UNDERGRADUATE RESEARCH AND CREATIVE ACTIVITY

The UNIVERSITY *of* OKLAHOMA

2025 UROCA SHOWCASE

URECA SHOWCASE SCHEDULE

THURMAN J WHITE FORUM BUILDING - SECTION B

- **5 - 5:20 PM** : POSTER PRESENTATIONS SESSION 1 - Conference Room B

Afan Hasic
Andrew Hoang
Ankit Jallipalli
Annelise Huynh
Arianna Dambold
Ataberk Eren
Christopher Ochoa
Emmaus Patterson
Finn Cash
Freya Winters
Hayyan Kisitu
Hazel Cruse

- **5:20 - 5:40 PM** : POSTER PRESENTATIONS SESSION 2 - Conference Room B

Helen Wagner
Isabella Woodson
Isabella Encapera
Jasmine Lim
Jayden Thomas
Kaitlin Rogers
Kaustubh Pandit
Kevin Nguyen-Do
Noah Holderbaum
Reagan Thompson
Rory Polson
Esther Hodson

- **5:40 - 6 PM** : POSTER PRESENTATIONS SESSION 3 - Conference Room B

Haidyn Peterson
Havah Alavi
Rylan Fox
Sanchith Velmurugan
Sanika Navalkar
Shelbie Raney
Sreshtha Chakraborti
Steven Di Jorio
Thao Tran
Trenton Swain
William Freeman
Abiel Berhanu

- **5 - 6 PM** : AUDIO VISUAL PRESENTATIONS

Room B1 - Joelle Kimbrough **Room B2**- Jacob Shaddock **Room B3**- Saray Suarez

- **6 - 7 PM** :

BREAKOUT PRESENTATIONS

Room B1 - Art and Performance
Terryn Ward, Zachariah Dinh, & Sydney Bartolome

Room B2 - Computers and the Online Sphere
Braden Wilson, & Paul Nquyen

Room B3 - Political Culture: Public and Private
Lorena Busuioc, Madeline Woodard, & Laila Raslan

Room B4 - Engineering
Kierra Teer, Gavin Thompson, & John Vianney Ssennono

Room B5 - Nature and Medicine
Sophia Anderson, Emma White, & Natalie Miller

Room B6 - Public Health and Mortality
Emily Flesher, Sam Hunt, & Anayat Yousuf

- **7:15 -8 PM** : NETWORKING DINNER Conference Room B

With Performances & ART by UReCA Fellows:

Elena Eaton - Art Piece - "Becoming Form"
Eric Parmelee with the Jazz Exchange - 7:20 -7:40 PM

VISUAL ART

On Display in Conference Room B

Elena Eaton - Biology - Provost's Summer UReCA Fellow

Becoming Form

Restoration and Recovery features two mounted sculptures that tell the story of substance abuse recovery through the lens of restorative dentistry and how the two intertwine. The leftmost sculpture, made of terracotta, represents an organic set of healthy teeth. To the right, the series of sculptures stacked vertically show a progression from an abstract set of teeth, representing early stages of recovery where actual tooth structure and identity may feel unrecognizable, to a set of teeth that mirrors the terracotta version, showing complete restoration of form. The armature wire and silver color represent the influence of dentistry juxtaposed with what is innate and organic, and the gradual increase in wire use and form show the care and attention of dentistry in rebuilding identity, health, and wholeness.

MUSCIAL PREFORAMNCE

7:20 - 7:40 PM - Conference Room B

The Jazz Exhange - Joshua Stenis, Alex Chapman, Titus Ott, & Caben Longest

The Jazz Exchange is an experimental jazz group based out of Norman, Oklahoma. This group is constantly pushing the envelope with the mission of spreading the joy of the jazz tradition.

AUDIO VISUAL PRESENTATIONS

5 - 6 PM

Joelle Kimbrough - Ballet Performance and Biology - Provost's Summer UReCA Fellow - Room B1

Bridging Dance and Science: The Role of Dance and neurological disorders

Dance is a universal language that connects people, but it also engages the brain in ways that may have long-term benefits. Dance has been studied as a therapeutic intervention for individuals with Parkinsons Disease (PD). I will investigate the variety of interventions, and the potential dance has as a preventive intervention for PD. Research shows that dance requires complex coordination across different brain regions, which helps to stimulate neuroplasticity and enhance motor control. This study hopes to investigate the common elements between Dance for PD and dance training from a neurological perspective and how these elements from dance experiences might contribute to reducing the risk or progression of neurodegenerative conditions such as Parkinsons disease.

Jacob Shaddock - Creative Media Production - Provost's Summer UReCA Fellow - Room B2

Pride on the Prairie

Over the summer, I connected with various pride organizations across Oklahoma with the intention of creating a documentary that creates an oral history of Queer Oklahoma from urban and rural perspectives. Scholarship on Oklahoma's 2SLGBTQIA+ communities exists, but oftentimes it's inaccessible, both financially and textually. Therefore, I pursued creating a documentary that is even in its focus on urban-based and rurally-based individuals. In my presentation, I'll be showing a short documentary about Rural Oklahoma Pride and an event they hosted in Tishomingo, Oklahoma. As I connect with and interview with more people, the documentary will become longer and more holistic in presentation.

Saray Suarez - Art Technology and Culture - Provost's Summer UReCA Fellow - Room B3

Existing Between Placement and Belonging

This art series, “Existing Between Displacement and Belonging,” explores the motifs that shape the Artist’s identity. This presentation reflects on the ongoing realities of Indigenous peoples and the lasting influence of colonization. The artist used the method of reflection, through memory from past and present motifs that expose the threads of belonging and becoming in my identity. Through this process of reexamining, my work seeks to uncolonize and reimagine our history, body, and culture beyond dominant narratives. My job as an artist is to help our community reimagine what we believe identity stands for, and through it, we can reimage our language, actions, and motives for one another. I use the thread of my life history to show nuance in what we believe art means. This presentation/video will show my process in sketching that later informed the final pieces of work. Showing the process was important to me because it shows how I started to think about the type of forms/figures I wanted to use. Photos of the exhibition will also be shown, as well as close-ups of the pieces in the exhibit.

POSTER PRESENTATIONS

5 - 5:20 PM Session 1

Afan Hasic - Biomedical Engineering - Provost's Summer UReCA Fellow

Optimizing PAIR Peptide-Based Prophylactic Cancer Vaccines

Protein Aggregation-Induced Response (PAIR) peptides have the potential to trigger immunogenic cell death (ICD), releasing damage-associated molecular patterns (DAMPs) that can stimulate protective immune responses. This project explored the use of PAIR peptides to generate prophylactic cancer vaccines by inducing cancer cell death in vitro and preparing cellular debris for immunization. To optimize vaccine preparation, LDH release and extracellular ATP were measured as markers of DAMP release, while PI staining was used to assess cell viability.

Andrew Hoang- Biology and Psychology - OUHC Cancer Undergraduate Research Experience

HDAC8 Inhibition by WK2-16 Restores Progesterone Sensitivity in Progesterone-Resistant Endometrial Cancer Cells

Endometrial cancer (EC) rates have gone up over the past two decades, making it the fourth most common gynecological cancer. Much of this rise is tied to obesity, and cases are increasingly showing up in younger patients. Surgery is still the main treatment, but it often results in infertility, so progesterone (PG) therapy is used as a fertility-preserving option. The challenge is that many patients eventually develop progesterone resistance (PGRes). Our earlier work pointed to histone deacetylase-8 (HDAC8) as a key driver of that resistance. In this study, we asked whether WK2-16, a selective HDAC8 inhibitor, could bring back progesterone sensitivity in PGRes EC cells. We used Ishikawa EC cells that had been made resistant in our lab and treated them with WK2-16 alone or combined with PG. To test effects, we ran MTT assays for IC_{50} and synergy, western blots to look at HDAC8, PR-B effectors (p21, Foxo-1), and apoptotic markers (cleaved PARP), plus scratch assays for migration. WK2-16 showed strong anti-proliferative activity (IC_{50} < 22 μM) and lowered HDAC8 protein levels in a dose-dependent way. Blocking HDAC8 boosted death. Overall, our findings show that targeting HDAC8 with WK2-16 restores progesterone sensitivity and could be a promising strategy to improve therapy for EC patients.

Ankit Jallipalli- Biomedical Engineering - Provost's Summer UReCA Fellow

Investigating Antagonistic Roles of Cell Proliferation and Melanin in Melanoma Development

The research I performed involves examining the underlying genes causing lower melanin melanocytes to have greater proliferation. This consists of first determining the differences in gene expression between melanocytes that consists of different melanin concentrations. Once the significant genes have been determined CRISPR editing is used to validate whether or not these genes play a role in melanin levels and proliferation rates. To determine if there was a significant change numerous assays and validation tests are used. For instance, qRT-PCR which determines DNA expression for each melanocyte which can be correlated to gene expression. Flow cytometry which can be used for identification purposes. Spectrometry to determine the concentration of melanin in each melanocyte.

Annelise Huynh- Chemical Biosciences and Piano Performance - Provost's Summer UReCA Fellow

Music Medicine in Cancer Patients

This project reframes Music Medicine (MM) as a distinct, scientifically grounded intervention in cancer care. Unlike therapist-led music therapy, MM uses passive, researcher-selected music to elicit measurable physiological outcomes. By integrating neurophysiological frameworks, biomarker assays, and mechanistic insights, the project investigates how music can modulate cancer-specific symptoms such as pain, fatigue, anxiety, and cognitive dysfunction. This precision-based approach emphasizes standardization and reproducibility, positioning music as a low-burden, scalable tool that can complement conventional oncology care.

POSTER PRESENTATIONS - SESSION 1

Arianna Dambold- Biomedical Engineering - Provost's Summer UReCA Fellow

Label-Free Characterization of Muscle-Nanoparticle Interaction Using Flow Cytometry

Gold nanoparticles (AuNPs) have become increasingly relevant in medicine due to their biocompatibility, stability, and potential as drug delivery systems. Measuring their uptake into cells is critical for assessing effectiveness, but many current methods require staining or preparation that alters nanoparticle chemistry, making results unrepresentative. This project applies a label-free approach using side scatter (SCC) signals from full spectrum flow cytometry to analyze uptake in C2C12 muscle cells without destructive preparation. Muscle cells are studied because their exposure to nanoparticles in vaccines remains underexplored. Findings could enhance nanoparticle-based vaccine design and drug-delivery strategies through improved understanding of nanoâ€“cell interactions.

Ataberk Eren - Aerospace Engineering and Physics - Provost's Summer UReCA Fellow

Orbital Dynamics of a Satellite Servicing and Space Debris Removal Spacecraft

Numerical simulations of the orbital dynamics of a spacecraft (agent) in low Earth orbit will be employed to model a hypothetical scenario in which the agent maneuvers toward a faulty satellite, referred to as the target, either to inspect and repair it or to remove it from orbit if repair is not feasible. Simulations will be prepared on Python, and a mission plan involving the agent satellite and multiple target satellites, with rendezvous and if necessary, deorbiting capabilities will be simulated, with maneuvers from parking orbit to a satellite or from one satellite to another. This framework can be used in optimization algorithms to evaluate the feasibility of the use of service satellites in satellite constellations.

Christopher Ochoa - Aerospace Engineering - Provost's Summer UReCA Fellow

Design and Evaluation of Lattice Structures for Regenerative Cooling in Additively Manufactured Rocket Nozzlesft

Regenerative cooling is used in rocket nozzles to prevent thermal failure, but conventional channel-based designs face thermal and structural challenges. High pressures cause fatigue, wall thinning, and microcracks, reducing nozzle lifespan and reusability. This research investigates the use of lattice structures as an alternative cooling method to enhance heat transfer and structural durability. Body-centered cubic (BCC) lattices were modeled in SolidWorks and evaluated using ANSYS Finite Element Analysis for stress and thermal performance. Results showed that increasing lattice rod thickness lowered wall temperature, stress, and strain, but caused higher pressure drops. Comparisons with rectangular channels validated the methodology and highlighted trade-offs between cooling performance and flow resistance. Overall, lattice structures show strong potential to improve nozzle durability and reusability, though design challenges remain for practical implication.

Emmaus Patterson - Psychology - Provost's Summer UReCA Fellow

The cognitive load on international students and how that affects motivation

International students often face a heavier cognitive load than domestic peers, balancing academic demands with cultural adaptation, language barriers, and social adjustments. This heightened mental effort can drain cognitive resources, making it harder to focus fully on coursework. When cognitive load is high, students may experience frustration, fatigue, and reduced confidence, which in turn lowers motivation. Tasks that might feel manageable in a familiar context can feel overwhelming in a new environment. In our research, we are examining how different levels of intrinsic and extraneous cognitive load affect international studentsâ€™ motivation, including their expectancies, values, and perceptions of cost.

POSTER PRESENTATIONS - SESSION 1

Freya Winters - Biomedical Engineering - Provost's Summer UReCA Fellow

Electromyographic Analysis of Neuromuscular Adaptations in ACL-injured Individuals

The goal of my research was to develop a framework for analyzing muscle recruitment patterns in the legs of both ACL-injured and healthy individuals to better understand neuromuscular adaptations post ACL-injury. Better understanding these neuromuscular adaptations could improve rehabilitation protocols and reduce the risk of reinjury. We focused on the muscle groups of the lower limb that are involved in knee stabilization and motion, including the quads and hamstrings, using a set of DELSYS EMG sensors to acquire muscle activation data across different exercises.

Finn Cash - Petroleum Engineering - Provost's Summer UReCA Fellow

Evaluating CO2 Mineral Trapping Potential of Basalt Formations Using CMG Modelling

IMy research focuses on CO2 storage in basaltic rocks, primarily on mineral storage through chemical reactions. A simplified model was created to analyse mineral trapping using CMG GEM simulation. The mode used an 80x1x1 grid to study the interactions CO2 with the rock. The identified parameters were three mineral reaction constants for basaltic minerals and the Henry constant of CO2, for a total of 10 parameters. Low, middle, and high values for each parameters were chosen and latin hypercube sampling was used to run 50 simulations to determine how the parameters affect mineral trapping. Further research would run more simulations, develop a more advanced grid, and identify more relevant parameters.

Hayyan Kisitu - Computer Science and Mathematics - Provost's Summer UReCA Fellow

Evaluating Generative Large Language Models for Mechanical Engineering Exams

My research evaluates ChatGPT, specifically GPT-4o, on real mechanical engineering exams. I assembled a dataset of 89 exams from 29 courses across nine U.S. universities, covering text, tables, 2D images, and 3D figures. Each question was screenshotted and submitted in a fresh chat with no prompt engineering to ensure fairness. Original course instructors graded GPT-4os responses using their rubrics, enabling direct comparison with student performance. I categorized errors into four types (Conceptual, Grounding, Computational, Image understanding) and conducted statistical analyses to compare GPT results with class means and medians while probing modality effects. The findings highlight strengths on text questions, notable weaknesses on visual reasoning, and concrete targets for fine-tuning and instructor guidance on when AI support is appropriate.

Hazel Cruse- Plant Biology - Provost's Summer UReCA Fellow

They are what they eat: Assessing the nutritional quality of pika forage in relation to a precipitation gradient

To predict how the impacts of climate change will reverberate through an ecosystem, we must understand its effects on primary consumers. In mountainous regions, predicted increases in precipitation coupled with rising global temperatures may lower the nutritional quality of vegetation on which herbivores rely. We examined collared pikas (Ochotona collaris)—cousins of rabbits that live along rocky slopes in Alaska and Western Canada—that cache food to eat during the winter, “haying” instead of hibernating. We collected vegetation samples from pika “haypiles” found at study sites in Alaska across a gradient of precipitation. We determined nitrogen and fiber content of the samples to characterize the impacts of increased precipitation on nutritional quality. We used these data to develop a better understanding of factors that may influence future pika foraging behavior, which can serve as a basis for predicting how climate change influences herbivore food sources and subsequently herbivore behavior.

POSTER PRESENTATIONS

5:20 - 5:40 PM Session 2

Helen Wagner - Environmental Sustainability - Provost's Summer UReCA Fellow

Conservation and Recreation in Historic Oklahoma State Parks

An archival examination of 3 out of 7 original Oklahoma State Parks, beginning in the mid 1930s through the Civilian Conservation Corps. It examines the relationship between conservation and recreation within the parks and the driving forces that shaped them in their early stages. The primary influences are the National Park Service, the Civilian Conservation Corps, and nearby locals and politicians. The National Park Service had a heavy hand in the start of the parks through their architects who followed strict codes to create buildings that reflecting the local culture while retaining the feeling of an untouched landscape. The Civilian Conservation Corps made the parks possible, working for 6 years to bring them to life. Locals citizens and politicians got hold of the parks once the Civilian Conservation Corps was disassembled and morphed into a more resort-like setting.

Isabella Woodson - Drama - Provost's Summer UReCA Fellow

Censorship on Stage: Pushing the Binary on Live Theatrical Performances

Premiering in 1994, The Secretaries, perhaps the most accomplished of The Five Lesbian Brothers' plays, examines the exploitation of women within the workforce through a satirical, absurdist style. The Five Lesbians Brothers were trailblazers through the theatrical censorship crisis of the 90's and with the resurgence of such ideals, my main goal in mind was to successfully produce at least three performances of The Secretaries.

To facilitate the completion of this show, we incorporated the site-specific approach to staging, a concept that challenges the traditional confines of theatre by performing in different locations outside the typical theater setting. This production not only provided students with theatrical experiences in self producing, artistic direction and pre-professional collaboration in the arts, but also with the larger aim of engaging with new audiences and offering economically accessible entertainment to Norman.

Isabella Encapera - Psychology - Independent Research

Is Perception Enough? Evaluating The Therapeutic Effects of a Perceived AI Versus Human Generated Guided Meditation

Artificial intelligence (AI) has become increasingly prominent in all aspects of life, leaving consumers, policy makers, and professionals to wonder how far the use of AI can go. Previous research suggests that AI therapy provides greater therapeutic benefits than receiving no therapy, suggesting digital therapy that is knowingly provided by AI holds the potential to provide benefits. However, other research has suggested that individuals will exhibit a negative bias towards products believed to be produced by AI. Therefore, we conducted a mixed methods study to test our hypothesis that if all participants are given a human-produced guided meditation therapy, individuals who believe they are receiving therapy from an AI will experience a lesser therapeutic effect than individuals who believe they are receiving therapy from a human due to their bias towards AI. The results of our study provide guidance on the potential use of AI therapy with young adult populations.

Jasmine Lim - Computer Science - Provost's Summer UReCA Fellow

LineSnap: Exploring the Use of Snapshots of Line Graphs in Information Communication in the Public Domain

Line charts are one of the most commonly used data visualizations in public domains, especially in online media, news articles, and social platforms. However, these charts are often presented in simplified or minimal formats that lack full textual context, such as axis labels, annotations, or detailed titles. At the same time, the titles that do appear are frequently framed with biased, emotional, or selective information. While prior research has shown that textual elements such as chart titles can influence recall, message interpretation, and user trust, the interaction between textual framing and core visual design elements remains underexplored. By focusing on minimal “snapview” line charts representative of real-world online visualizations, the research aims to uncover how viewers interpret trends when faced with partial or strategically framed information. The findings will contribute to perception research and inform best practices for designing interpretable and trustworthy data visualizations in digital and journalistic contexts.

POSTER PRESENTATIONS - SESSION 2

Jayden Thomas - Biology - Provost's Summer UReCA Fellow

Aboveground and Belowground Plant Responses to Drought Recovery in the Great Plains Ecosystem

The aim of this study is to understand how plants allocate resources during recovery from a prolonged drought. Specifically, we examined whether plants direct energy toward aboveground structures such as shoots and leaves, or belowground structures such as roots. A central focus was on root morphological traits —including mass, volume, length, diameter, and specific root length—to determine how these characteristics shift during the recovery period. The experiment was conducted across an entire growing season, allowing us to capture temporal changes in allocation strategies. By linking above- and belowground responses, this research provides insight into plant resilience and resource allocation strategies in the Great Plains ecosystem, offering a deeper understanding of how plants may adapt to future climate variability.

Kaitlin Rogers - Biology and Community Health - Provost's Summer UReCA Fellowship

A Systematic Literature Review: The Affordable Care Act and Physician Job Satisfaction after Medicare Expansion

With the signing of the Affordable Care Act in 2010, there were immediate questions raised as to how healthcare providers would compensate for the surge of newly insured Americans with the expansion of Medicare. Due to the historic and continuing physician shortage in the United States, it is necessary to investigate how, and if, the Affordable Care Act had unintended effects on physicians' empathetic attitudes towards patient care as a result of the changes in the shift to a patient satisfaction payment model. By investigating the secondhand effects on physician autonomy, this systematic review of peer-reviewed publications between 2010-2025 examined how these factors have an overarching effect on potential physician burnout, compassion fatigue, and physician leadership attitudes.

Kaustubh Pandit - Mechanical Engineering - Provost's Summer UReCA Fellow

Dual-Modality Imaging for Pre-Transplant Kidney Fibrosis: Integrating Photoacoustic and Optical Coherence Tomography

Kidney fibrosis, the buildup of scar tissue, is a major driver of chronic kidney disease and affects nearly 10% of people worldwide. Right now, the only reliable way to detect fibrosis is through biopsy, but that procedure samples less than 1% of the organ, is invasive, and carries risks like bleeding or infection. Imaging tools, such as MRI or ultrasound, can show the kidney's structure, but they struggle to detect the microscopic collagen that signals fibrosis. Our project explores a new approach that combines Photoacoustic imaging (which can detect collagen several millimeters deep) with Optical Coherence Tomography (which maps tissue structure at micrometer resolution). Together, these techniques can generate real-time, dye-free maps of fibrosis across entire donor kidneys. By validating this system against gold-standard histology, our goal is to develop a safer and faster method for evaluating organ health before transplant, thereby enhancing decision-making and improving patient outcomes.

Kevin Nguyen-Do - Chemical Engineering - Provost's Summer UReCA Fellow

Therapeutic Effects of Different Polymer Surface Decoration of Nanogels on Murine Macrophages

Nanogels (NGs), or hydrogel nanoparticles, are promising yet are underutilized drug delivery systems with high cytocompatibility, pH responsiveness, immune modulation, and targeted delivery properties, particularly to macrophages. Macrophages regulate key disease pathologies through polarization between inflammatory (M1-like) and anti-inflammatory (M2-like) states, but predicting these states remains challenging. The Clegg Lab investigates nanogel formulations that influence and maintain macrophage phenotypes. Our goal was to formulate a nanogel library and document their effects on macrophage polarization. My research is focused on synthesizing nanogels with different grafted polymers at varying stoichiometric ratios. I assessed physiochemical properties and tested the hypothesis that different polymers and surface density influence macrophage polarization. These findings have implications for cancer therapy, inflammation control, and tissue repair.

POSTER PRESENTATIONS - SESSION 2

Noah Holderbaum - Geographic Information Science and Information Science & Technology- Provost's Summer UReCA Fellow

Equality of Sun Belt Sprawl: The Intersection Between Land Cover, Air Pollution, and Demographics in Phoenix and Houston

This research exThis research examines the relationship between changes in air pollution, demographics, and urbanization in the cities of Phoenix, Arizona and Houston, Texas between 2000 and 2022. Air pollution data from the Washington University's Atmospheric Composition Analysis Group's SATPM2.5 V5.NA.05 model was used, while demographic data was obtained from the 2000, 2010, and 2020 decennial censuses through IPUMS NHGIS. Urbanization data was received from the National Land Cover Database's Land Cover and Percent Impervious Surface products. Using these sources, this study aims to determine spatiotemporal trends in air pollution as well as explore connections between air pollution, demographics, and urbanization. This research also looks at variations between these relationships between different time periods and neighborhoods within the two study areas.

Reagan Thompson - Physics - Provost's Summer UReCA Fellowship

An Ab Initio Study of Spinor Dynamics in One-Dimensional Few-Boson Systems

Understanding the dynamics of interacting many-body quantum systems is a central challenge in physics, with ultracold atomic gases providing a versatile platform for experimentally probing such behavior. Of particular interest are spinor Bose-Einstein Condensates, where the presence of multiple spin states introduces additional degrees of freedom. Recent theoretical work suggests that applying a periodic drive to such systems may effectively alter the characteristics of interactions between atoms, allowing experimentalists an enhanced degree of control over their systems. However, many proposed models rely on approximations that neglect important quantum effects such as correlations and fluctuations. In this project, we numerically investigate a few-body system of spin-1 bosons confined to a one-dimensional harmonic trap, with Zeeman sub-level splitting induced by a uniform magnetic field. Using a configuration interaction approach, we capture the exact quantum dynamics and study the effects of periodically modulating the trapping potential, focusing on both spin-preserving and spin-changing collisions.

Rory Polson - Engineering Physics - Independent Research Experience

Constructing NMR Apparatus for ZOMBIES Fundamental Symmetries Lab

I worked at Argonne National Laboratory over the summer getting the NMR apparatus setup for monitoring field inhomogeneities in the magnet central to the experiment. I constructed NMR probes and inserted them into the magnet, and got the signal generating and receiving apparatus working. I built a user interface with python that allows live viewing of the NMR time domain signal and FFT, as well as data saving and probe switching capabilities.

Esther Hodson - Lighthouse Quartet - Provost's Summer UReCA Fellow

Nomad, a New Chamber Music Album by Lighthouse Quartet

With the UReCA grant, Lighthouse is creating a professionally recorded album showcasing saxophone works from around the world, featuring music from underrepresented composers whose repertoire is rarely recorded. This album provides us the opportunity to follow in the footsteps of previous ensembles from OU and furthers our careers in music as we engage in the process of professional recording and producing, as well as providing recordings of underrepresented works for the global saxophone community.

POSTER PRESENTATIONS

5:40 - 6 PM Session 3

Abiel Berhanu - Computer Engineering - Provost's Summer UReCA Fellowship

Flux-bias tunable quantum phase-slip spiking neuron

Developing a flux-bias tunable quantum phase-slip spiking neuron (QPSJ-based superconducting loop with on-chip microcoil for real-time threshold control) as part of a neuromorphic quantum hardware platform.Investigating how tunable QPSJ spiking elements can be leveraged to create energy-efficient, low-latency circuits for quantum state classification and hybrid neuromorphic/quantum processing.

Haidyn Peterson - Biochemistry & Computer Science - Provost's Summer UReCA Fellow

Using mitochondrial genomes to investigate Holocene climate impacts on brown and polar bears in the Aleutian Islands, Alaska

This summer I used mitochondrial genomes to trace how Holocene climate shaped brown and polar bear histories in the eastern Aleutians. I built a curated reference panel (modern and ancient bears from Alaska, North America, and Europe), generated consensus mitogenomes for Unalaska bones in Geneious, and produced a single global alignment for phylogenetic analysis. Using PartitionFinder for model/partition selection and IQ-TREE for maximum-likelihood inference with ultrafast bootstraps and SH-aLRT support, I rebuilt the tree after a new 2025 study added 12 key references. I also quantified site-level diversity: five unique haplotypes at Margaret Bay (~5,000 BP) and two at Amaknak Bridge (~3,000 BP). Along the way I documented a fully reproducible pipeline and resolved legacy software issues. These results will appear in my UReCA poster and a manuscript my mentor and I plan to submit this winter.

Havah Alavi - Psychology and Women's & Gender Studies - Provost's Summer UReCA Fellow

Biased Law or Biased System; An Analysis of Biases in the Child Welfare System

This research takes a critical look at bias in the child welfare system through the primary use of vignettes and secondly interviews. The interviews asked participants regarding their explicit beliefs regarding bias as it operates within the child welfare system. The vignette analyzed how three major variables may illicit bias and impact how attorneys, social workers/case workers, and court appointed special advocates evaluate a possible child welfare case. In the vignette participants were given the three following situations that all constituted either neglect or abuse: (1) educational neglect which tested the impact of economic class, (2) domestic violence which tested the impact of gender, and (3) substance abuse which tested the impact of race.

Rylan Fox - Chemistry & Biochemistry - Provost's Summer UReCA Fellow

Skeletal Editing of Furans into Pyridines with Sulfenylcarbenes

With the ever-increasing financial burden that research and pharmaceutical industry face, avenues of alleviating costs are becoming more prominent. In accordance, our research has delved into possible routes involving Furan structures conversion to their N-Heterocyclic counterparts such as Pyridine and Pyrimidine which are vastly used in a majority of modern pharmaceutical compounds for their therapeutic potential. However, while Pyridine and Pyrimidine remain desirable for researchers, in-depth research regarding this route has remained minor with previous researchers such as Sir Derek Barton only discovering a minor product of tetraphenylpyrimidine with a final yield of 6%. As such, we have completed research regarding the possible use of sulfenylcarbene precursors to open up the furan structure and create ene-one intermediates. After this, these intermediates then gain nitrogen from an added source, fostering the development of a pyridine. With this, we have also been able to optimize the reaction up to a 96% yield.

POSTER PRESENTATIONS - SESSION 3

Sanchith Velmurugan- Computer Engineering - Provost's Summer UReCA Fellow

Developing Efficient Segmentation and Radiological Tool for Stroke Outcome Prediction

My research focuses on applying machine learning (ML) to improve prognosis in acute ischemic stroke (AIS). AIS occurs when a clot blocks blood flow to the brain, leading to neurological damage, disability, or death. Prognosis requires accurate measurement of infarct volume, yet current clinical tools are often qualitative, time-consuming, and subject to reader variability. To address this, I trained and tested a 3D deep learning segmentation model, SAM-Med3D, on MRI and CT brain scans of stroke patients. The model was designed to complete two tasks: segmentation of total brain volume and isolation of cerebral infarct regions. By quantifying infarct volume automatically, the approach reduces reliance on manual interpretation, increases consistency across cases, and accelerates clinical decision-making for stroke treatment.

Sanika Navalkar - Biology - Provost's Summer UReCA Fellowship

Behavioral Repeatability Across the Breeding Season in a Social Songbird

I examined the behavioral repeatability of aggression in approximately 12 breeding female house sparrows, focusing on seasonal patterns across distinct stages of the breeding season. Using video observations from the Bentz Lab aviary, I tracked individual behaviors during territory establishment, egg-laying, and post-clutch periods for each clutch, while also analyzing population dynamics before, during, and after egg-laying. This study aimed to answer key research questions, including how aggression scores varied across the breeding season, how specific breeding stages influenced aggression scores, and how these patterns were reflected graphically over time. Moreover, leveraging insights from prior research, including George (2024), this project contributed to a deeper understanding of the social and reproductive behaviors of sparrows.

Sreshtha Chakraborti - Biomedical Engineering - Provost's Summer UReCA Fellowship

Antimalarial Activity of a Chimeric Fusion Protein

Currently my project explores a novel therapeutic strategy against drug-resistant malaria by using a bioconjugate fusion protein (ANXA5-mCGL). This protein selectively binds to Plasmodium-infected erythrocytes. Moreover, the study aims to use fluorescence microscopy to visualize protein binding and evaluate parasite-infected erythrocyte rupture which offers a targeted, non-drug-based alternative to traditional antimalarial treatments.

Steven Di Jorio - Biomedical Engineering - OUHC Cancer Undergraduate Research Experience

Evaluating Bile Ducts in Liver Transplantation Using OCT

My research focuses on applying OpticMy research focuses on applying Optical Coherence Tomography (OCT) to evaluate bile ducts in liver transplantation. Bile duct complications are a major cause of graft failure, yet current imaging tools often lack resolution for early detection. OCT provides cross-sectional, micron-scale imaging that can visualize epithelial and subepithelial structures in real time. In this project, I work on characterizing features such as cystic dilation of Beale's sacculi, epithelial irregularities, and subepithelial edema to distinguish normal from pathological ducts. Using image processing pipelines in Python and MATLAB, I extract features for lesion classification, aiming to improve intra-operative and post-transplant evaluation. This approach has the potential to guide surgeons during transplantation and reduce long-term complications by enabling earlier intervention.

POSTER PRESENTATIONS - SESSION 3

Thao Tran- Biomedical Engineering - Provost's Summer UReCA Fellow

Assessing siRNA-Lipid Nanoparticle Safety in Immune Cell Populations

RNA-based therapeutics, particularly small interfering RNA (siRNA), hold great potential for treating various diseases by silencing specific genes. However, delivering siRNA efficiently and safely remains a challenge due to its susceptibility to degradation in biological environments. Lipid nanoparticles (LNPs) have emerged as a promising vehicle for siRNA delivery, protecting siRNA, and facilitating its uptake by target cells. My research focuses on evaluating the stability and immune response of siRNA loaded LNPs in immune cells to ensure their safety for therapeutic applications.

Trenton Swain - Mechanical Engineering - Provost's Summer UReCA Fellowship

Single Cell Analysis For Early Cancer Diagnosis Using Surface Enhanced Raman Spectroscopy (SERS)

My research focuses on designing and manufacturing a microfluidic chip capable of separating cells from a liquid biopsy. Once separation occurs, I analyze the isolated cells using a Raman spectroscope to obtain detailed spectral data. This data is then processed through a machine learning algorithm, which builds a growing database distinguishing healthy from unhealthy samples. Over time, this database strengthens the algorithmâ€™s predictive power, improving the accuracy of early cancer detection. The ultimate goal of my work is to create a method for simple, non-invasive biopsies that patients can undergo with minimal discomfort. By doing so, individuals can better monitor their health and identify cancer risks earlier.

Shelbie Raney - Cybersecurity - McNair Scholar

AI-enabled Framework for Early Detection of Respiratory Diseases via Cough Sounds

Respiratory illnesses such as tuberculosis, pneumonia, and COVID-19 remain pressing global health concerns, particularly in resource-limited regions where delayed diagnosis impedes timely treatment. This project presents an AI-enabled framework for the preliminary detection of respiratory diseases using cough sound analysis. The system integrates acoustic signal processing with convolutional neural networks (CNNs) to identify disease-specific audio patterns. Publicly available datasets are used to support classification: the ESC-50 dataset provides environmental sounds to serve as non-respiratory controls, while the Coswara-Data-Master dataset contributes labeled cough samples from individuals diagnosed with COVID-19. These datasets are preprocessed using the Librosa library in Python, enabling audio normalization, segmentation, and denoising. Mel-Frequency Cepstral Coefficients (MFCCs) are extracted to capture key time-frequency characteristics of each sample. A CNN model is trained on these features to distinguish between respiratory and non-respiratory audio classes. Model performance is evaluated using cross-validation and classification metrics including accuracy, precision, recall, and F1-score. In parallel with the machine learning pipeline, a mobile app prototype, CatarrhSense, has been developed as a potential deployment interface. The app is designed to eventually run lightweight classification models or transmit audio samples to a cloud-based diagnostic system, offering users a preliminary respiratory screening tool via smartphone or smartwatch. While still in the research phase, this framework demonstrates a scalable, low-cost solution for accessible respiratory diagnostics, particularly in underserved communities. This project does not involve clinical trials but focuses on experimental development using open-source datasets. Future work will expand the range of respiratory conditions modeled, refine deployment strategies for mobile integration, and evaluate ethical considerations in AI-assisted healthcare tools. By leveraging sound-based analysis and machine learning, this research contributes to the development of non-invasive, accessible diagnostic technologies for early detection of respiratory illness.

William Freeman - Cybersecurity - McNair Scholar

Democratizing Generative AI Quiz Creation: Accelerating Assessment Development in Engineering Education

Generative Artificial Intelligence (GenAI) is experiencing rapid growth across numerous industries, with its adoption expected to expand even further. Despite its potential, educational institutions, particularly those with limited funding, struggle to integrate GenAI into their workflows due to technical challenges and resource constraints. This research addresses these barriers by developing an autonomous GenAI-powered quiz generation system designed to streamline the creation of assessments. The system will automatically integrate course materials into Learning Management Systems (LMS), enhancing accessibility for educators while preserving the pedagogical quality of assessments. This project aims to bridge the gap between technological innovation and educational application, empowering instructors with efficient tools to improve learning outcomes

BREAKOUT PRESENTATIONS

6 - 7 PM

Room B 1 - Art and Performance

Terryn Ward - English - Independent Research

The Room's "Intimate Malaise": Medbh McGuckian, Virginia Woolf, and Northern Irish Womanhood

Few female Northern Irish poets have found the same level of success as Medbh McGuckian. In a nation haunted by colonialism, misogyny, and oppressive language, McGuckian's work shows how these forces infiltrate private space in Northern Ireland, rendering the notion of privacy absurd. This paper compares Medbh McGuckian's ideas about space in her early collections, The Flower Master and Venus and the Rain, with Virginia Woolf's 1929 essay A Room of One's Own. Where Woolf suggests that privacy and independence (through space and wealth) make it possible for women to contribute intellectually to the world, McGuckian's work shows how privacy and independence are impossible for Northern Irish women. This paper finds that although "a room of one's own" might offer opportunity and peace to a middle-class English woman, in the oppressive Northern Irish world, it is too simplistic a solution.

Zachariah Dinh - Philosophy & Mathematics - Provost's Summer UReCA Fellowship

Incongruity as a Muse for Amusement

In my research, I sought to refine the incongruity theory of humor, the most widely accepted theory of humor. It identifies the perception of clashing ideas as the source of amusement. The theory is broad and flexible, accounting for most if not all instances of humor. However, it lacks an explanation for why we come to be amused. I argue that the incongruity theory is not a theory of humor, one that explains how people cause others to laugh, but a theory of amusement, about the cognitive state and its causes. A theory of humor needs to situate amusement and its causes in a social and artistic context, where people communicate and intend to cause others to laugh. I propose such a theory which incorporates incongruity. Because incongruities are novel and emotionally-charged, humorists can use them to arouse people's wits and cause them to laugh.

Sydney Bartolome - Acting - Provost's Summer UReCA Fellowship

The Art of Impact: Exploring Stunt Performance

For my research, I focused on understanding and practicing the techniques, safety protocols, and training methods used by professional stunt performers. I studied various types of stunts, including falls, fights, and physical choreography, and analyzed how performers prepare their bodies to execute them safely. I also researched injury prevention, proper warm-ups, and recovery strategies to maintain long-term physical health. In addition to reading articles and watching professional stunt work, I applied what I learned through hands-on practice, experimenting with controlled stunts under guidance. I documented my progress, challenges, and observations to better understand the connection between physical skill, precision, and safety in stunt performance. This combination of practical experimentation and research allowed me to explore the craft of stunts from both a theoretical and applied perspective..

BREAKOUT PRESENTATIONS

6 - 7 PM

Room B 2 - Computers and the Online Sphere

Braden Wilson - Cybersecurity - Provost's Summer UReCA Fellowship

Exploring AI-Assisted Game Development

Over ten weeks I explored artificial intelligence as a creative and technical partner in early stage game development. Using Unity 6 and the GSpawn Pro toolkit, I built a prototype sci fi survival horror game with a modular space station map, a controllable player, basic combat, and enemies that use NavMesh for AI driven navigation. AI tools helped generate layout ideas, code snippets, and narrative beats, which I adapted and debugged to fit the project. The process strengthened my understanding of Unity workflows and taught realistic planning, time management, and problem solving. While the prototype stops short of a full story, it establishes a solid foundation I will expand with richer environments, polished combat systems, and incremental narrative integration.

Paul Nguyen - Cybersecurity - Provost's Summer UReCA Fellowship

A Comprehensive Framework on Reclaiming Autonomy

The nature of our current attention economy deprives an individuals ability to focus and engage with reality. Homo distractus, a distracted species that overindulges in the digital age economy of distraction, accurately encapsulates the cohort that this research serves to address. With the unregulated magnitude and exponential progress that technology has made within these past decades, humans have engineered an economy built to gorge attention for profit, and society silently bleeds by taking away people's executive function and ability to focus as needed. This system is heavily responsible for the continual rise of mental disorders and downfall of overall ability to healthily function. Moreover, not only do people complacently distract themselves through this outlet, our society is trending towards an era where we are offloading tasks and independent thinking to technology. After grasping attention as a valuable fiscal and mental currency, I understood its significant influence on our overall human experience. Adding on from the current neuroscience-based practices to reclaim mental autonomy in technology use, what framework can help address the current and upcoming generation of attention deprived individuals?

BREAKOUT PRESENTATIONS

6 - 7 PM

Room B 3 - Political Culture: Public and Private

Lorena Busuioc - Anthropology - Provost's Summer UReCA Fellowship

Longing and Belonging: The Changing Meaning of “Dor” in Romanian Lived

My research consisted of understanding the Romanian political culture through a literature review of relevant articles and books and through first-hand interviews with Romanian people that are currently living in the country, and that have moved to the diaspora. The people interviewed ranged in ages between 18 and 60, the different perspectives giving a different insight into the globalization's role in the changing of Romanian culture, political opinions and idea of representation. At the same time, I have centered my research on the word "dor" which is core element of the culture as it is untranslatable and describes a deeply Romanian feeling.

Madeline Woodard - Classical Studies - Provost's Summer UReCA Fellowship

Experiences and Political Culture

By analyzing amphorae, ceramic Roman shipping containers, archaeologists gain valuable insight into ancient Mediterranean trade. By tracking different amphorae forms across the ancient Mediterranean, archaeologists are able to determine where goods may have originated from and how they traveled through trade networks. For my research, I analyzed amphorae found in Ficulle, Umbria.The amphorae, along with other unearthed artifacts and the site's geographic location, have allowed me to place Ficulle as a trading stop for goods bound for Rome. The amphorae seem to suggest that goods coming through the area may have originated from as far away as Spain and that, for at least a hundred years, Ficulle also produced a local export that was sent to Rome with the Spanish imports.

Laila Raslan- Mechanical Engineering - Provost's UReCA Summer Fellowship

Impact of AI use on social networks in the workplace

AI chatbots are often studied mainly as tools or groundbreaking technologies that influence social networks only when people choose to use them. This perspective is limiting, as it excludes the possibility of AI functioning as an active node within a network, one that can participate in and even shape the social connections around us. Drawing on network theory, this research positions AI not just as a tool but as a human-like node in workplace settings, providing a more nuanced understanding of its role in shaping participants' everyday experiences.

BREAKOUT PRESENTATIONS

6 - 7 PM

Room B 4 - Engineering

Kierra Teer - Aerospace Engineering - Provost's Summer UReCA Fellowship

On the Dynamics of a Multipurpose Martian Satellite Constellation Synchronous with Phobos and Deimos

When it comes to Mars, one of the leading factors that is stopping human missions on Mars is the lack of infrastructure. To combat this issue, satellite constellations can be designed to provide global coverage, guidance and navigation systems, and communication. This will aid in future human missions to the Martian planet as well as provide a source of information that will help us better understand history, composition, and possibilities of life on Mars. The purpose of this research is to create a multipurpose constellation on Mars that is synchronous with Phobos and Deimos. Additionally, this research will address challenges of creating a multipurpose constellation, and finding less disturbed configurations to minimize the effects of the mass variation is satellites.

Gavin Thompson - Mechanical Engineering - Provost's Summer UReCA Fellowship

Optimization of Electromagnetic Braking Systems and Development of a Portable Rehabilitation Device

This project develops a smart resistance device designed to support physical rehabilitation. Instead of traditional weights, it uses an electromagnetic brake and a stepper motor to provide adjustable resistance through a cable, similar to gym equipment. An ESP32 microcontroller with artificial intelligence adapts the resistance in real time so movements feel smooth and consistent. Sensors measure force, motion, and temperature, enabling the device to track progress and provide valuable data for physical therapists. Compact and customizable, the design combines engineering and healthcare to improve rehabilitation outcomes and create a modern, data-driven tool for recovery.

John Vianney Ssennono - Electrical Engineering - Independent Research

A Systematic Literature Review exploring the Application of Deep Learning in Electric Vehicles: Emerging Trends and Future Directions

During the summer of 2025, I began my research journey in the electric vehicle sector, aiming to understand its impact on different societies today. I decided to focus on the influence of deep learning, a type of machine learning, on the integration of electric vehicles into the transportation market and what trends have been shown so far, in addition to the future developments being predicted. I reviewed various data-driven and systematic literature reviews together with my two co-authors to draw conclusions regarding the progress made in this sector over the past 10 years in different countries around the world.

BREAKOUT PRESENTATIONS

6 - 7 PM

Room B 5 - Nature and Medicine

Sophia Anderson - Biology - Provost's Summer UReCA Fellowship

Parasite-Induced Trade-Offs: Parental Care in Stickleback Fish Populations

I work in the Stein Lab. Members are interested in studying fish behavior, mainly by studying Threespine Stickleback fish. Threespine Stickleback males exhibit parental behaviors such as building a nest, guarding eggs, fanning the eggs (providing oxygen), and temporarily defending the fry after they hatch. This summer, I traveled to Alaska to gather data on populations in lakes impacted by parasitic infections by tapeworm Schistocephalus solidus, wanting to examine whether this tapeworm infection affected rates of stickleback fathers stealing eggs or fertilizing stickleback eggs other than their own due to lack of energy. While in Alaska, members of my team and I snorkeled to find fanning males, determined if they were infected, then collected eggs from their nest. In the lab, I am now beginning to work on paternal analysis, which will allow DNA matching to the male who cared for each set of eggs, allowing determination of alloparenting.

Emma White - Chemical Engineering - Provost's Summer UReCA Fellowship

Synthesis of Cannabigerol (CBG) Analogs

Cannabigerol (CBG) is a non-psychoactive compound found in Cannabis sativa that shows potential for treating conditions like pain, inflammation, and even cancer. However, CBG has low bioavailability and weak binding to important receptors (CB1 and CB2), limiting its effectiveness. My research aims to improve CBG's therapeutic potential by modifying the structure of the molecule and studying how these changes affect its biological activity. The two primary goals are: (1) to modify the length of the alkyl chain (C3-C8) in CBG, and (2) to modify the prenyl side chain of CBG. This research will contribute to advancing the understanding of cannabinoids and their use in medicine.

Natalie Miller - Geophysics - Provost's Summer UReCA Fellowship

CO2 Storage Resource Assessment for the Hunton Group, Anadarko and Arkoma Basins, Oklahoma

The Hunton Group has been well explored and developed across the Anadarko and Arkoma basins for hydrocarbon potential. Information from 80,800 wells and 359 well logs was used to correlate and interpret the Hunton across the basins and generate structure-contour and isopach maps. Conventional well logs and estimated lithology logs were used to create detailed, basin-scale 3D lithology models for the Hunton Group, consisting of limestone, dolomite, and sandstone/silica. Total porosity was calculated from neutron- and density-porosity logs. Those data were used to generate 3D porosity models that were constrained to the lithology models. To determine the CO2 storage resource, a volumetric approach using the U.S. Department of Energy methodology was applied. Based on calculated CO2 density, the CO2 storage resource for the Hunton was determined using both site-specific and formation-level saline storage efficiency (ESaline) values and reported for the entirety of the two basins by lithology and by measured depth.

BREAKOUT PRESENTATIONS

6 - 7 PM

Room B 6 - Public Health and Mortality

Emily Flesher - Sociology, Clinical Psychological Research and Scientific Communication - Provost's Summer UReCA Fellowship

Assessing Factors Facilitating Inclusive and Resilient Mental Healthcare for Transgender and Gender Diverse Adolescents: The AFFIRM Study

I work in the Stein Lab. Members are interested in studying fish behavior, mainly by studying Threespine Stickleback fish. Threespine Stickleback males exhibit parental behaviors such as building a nest, guarding eggs, fanning the eggs (providing oxygen), and temporarily defending the fry after they hatch. This summer, I traveled to Alaska to gather data on populations in lakes impacted by parasitic infections by tapeworm Schistocephalus solidus, wanting to examine whether this tapeworm infection affected rates of stickleback fathers stealing eggs or fertilizing stickleback eggs other than their own due to lack of energy. While in Alaska, members of my team and I snorkeled to find fanning males, determined if they were infected, then collected eggs from their nest. In the lab, I am now beginning to work on paternal analysis, which will allow DNA matching to the male who cared for each set of eggs, allowing determination of alloparenting.

Sam Hunt - Economics - Independent Research

The Local Mortality Effects of NAFTA

My research project is on identifying some of the unintended side effects of free trade, specifically NAFTA, by looking at mortality patterns of counties that were heavily exposed to the effects of NAFTA. I use econometric models to formulate a metric that measures NAFTA impact, and then use that metric to explain variations in the mortality rate caused by "deaths of despair" in impacted regions. My presentation also covers how economists view the costs and benefits of trade, which is a highly relevant topic.

Anayat Yousuf - Biology and Public Health - Independent Research

Bioengineered Bone Implants with Early Vascularization

My research was conducted at Georgetown University School of Medicine and focused on developing a prevascularized bone scaffold using 3D bioprinting technology. The goal was to create a bone-like structure with microchannels to support blood vessel formation. These channels were formed using a sacrificial material, pectin, which was later dissolved to create space for vascular growth. The main scaffold was printed using hydroxyapatite and a biocompatible polymer, materials known to support bone regeneration. This model successfully mimicked the natural bone environment and improved nutrient diffusion and cell survival. The significance of this research lay in its ability to address one of the biggest challenges in bone tissue engineering—limited vascularization in large or complex bone defects. Our scaffold showed potential for improving bone healing and could serve as a valuable tool for drug testing, disease modeling, and future regenerative medicine applications.

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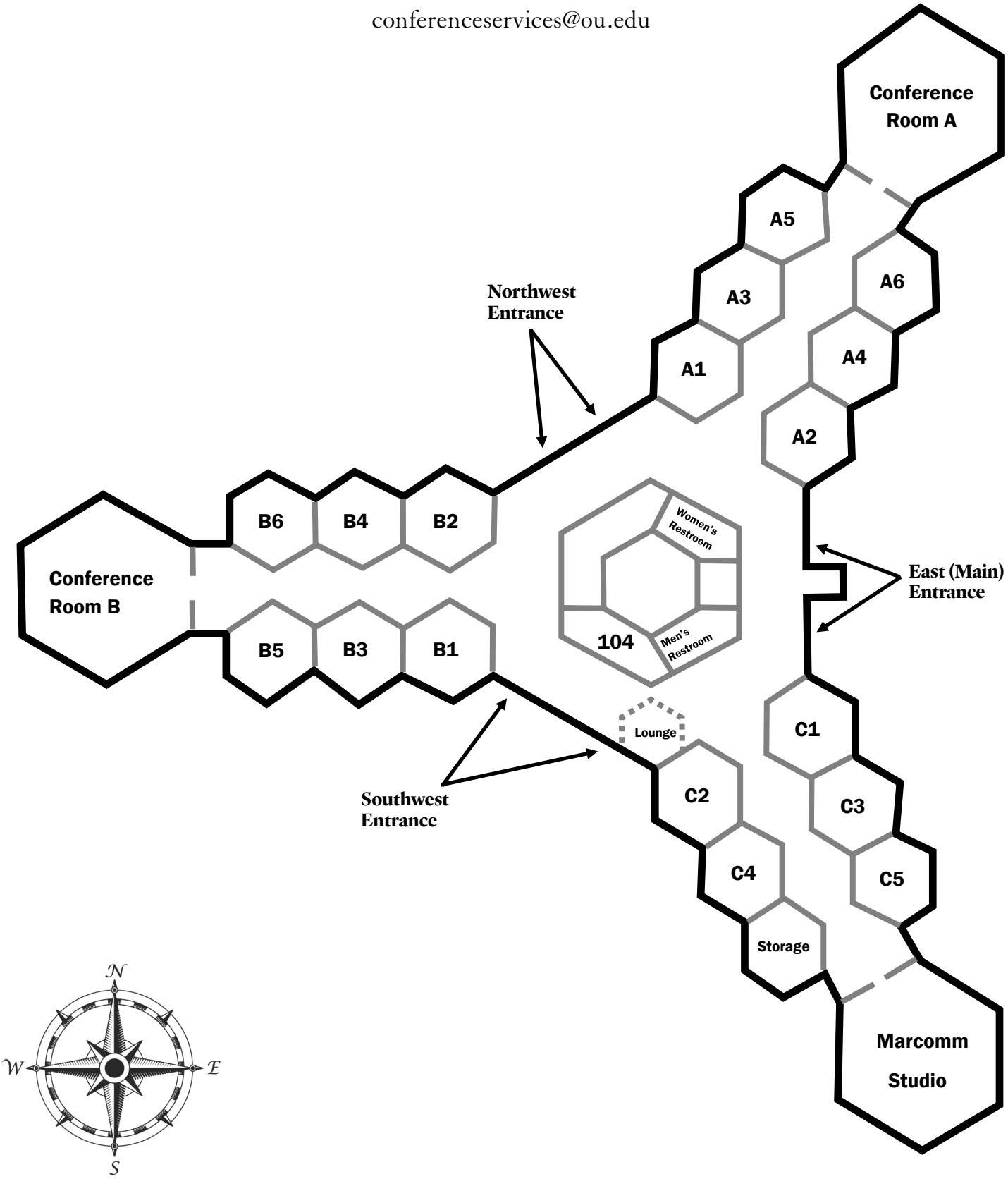

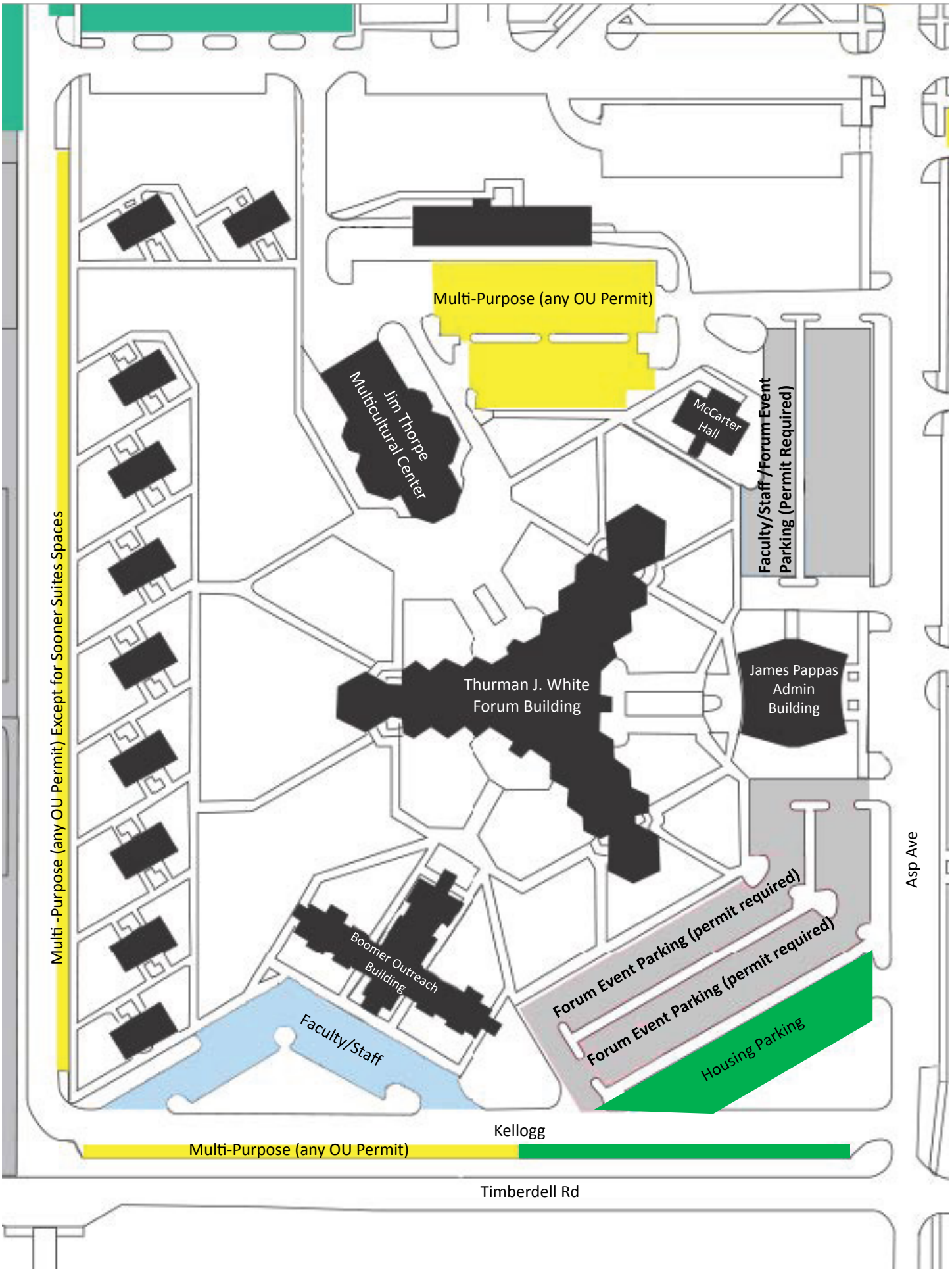
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