of the ASN2 gene in elite bread wheat varieties, directly reducing free asparagine in the grains. Current methods to reduce acrylamide rely on costly food additives, enzyme treatments and altered baking conditions. Our approach solves the problem at its source by reducing free asparagine in the grain through precise genome editing. This method delivers field-stable reductions in acrylamide risk without requiring changes to processing or sacrificing agronomic or baking performance. This technology will be valuable to wheat breeders, seed companies, millers, bakers and snack-food manufacturers who must meet tightening acrylamide regulations, as well as consumers and public-health agencies seeking safer and healthier staple foods.

Poster Number: 45
Title: Computer Vision Pain Monitoring for Research Animals
Presenter: Christopher Brown
Abstract:
Accurate pain assessment in animals remains difficult as animals instinctively mask signs of discomfort, while current monitoring relies on periodic human observation that is subjective and may miss early indicators of pain. We are developing an automated computer vision system that continuously monitors animals using cameras to analyze gait patterns and facial expressions associated with pain. Machine learning models detect subtle lameness, abnormal weight-bearing, and Grimace features to alert veterinary staff to potential pain events. Unlike conventional observation-based monitoring, this

approach provides continuous, and objective assessment without increasing animal stress or staff workload. The platform is designed for use across multiple species and may benefit research institutions, veterinary hospitals, and livestock operations seeking improved welfare monitoring and early detection of clinical problems.

Poster Number: 46

Title: Novel Device and Disposable for Blood Pathogen Reduction using UV Light and Riboflavin for Treatment of Whole Blood

Presenter: Socks Jones

Abstract:

Contamination during blood collection and processing in large scale blood banking operations increases patient transfusion-associated infection risk. Current UV systems, such as Mirasol PRT, are effective in pathogen reduction and preservation of blood quality; however, require approximately 1 hour per whole blood unit. Alternatively, a flow through system could achieve comparable results in a reduced time. This would allow for quicker treatment of blood after collection from a donor, potentially providing lifesaving care for a patient in need. Despite established efficacy, the current technologies are not optimized for speed, limiting rapid clinical use and scalability. Limited data exists on whether continuous flow-through a UV photochemical treatment can achieve equivalent pathogen reduction while maintaining cellular and protein integrity. This study offers a comparison between the Mirasol PRT system and a continuous flow-through UV treatment. Cell and protein quality data on treated products is also presented corresponding to 3-5 Log inactivation

Poster Number: 47

Title: INTENTIONAL MICROGESTURE RECOGNITION FOR EXTENDED HUMAN-COMPUTER INTERACTION

Presenter: Chirag Kandoi

Abstract:

As extended reality (XR) systems become more widespread, users increasingly rely on mid-air gestures for interaction. However, conventional gestures such as pointing and swiping lead to arm fatigue, making them unsuitable for sustained use. This work addresses the lack of data needed to support an alternative interaction approach based on microgestures—small, low-effort hand movements designed to reduce physical strain. I introduce a novel video dataset of intentional microgestures and evaluate multiple machine learning models to assess the feasibility of recognizing these fine-grained movements. Unlike prior work, which largely discusses microgestures conceptually, this research provides the first dedicated dataset and baseline classification results to support data-driven development. The dataset and findings are intended for researchers and developers working in human–computer interaction, computer vision, and XR systems, particularly those designing gesture-based interfaces for head-mounted displays and intelligent agents.

Poster Number: 48

Title: Endoprosthetic Sleeve that Improves Bone-Scaffold Efficacy for Critical Bone Defects

Presenter: Shashank Kanakamedala

Abstract:

Large bone defects affect over 1.5 million Americans annually, causing infections, reoperations, and limb loss, costing over $1 billion per year. Calcium-phosphate scaffolds are osteoconductive but mechanically weak at high porosities required for nutrient exchange, making mechanobiology a key unsolved challenge. A 3D-printed PCL endoprosthetic sleeve was developed and tested on PLA gyroid scaffolds in ovine metatarsi with cyclic loading. It reduced transverse strain by 30% and maintaining it below the 5%

mechanobiological threshold for intramembranous bone formation, while axial strains remained at 200–300 με, comparable to native bone. Unlike approaches that alter scaffold composition and architecture which compromise porosity and bioactivity; this sleeve acts externally, preserving the osteoconductive properties while independently controlling the strain environment. This solution directly serves orthopedic surgeons by providing a clinically viable scaffold system for large bone defects.

Poster Number: 49
Title: RADSENSE: A Machine Learning based Smoke Forecast System
Presenter: Zongrun Li
Abstract:
Wildland fires have increased substantially in recent decades and are a major source of PM2.5 in the US, posing serious health risks. Accurate forecasts are critical for public health protection. However, current smoke forecasting systems rely on physics-based models that produce inaccurate predictions due to uncertainties in fire emissions.

In this study, we develop an ML-based ensemble framework to improve smoke forecasts by correcting biases in UFS-AQM. The framework integrates data sources, including satellite retrievals, meteorological forecasts, and PM2.5 monitoring data. Three ML models are trained using an out-of-fold learning strategy and combined using optimized ensemble weights to generate improved hourly PM2.5 forecasts up to 24 hours ahead. The ML framework improves forecast accuracy (R2=0.39), compared to UFS-AQM (R2=0.01), while remaining computationally efficient. This approach can be used in same-day forecasting systems, providing reliable smoke alerts to the public.

Poster Number: 50
Title: Machine Learning-Guided Design of Avidity-Based Readers Targeting H2AK127ub
Presenter: Colby Williams
Abstract:
Ubiquitylation of histones has been shown to regulate gene expression and support DNA repair, yet many of these modifications remain poorly understood as they cannot be detected with site-specific precision. One example is H2AK127ub, a BRCA1/BARD1-installed modification essential for DNA repair and frequently disrupted in cancer. No existing tools can selectively detect this mark, limiting efforts to define its function and contribution to genomic stability. We addressed this gap by developing a machine-learning-guided pipeline that designs de novo protein Readers with specificity for individual ubiquitylated histone sites. One design selectively recognizes H2AK127ub in vitro and in cells, enabling direct visualization of this elusive signal. By providing a programmable, modular route to site-selective recognition, this innovation offers an alternative to antibodies and a new strategy for researchers studying DNA repair, chromatin biology, and cancer-associated ubiquitin signaling.

Poster Number: 51
Title: Gadolinium-free fluorescent metal-doped carbon nanodots as kidney-friendly alternative bionanoprobes.
Presenter: Alexander Lott
Abstract:
Patients living with chronic kidney disease (CKD) and populations susceptible to nephrotoxicity from Gd based MRI contrast agents deserve safe access to high quality diagnostic imaging. Using a design of experiment (DoE) approach, we have created luminescent, Gd-free, 3d transition metal doped carbon nanodots (M-CNDs) to provide strong MRI contrast and optical signal while promoting rapid renal

clearance through surface engineering. This design aims to address concerns about nephrotoxicity in susceptible demographics and to alleviate equity concerns in diagnostic healthcare. Our findings support M-CNDs as a versatile, potentially safer preclinical bimodal imaging platform. We expect a commercial version of our next-generation kidney safe imaging agents to benefit radiologists seeking safer contrast agents for high risk patients; nephrologists and primary care teams managing patients with CKD; and institutions serving minority communities with a genetic propensity towards CKD.

Poster Number: 52
Title: Identifying QTL for mineral biofortification in African sorghum breeding programs

Presenter: Rae (Rachel) McDowell
Abstract:
Iron and zinc are micronutrients essential for proper growth, maintenance, and immune function. Supplementation programs and fortification strategies have been implemented in many countries to combat micronutrient deficiencies, however in rural regions or places of government and economic instability, these options may not be accessible. Micronutrient biofortification is underway in most staple crops and has been tested and employed in several countries. Biofortification of sorghum grain iron and zinc can be accelerated in breeding programs with the deployment of marker assisted selection (MAS), however identification of quantitative trait loci (QTL) and casual genes is needed in order to develop effective markers to use for selection. Through a reverse genetics pipeline, we have identified several putative causative variants in candidate genes derived from literature. These variants have been turned into genetic markers in the process of validation and testing. These markers have potential to assist breeders in MAS of lines to accelerate the nutritional improvement of sorghum.

Poster Number: 53
Title: Early Health Checks for Healthier Organic Dairy Youngstock
Presenter: Miso Lunika
Abstract:
Organic dairy farms have limited treatment options, making early disease detection essential for calf health. The challenge is that respiratory diseases often develop without obvious clinical signs. We evaluated seventy-three calves in three age groups on a Colorado dairy using serum total protein testing, health scoring, fecal flotation, nasal swabs, and thoracic ultrasonography (TUS). Although 91.2% of newborn calves achieved excellent passive immunity, respiratory disease was common. Pasteurella multocida was detected in 78.9% of weaned calves, while viral respiratory pathogens were more frequent in preweaned calves (22%). Coccidia were identified in 63.2% of weaned calves. Fever and lung lesions often occur without other visible signs. By combining health scoring with TUS, this approach detects subclinical lung disease that visual exams alone miss, providing organic producers and veterinarians with earlier, actionable information to improve calf health and management decisions.

Poster Number: 54
Title: Movement that Moves Fatigue
Presenter: Hannah Parker
Abstract:
Problem: Cancer-related fatigue (CRF) is the intense, persistent, and overwhelming exhaustion that is not relieved by rest or sleep. Over 80% of cancer survivors struggle with CRF and it exists on a spectrum

within a day. Currently, patients are lacking information and app-based guidance about what to do when they feel fatigued.

Solution: My research looks at the within-day relationship between movement behaviors (MB) and CRF. This will allow us to gain information about which MBs are most linked with CRF within the same day as well as the directionality of this relationship. This research is necessary to build an app that patients can use to help alleviate their CRF every day.

Innovation: This research is innovative in that it looks at CRF as patients feel it – at the momentary level. My research will develop an app that sends brief surveys throughout the day to measure CRF and then gives recommendations on MBs.

Audience: Ultimately, the audience would be cancer survivors.

Poster Number: 55
Title: Production and use of Immunoglobulin Y antibodies as a prophylactic and therapeutic tool
Presenter: Myah Hinshaw
Abstract:
In 2024 diarrheal diseases remained a major killer of children under five years old, especially in low and middle-income countries. Antibiotic treatments lead to increasing bacterial resistance. The proposed research aims to develop a therapeutic approach based on Immunoglobulin Y (IgY) to treat enteric bacterial pathogens (pathogenic bacteria in the intestines of animals and humans) and counter the emerging threat of antibiotic resistance. The IgY extracted from the egg yolk of vaccinated hens should prevent enteric pathogens from colonizing in the intestines and interacting with cells in the intestinal cell lining and thus provide an alternative treatment to the use of antibiotics for the prevention of bacterial diarrhea. This proposes a more cost efficent way of treating bacterial diarrhea while avoiding antibiotic resistance.

Poster Number: 56
Title: Algae's Appetite for CO2 – A Sustainable Feast
Presenter: Asim Phadke
Abstract:
Fossil fuel power plants are one of the major contributors to global emissions, releasing flue gas containing ~12% CO2. The goal of this project is to demonstrate, characterize, and optimize a biorefinery process for converting utility-source of CO2 into high-value products, such as carbon nanofiber supercapacitors and ink, through algal cultivation. This phase of the project focuses on maximizing the utilization of CO2 from flue gas by dissolving it in an aqueous stream to promote algal growth. Traditional methods of CO2 dissolution rely on sparging which lacks in residence time and is highly inefficient. Our method introduces an enhanced sparging method through orifice induced turbulence increasing carbon uptake rate. Initial results in the 100L ponds show that this method can dissolve CO2 alongside other harmful gases such like SO2 and NO2. If successful at a commercial level, this technology can be a cost-effective solution for companies looking to reduce their carbon emissions.

Poster Number: 57
Title: Production of Renewable Chemicals from Food and Agricultural Waste

Presenter: Ficky Muabuay
Abstract:
Every year, the US sends over 80 million tons of food waste and organic material to landfills, generating greenhouse gases and losing billions in recoverable value. Our research converts this waste into carboxylic acids, the chemical building blocks used in bioplastics, animal feed additives, and renewable fuels, using a process called arrested anaerobic digestion. The key breakthrough is a precise pH control method using lactic acid that reliably stops methane-producing microbes across any organic feedstock, including difficult fibrous materials that previously failed. No existing technology achieves this across such diverse waste streams. Our system produces acid yields up to 0.47 g COD/g VS with no external chemical waste. Municipal waste processors, agricultural operations, and bio-based chemical manufacturers can use this as a drop-in upgrade to existing digester infrastructure to generate revenue from waste streams they currently pay to dispose of.

Poster Number: 58
Title: Chemical Lures Offer Novel Protection Strategy Against Wheat Stem Sawfly
Presenter: Mj Riches
Abstract:
Wheat stem sawfly (WSS) is a threat to winter wheat, costing $350 million/yr in crop loss in the USA. Current management strategies (e.g., resistant cultivars and biological control) slightly reduce infestation at the cost of reduced yield, but infestation continues to spread to new regions. We propose a lure using blends of volatile organic compounds (VOCs) naturally emitted by wheat. By replicating the chemical signals that female WSS use to locate host plants, our lure would become the most attractive target. Lab measurements of resistant and susceptible cultivars allowed us to identify VOCs that attract and repel WSS and attract their parasitoids. As the first study to quantify these VOCs, we can integrate them at attractive and ecologically relevant concentrations to rival the natural emissions from winter wheat. This approach benefits wheat growers seeking effective, minimally invasive, insecticide-free tools to protect high-yield cultivars and reduce economic loss.

Poster Number: 59
Title: Precision Mitigation Techniques for Larkspur in Western Rangelands
Presenter: Amber Pelon
Abstract:
Foothills larkspur is a perennial plant native to the foothills of the Rocky Mountains. It is toxic to cattle, causing intestinal stasis, bloat, muscular paralysis, and sudden death due to respiratory paralysis. This high risk of cattle fatalities significantly reduces the usable area of ranchland for cattle production and affects ranchers' annual economic returns. Our solution will involve two novel approaches in larkspur mitigation: mapping and precision removal of above-ground plant mass using drones and robots, and research and testing of growth inhibitors targeting the terpenoid pathway responsible for producing the toxin in plants. Both methods will allow this valuable forb to remain in the rangeland while reducing the toxic risk to cattle, thus enabling higher stocking rates on cattle ranches. We aim to provide innovative larkspur mitigation techniques and to develop a tool to help ranchers choose the most effective strategy for their profit, herd, and rangeland health.

Poster Number: 60

Title: OrthoAlign™: Kinematic Solutions for ACL Reconstruction Surgery
Presenter: Abigail Waugh
Abstract:
The clinical success of ACL repair is, in part, determined by the accurate graft placement during surgery, which is critical for maintaining native knee kinematics and reducing the risk of early and long-term complications. Precise identification of the center of rotation (COR) is essential, as the ACL graft must pass through this point during flexion and extension to maintain native kinematic motion. Our method calculates the instantaneous COR using motion capture techniques and a proprietary algorithm, transforming graft placement from a "blind procedure" reliant on physician training to a mathematically optimized approach based on anatomical landmarks. This innovative method is the foundation for advancing robotic-assisted ACL procedures. By integrating this data into a six-degree-of-freedom robotic manipulator, we enable precise drill guide alignment, ensuring reproducible, patient-specific tunnel trajectories and optimized graft placement during ACL reconstruction.

Poster Number: 61
Title: Structural and Kinetic Correlations in Gentamicin-Loaded PLGA Nanoparticles: The Impact of Drug Loading on Antibacterial Activities of PLGA Nanoparticles
Presenter: Mahboube Piryaee
Abstract:
Antibiotic resistance and ineffective local drug delivery remain major challenges in treating bacterial infections. A key but underexplored factor is how drug loading influences the structure and performance of biodegradable nanocarriers. This study investigates gentamicin-loaded PLGA nanoparticles synthesized using a double-emulsion method with controlled gentamicin concentrations (10–40 mg). By tuning the inner aqueous phase volume and drug loading, we controlled nanoparticle porosity and release behavior. An optimal formulation produced balanced pore formation and stable emulsions, enabling an initial burst release exceeding minimum inhibitory concentrations for E.coli and S.aureus, followed by sustained antibacterial activity. Unlike approaches that maximize drug loading, our work demonstrates that moderate loading optimizes nanoparticle structure and therapeutic performance. This innovation provides a design strategy for precision antibiotic delivery systems relevant to researchers, biomedical engineers, and pharmaceuticals developing advanced infection-control technologies.

Poster Number: 62
Title: Muscle Strength Assessment in the Laboratory Mouse
Presenter: Sandra Bandimere
Abstract:
Grip strength testing machines for preclinical research animals (rats and mice) are commercially available, however they are expensive and report only maximum force values generated during testing, and omit the complex biomechanics patterns. Here, we present an innovative forelimb grip testing apparatus that is both affordable and which produces a robust graphical analysis. This apparatus solves the problem of limited information from other expensive equipment that only measures maximum force. Complex waveforms can be analyzed for maximum force, average force, rate of force, and integrated force. This application can be used in biomedical research and in educational settings to teach students about basic biomechanics in small animals.

Poster Number: 63
Title: Storage-induced Color Change as an Indicator of Cannabidiol Degradation in MCT Oil
Presenter: Byeong-Ryeol Ryu
Abstract:
Because consumers frequently rely on visual cues to assess product quality and freshness, the common discoloration of cannabidiol (CBD) oil during storage raises concerns about quality and efficacy. However, its relationship to chemical degradation remains unclear. This study addressed that gap by quantifying color change and CBD loss in medium-chain triglyceride (MCT) oil over 192 days under varied light, temperature, and air conditions. The results showed a strong inverse correlation between visible yellowing and CBD concentration. Unlike previous studies focused mainly on chemical content, this work integrates quantitative L*a*b* color analysis with HPLC under combined real-world storage stresses to link visual and chemical degradation. These findings establish visible yellowing as a practical quality indicator that can be used by consumers and manufacturers to assess product quality and improve storage conditions.

Poster Number: 64
Title: UroNet – A Microfluidic Platform for Non-invasive Cancer Screening
Presenter: Fig Veldhuizen
Abstract:
Cancer is currently the second leading cause of death worldwide, commonly detected late, limiting treatment plans and reducing survival rates. Current diagnostic tools are invasive, expensive, and inaccessible, while usually missing early stage disease markers. Our innovation, UroNet, provides a simple, one way workflow for laboratory technicians to investigate the presence of cancer in patients in a non-invasive, accurate way with just a urine sample. UroNet integrates specialized engineered crystals in microfluidic platforms to capture and concentrate cancer derived genetic biomarkers (Circulating Tumor DNA, ctDNA) in a urine sample for analysis. With the ability to detect cancer non invasively and efficiently, UroNet is ideal for patients who are genetically predisposed to cancer, have recovered from previous occurrences, or anyone who needs constant monitoring for lower risk.

Poster Number: 65
Title: Using Cow-monitoring Devices to Detect Highly Pathogenic Avian Influenza H5N1
Presenter: Kate Schinkel
Abstract:
Highly pathogenic avian influenza (HPAI) H5N1 is an emerging disease in humans and cattle. At least 41 instances of cattle-related cases have occurred in humans, which is likely an underestimation. Further, HPAI H5N1 has impacts on cow health, decreasing milk production and potentially leading to culling of the animal, causing significant economic impact for farms. Many farms use cow-tracking devices to monitor cow health, similar to how smartwatches can monitor human health. This project aims to use the data collected from such devices to identify cases of HPAI H5N1 before cows begin to exhibit severe clinical signs. This allows for more careful monitoring of the cow and the ability to provide supportive treatment earlier. While current tracking devices do generate health alerts, they are not attuned to the unique patterns of HPAI H5N1 cases. Farms could use this HPAI H5N1-specific framework to identify cases earlier, reducing disease spread and losses in the herd.

Poster Number: 67
Title: Combining Host-Metabolism Targeted Therapeutics with Direct Acting Antivirals: A Novel Path to Total Virus Elimination
Presenter: Ryan Thompson
Abstract:
Flaviviruses like DENV, have been shown to make large changes to the host's metabolome and lipidome. Using LC-MS we determined that certain metabolic pathways were upregulated during DENV, serotype 2 infection. We also found that Fatty Acid Synthase (FAS), was recruited to sites of DENV2 viral replication and activated by NS3. Inhibiting FAS yielded a slight decrease in titer. Repeating the LC-MS while using the FAS inhibitor, we found a compensatory increase in Purine salvage pathway metabolites. Subsequent inhibition of purine metabolism yielded a significant decrease in DENV2 titer. Lastly, we tried to achieve total virus elimination using the experimental direct acting anti-viral Mosnodenvir. All three drugs in combination yielded nearly total elimination of the virus. By combining host targeted therapeutics, and direct acting anti-virals we have discovered a new highly effective prospect for dengue infection drug treatments. This is a boon for doctors and patients in affected nations around the world, allowing fast and effective treatment of a currently untreatable illness.

Poster Number: 69
Title: Advancing Early Esophageal Cancer Diagnostics: Detection of Salivary microRNAs
Presenter: Tessa Whitaker
Abstract:
Esophageal cancer has one of the highest global mortality rates, despite effective treatment options being widely available. This disparity is attributed to invasive nature of the gold standard diagnostic procedure, an endoscopy, which deters patients from being diagnosed in a timely manner. Patients are often diagnosed at a late stage, when treatment options are less effective. I will create a non-invasive platform for the early diagnosis of esophageal cancer by utilizing saliva samples. Saliva contains microRNAs that can be correlated to esophageal cancer. Salivary microRNAs are difficult to detect and quantify due to their low concentration and the abundance of other interfering biological molecules in saliva. I have designed an electrochemical sensing platform that makes sensitive measurements without false positives from other molecules. This biosensing platform would be used by clinicians at a hospital to diagnose esophageal cancer at an early stage, improving patient outcomes.

Poster Number: 71
Title: Uncovering the Design Rules for Sustainable Growth of Mineralized Mycomaterials
Presenter: Dylan Moss
Abstract:
Mycomaterials, materials made from filamentous fungi, have several advantages over traditional materials such as their genetic programmability and self-healing properties. However, their lack of mechanical strength and cost of production often constrain their applications. In this work, we take inspiration from natural systems to overcome these challenges by elucidating design principles for mineralization-based enhancement of mechanical strength and synthetic lichen-based low-cost growth. We demonstrate that surface display of an enzyme from sea sponges, silicatein α, on the hyphae of the filamentous fungus Aspergillus niger enables mineralization of polysilicate. We show several methods to

modulate the degree of mineralization and demonstrate its enhanced mechanical strength. We show how it can be grown without external carbon sources in a synthetic lichen-based coculture to facilitate low-cost biomanufacturing. Our results lay the groundwork for the sustainable production of mineralized mycomaterials and creates a new model system to study the impact of mineralization on mycelium.

Poster Number: 73
Title: Furggle: Empowering Pet Owners Through AI and Inclusive TeleVet
Presenter: Allie Seok
Abstract:
Pet owners often face high veterinary costs, transportation barriers, and language challenges, leading many to rely on unreliable online searches that can compromise pet care. Furggle is an AI-powered chatbot built on credible veterinary data that delivers personalized guidance based on a pet's species, breed, age, weight, and health history. At home, users can chat with the bot to receive tailored recommendations for preventive care, nutrition, behavior, and breed-specific risks. In clinics, Furggle partners with veterinary teams through referral integration and communication tools. After visits, users can upload visit summaries, store medical records, and receive care reminders. Operating as both a B2C and B2B platform, Furggle bridges home and clinical care to provide accessible, reliable, and inclusive veterinary support.

Poster Number: 75
Title: ABC to manage your ABC: A Unified AI-Powered Platform for Customer, Workforce, and Billing Management
Presenter: Ujjwala Vungarala
Abstract:
Many businesses cannot afford big software like SAP or Oracle. Using separate tools for managing customers, employees, and billing causes confusion, extra costs, and integration gaps. Our platform brings all three together in one simple system. Businesses only pay for what they use. A company can save so much compared to many software products available in the market. Unlike other products, our modules are connected, so data flows freely between them with no integration headaches. What makes us stand out is AI built right into the system: it auto-generates invoices and follows up on payments, predicts inventory and staffing needs before problems arise, and automatically assigns the right employees to the right projects. AI handles it in the background. Whether you run a small shop, a startup, or a growing business, our platform gives you everything you need to manage your clients, team, and finances simply, affordably, and smartly.

Poster Number: 77
Title: Dairy Calf Management A Virtual Reality (VR) Experience
Presenter: Sasha Terry
Abstract:
Dairy farm hygiene and biosecurity practices are critical for protecting animal and human health, yet in dairy farm environments, hygiene practices are often neglected, especially in calf care, which can lead to serious public health risks. To address this gap, we developed a Virtual Reality (VR) training program that allows K–12 students to practice dairy calf management in an interactive, simulated farm environment. Through VR, students' complete tasks such as feeding pasteurized milk, interacting with calves, and

applying proper biosecurity measures. Unlike traditional classroom instruction, this immersive approach allows students to safely experience real-world farm scenarios and identify common hygiene mistakes. The program increases engagement while improving understanding of agricultural safety practices. This innovation is designed for K–12 students to stimulate interest in agricultural careers, education, dairy science, and experiential learning tools while spreading awareness of a public health need.

Poster Number: 79
Title: Gamifying the Heart: A Virtual Reality Anatomy Approach
Presenter: Haley Morgan
Abstract:
Traditional anatomy education struggles with student engagement and spatial visualization of complex structures like the heart. We developed a virtual reality cardiac anatomy escape room addressing these challenges through immersive gamification. Unlike passive learning, our timed escape room requires active application of anatomical knowledge across seven puzzle stations that generate cardiac structures upon completion. This culminates in assembly of the heart. Testing with Colorado State University students revealed high engagement and improved confidence. This innovation serves undergraduate and graduate anatomy students, educators supplementing traditional curricula, and institutions looking to enhance anatomy programs. The combination of game mechanics, virtual reality immersion, and hands-on construction differentiates this from traditional methods, offering repeatable practice without cadaver access limitations which appeals to anatomy education programs.