URCAD
UNIVERSITY RESEARCH AND CREATIVE ACHIEVEMENT DAY

Undergraduate Poster Presentations

Location: Alumni Hall – Student Center

Time: 2:00 PM – 4:00 PM

Explaining Variation in Human Stature: Climate Versus Subsistence Strategy

Shana Kilkenny
Anthropology
Advisor: Dr. Thomas Rein

Human populations exhibit variation in stature across different environments, such as Arctic and desert climates, influenced by environmental factors and lifestyle choices, including subsistence strategies. According to Allen's and Bergmann's rules, those from warmer desert areas tend to be taller, while Arctic populations are often shorter and stockier. For my study, I focused on Australian Aboriginals and Alaska Iñupiat, along with horticulturists from Libben, Ohio, and foragers from the Indian Knoll site in Kentucky. Stature is the dependent variable, with climate and subsistence strategy as independent variables, controlling for age and sex. I predict that if climate is the main factor, Australian Aboriginals will be taller than Alaskan Iñupiat, assuming similar subsistence strategies. Conversely, if subsistence strategy is more significant, differences in stature between horticulturists and foragers will be evident, even within the same climate. For data collection, I used stature estimation equations based on long bones like the femur and tibia. Statistical analyses were conducted using RStudio, including Shapiro-Wilk normality tests and t-tests, with ANOVA also planned. I expect climate to have a stronger influence on stature than subsistence strategy, with desert populations being taller than those from the Arctic. These outcomes show the role of environmental adaptation in human body proportions while acknowledging the impact of nutrition and lifestyle on variation.

Multivalent Glyco-Peptoid Scaffolds as High-Avidity Inhibitors of Carbohydrate–Lectin Interactions

Ryan Rigsby
Biochemistry
Advisor: Dr. Dilani Chathurika Dehigaspitiya

Nature exploits multivalent binding to amplify overall avidity by engaging many weak ligand–receptor interactions simultaneously. These multivalent carbohydrate–lectin contacts are central to host recognition by numerous pathogens, including influenza virus, uropathogenic Escherichia coli, cholera toxin, and Shiga toxin. Consequently, rationally engineered multivalent inhibitors that competitively block pathogenic carbohydrate-lectin adhesion have emerged as a promising strategy for preventing infection and toxin-mediated disease. The successful design of such synthetic ligands requires precise control over ligand architecture and spatial presentation to match the number, orientation, and spacing of lectin binding sites, thereby maximizing avidity while retaining selectivity. In this work, we present the rational design and synthesis of a multivalent glyco-peptoid scaffold

tailored to engage the model plant lectin Wheat Germ Agglutinin, illustrating how controlled multivalent display can be harnessed to create high-affinity lectin-blocking agents.

Toxicological Impact of Polystyrene Microplastics on Dugesia japonica

Amoy King
Biochemistry
Advisor: Dr. Betsy Dobbs-McAullife

Environmental pollution from polystyrene nanoplastics poses significant risks to aquatic ecosystems due to their ability to cross cellular membranes and induce oxidative stress. While anthocyanins have shown potential in mitigating these effects in Dugesia japonica (planaria), the comparative efficacy of antioxidants such as N-acetyl cysteine (NAC) and folic acid (FA) remains underexplored. This study investigates the toxicological impacts of polystyrene nanoplastics (PSNPs) on planaria and evaluates the therapeutic potential of FA and NAC treatments. To assess physiological stress, mortality and behavior were monitored in full planaria exposed to varied PSNP concentrations, while regeneration rates, mortality, and light-response recovery were analyzed in decapitated subjects. In this study, we highlight the concentration-dependent toxicity of PSNPs on planaria and provide a preliminary assessment of the alleviative potential of NAC and FA.

Cloning and Validation of SHP-2 SH2 Domains

Julissa Hidalgo
Biochemistry
Advisor: Dr. Nilda Alicea-Velazquez

SH2 domains within proteins play an important role in mediating protein-protein interactions involved in signaling pathways. These domains specifically recognize phosphorylated tyrosine residues on their binding partners. SHP-2 is a protein tyrosine phosphatase that contains two SH2 domains (N-SH2 and C-SH2) that regulate its activity and function. Our research group is interested in understanding how the SH2 domains within SHP2 recognize their biological targets. Here we present the subcloning of the SHP-2 N-SH2 and C-SH2 domains to produce a recombinant plasmid for protein expression in bacteria. The DNA sequence encoding the N-SH2 domain was amplified using PCR with specifically designed primers. The product was purified and digested with EcoRI and BamHI restriction enzymes, along with a plasmid vector, to generate compatible ends for ligation. The insert was ligated into the vector to create a recombinant plasmid, which was then introduced into competent bacterial cells through transformation. Plasmid DNA was isolated via miniprep, and successful insertion was confirmed through analytical restriction digestion and gel electrophoresis. Final validation was achieved through DNA sequencing to ensure accuracy of the cloned sequence. This work provides a foundation for future studies aimed at understanding how the N-SH2 domain contributes to the regulation and activity of SHP-2.

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Determination of simple sugars from fruits of Jaltomata using Hydrophilic Interaction Liquid Chromatography (HILIC) - Ultra High-Performance Liquid Chromatography - Corona Charged Aerosol Detection (uHPLC-CAD)

Anthony Ntiamoah
Biochemistry
Advisor: Dr. Chakraborty Sourav

Simple sugars are key components of biological matrices, and non structural carbohydrates such as glucose, fructose, and sucrose play essential roles in plant health, growth regulation, and defense. Several species of the neotropical genus Jaltomata occur in the southwestern United States and along the Andes Mountains of South America; however, little information is available regarding the carbohydrate composition of their fruits. In this study, we characterized simple sugars in fruits from two Jaltomata species, J. auriculata and J. darcyana (accession # 694). Plants were propagated from seeds or cuttings and grown in the CCSU greenhouse. Mature fruits were harvested and stored at –80 °C prior to analysis. Samples were lyophilized, pulverized in liquid nitrogen, and extracted using ultrapure water. A solid phase extraction (SPE) method was optimized using HyperSep C18 cartridges to pre concentrate sugars and separate polar from non polar constituents. SPE eluates were lyophilized to obtain dry carbohydrate fractions, which were reconstituted in 65% acetonitrile and 35% water for analysis. Because direct chromatographic separation of highly polar sugars is challenging, we employed a HILIC Z interface with an aqueous (8%) and acetonitrile (92%) mobile phase, coupled to a charged aerosol detector (CAD), to quantify glucose, fructose, and sucrose using lactose as an internal standard. This method yielded reproducible separation of both standards and fruit samples.

From Roads to Rivers: The Delay of Chloride Pollution

Aidan Carvajal
Biology
Advisor: Dr. Michelle Kraczkowski

Every winter in New England, roads and sidewalks are treated with salt (sodium chloride) to improve safety during snow and ice storms. These salts are not removed afterward; instead, precipitation and snowmelt wash them off impervious surfaces into drains and nearby water bodies, creating large chloride pulses in watersheds. Due to widespread use, identifying major contributors to stream chloride levels is difficult. At Central Connecticut State University, a stream runs beneath campus, allowing comparison between upstream (non-campus) and downstream (campus-influenced) conditions. We sampled water before and after it passed through campus and measured chloride concentrations using titration following winter storms. We expected downstream sites to consistently show higher chloride levels, but initial results showed the opposite—lower concentrations immediately after storms. Over time, however, chloride levels increased and eventually exceeded initial measurements. This pattern suggests early snowmelt diluted the stream, while later melting and reduced storm frequency revealed higher, more representative chloride concentrations.

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Expression of Mll2 and Ezh2 in IVF and in-vivo mouse embryos

Sadie Marjani
Biology
Advisor: Dr. Sadie Marjani

Mll2 and Ezh2 control a bivalent domain in histone methylation that is activated during early embryonic development. These genes, controlling the trimethylation of H3K4 and H3K27, respectively, are in part responsible for the differentiation of cells in the early embryo. In particular, activation of the Mll2 may lead to a decrease in cell differentiation and proliferation, while activation of the Ezh2 gene may lead to differentiation. Embryos produced by in vitro fertilization (IVF) develop to the blastocyst stage in an artificial laboratory environment when these genes are expressed. I hypothesized that in vitro production caused abnormal expression of Mll2 and Ezh2 in IVF embryos compared with in vivo control embryos. RT-qPCR was done to study the expression of Mll2 and Ezh2 in mouse IVF and in vivo blastocyst stage embryos. The comparative CT method was used for data analysis using Gapdh as a control gene.

The Genetic Comparison Between Lineages of Albinism Observed in Boa imperator

Nate Miller
Biology
Advisor: Dr. Sadie Marjani

In the world of captive reptiles, few animals catch people's attention like albino boas. Bright yellow and orange colors make them especially striking, even to those who aren't reptile enthusiasts. What most people don't realize, however, is that "albinism" isn't caused by just one genetic change, and there are actually multiple different mutations that can produce this appearance. This idea became interesting after a 2008 breeding by JPCBoas. In this breeding, two boas, neither of which was known to carry any albino mutations, produced a litter of 34 babies: 33 normals and a singular Albino. The following year, the same pairing yielded 35 babies, with no albinos. This raised an important question: how could a singular albino appear when genetics suggests this shouldn't happen? For a boa to be albino, it must inherit a specific mutation from both parents. If both parents carry that mutation, about 25% of the babies should be albino, not just 1 out of 69. This unusual result suggests that something unexpected may have occurred genetically. The goal of this research was to find out what caused this singular albino. By analyzing DNA from different boas, some with known albino mutations and others related to this unique individual, we compared the sequence of their TYR gene, which controls melanin (black pigment) production. This allowed us to determine whether this snake has a brand-new genetic mutation, or a known mutation that went unnoticed in its parents.

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Exploration of Nectar Variance in Flowers of Jaltomata auriculata

Michelle Helming
Biology
Advisor: Dr. Mione

Characteristics of Jaltomata auriculata of The Solanaceae family, including reproductive morphology and behavior are not fully known. With the ability of both self-reproduction and pollinator-based reproduction, its uniquity is imperative to preserve as a wild relative to the agriculturally known tomato. The aim of the research is to quantify the amount of nectar per flower in order to gain novel insights on J auriculata's possible influence on pollinator attraction. The 20 flowers sampled had shown substantial variance in nectar ranging from a volume of .67-4.18 µL with a mean of 2.13 µL.

Assessing Genetic Differentiation Between Two Morphologically Identical Plethodon Populations

Frankie Ince
Biology
Advisor: Dr. Michelle Kraczkowski

Amphibians are a threatened group across the globe, due to issues such as disease, habitat destruction, and climate change. We are focused on the preservation of one of the twelve species of salamander found in Connecticut, the Northern Slimy Salamander, Plethodon glutinosus, which currently is a state threatened species. Previously, we uncovered genetic differences between Plethodon glutinosus and a morphologically cryptic species, White Spotted Salamander, Plethodon cylindraceus. Research had been conducted on the mitochondrial loci of these species and large genetic differentiation has been recorded of nearly 10%. The current focus of this research aims to identify the nuclear DNA markers that may reveal genetic differences between the species and explanation of overlapping phenotypes. We hypothesize that differences will be found in nuclear DNA to indicate crucial information in genetic variation. Our methods for this research use Polymerase Chain Reaction (PCR) and gel electrophoresis to amplify the fragment length of base pairs. Ongoing research involves optimizing primer combinations to amplify the RAG1 locus with an ideal sequence size ≥500 base pairs. Current findings have shown sequences only approximately ~300 bp and these fragments have been non-informative as no nucleotide differences were observed for the samples sequenced thus far.

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The Microbiome of Cassiopea xamachana, the Upside Down Jellyfish

Lisa Nigro
Biology
Advisor: Dr. Lisa Nigro

Cassiopea are unique coastal jellyfish species that orientate themselves upside down, with their bell towards the sediment and oral arms toward the water. They have a symbiotic relationship with photosynthetic algae similar to some coral species. It has been shown that they can go through metamorphosis and survive without their algal symbionts, but their health and survival are negatively impacted. Less studies have looked at the bacterial microbiome. As a preliminary project, we aimed to look at the microbiome during different phases (polyp and adult) of the jellyfish. We extracted DNA from polyps as well as the oral arms, bell, and mouth of adults. We performed PCR utilizing 16S rRNA universal prokaryotic primers with barcodes that work with the Illumina Miseq sequencer. Successful PCRs were confirmed by gel electrophoresis. PCR was mostly successful in adult samples, but only 50% of the polyps showed amplification. We are currently refining the protocol so we can have higher success with polyps. Samples will be sequenced by the UConn sequencing center. Initial sequences from 2 samples indicate that Gammproteobacteria dominate the microbiome of adult samples, followed by Alphaproteobacteria and Bacilli.

Expression of YAP1 in Cloned Bovine Embryos

Sadie Marjani
Biology
Advisor: Dr. Sadie Marjani

Reproductive cloning, achieved through somatic cell nuclear transfer (SCNT), involves transferring the nucleus of a donor somatic cell into an enucleated oocyte to create a genetically identical organism. Cows have become a staple for cloning due to the relative ease of obtaining oocytes and their importance as a food animal. However, there have been persistent problems with cloning efficiency. Many cloned mammals have been susceptible to placental abnormalities and large offspring syndrome. These challenges are thought to have formed from errors in epigenetic reprogramming leading to placental dysfunction. This has been a leading cause of mortality in cloned calves. Previous work has suggested that the placental abnormalities are associated with the transcriptional coactivating gene, YAP1. This gene is involved in the upregulation of cell proliferation and the inhibition of cell death. Upregulation of proliferation may explain why there are structural abnormalities in the placenta. We analyzed the gene expression differences between SCNT and in vivo, bovine, blastocyst stage embryos. The expression of YAP1 was measured using quantitative PCR (RT-qPCR) and compared to internal control gene H3F3B. It was hypothesized that cloned embryos would exhibit elevated levels of YAP1 expression compared to their in vivo counterparts following amplification. Understanding these differences may provide insight into the developmental challenges associated with reproductive cloning.

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Insights in Conservation of Vernal Pools in Western Connecticut

Ian MacKennedy
Biology & Earth Science (Double major)
Advisor: Dr. Michelle Kraczkowski

A vernal pool is a temporary wetland habitat that fills with water seasonally from snowmelt and early spring rains but dries out in the late spring. The temporary nature of these pools allows for many species of amphibians to use them as breeding pools, chosen for the lack of predatory fish. In Connecticut these amphibians include the Jefferson salamander – a species of special concern. Species of special concern are those that require special attention within conservation due to their limited presence or high significance as an indicator species for ecosystem health, triggering additional protections to the lands they are present on. The Jefferson salamander has special concern listing because they are highly threatened by habitat destruction and fragmentation, and as a vernal pool obligate species, they require the presence of healthy vernal pools to reproduce and cannot survive without them. For these reasons, it is important and informative to monitor the health of vernal pools on the landscape year by year. We have been fortunate to be able to collaborate with the Steep Rock Association to analyze their database of 55 vernal pools across 8 years of study. In this case, we hope to reveal trends in the viability of vernal pools in the preserve for both the Jefferson and spotted salamander species. Through data curation as well as careful quality checking and statistical analysis, we provide the first large scale analysis of this full data set for Steep Rock to utilize.

Design and Synthesis of Peptoid Metal Chelators

Tyler Violette
Chemistry
Advisor: Dr. Dilani Chathurika Dehigaspitiya

Peptoid macrocycles, synthetic analogs of peptides with N-substituted glycine backbones provide a versatile platform for the development of selective and stable metal chelators. Their chemical robustness and tunable conformations make them attractive for applications in biomedicine, catalysis, and environmental remediation. This project will investigate the metal-chelation behavior of novel peptoid macrocycles toward biologically relevant metal ions, specifically Cu^{2+}, Zn^{2+}, and Cd^{2+} using analytical techniques. We aim to elucidate the structural factors governing metal-ion binding and to assess the potential of peptoid macrocycles for biomedical and materials-based applications.

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PRMD14 Expression in Cloned Bovine Blastocysts

Sadie Marjani
Biology (accelerated)
Advisor: Dr. Sadie Marjani

Epigenetic reprogramming is important during early embryonic development, especially in cloned embryos, where it does not always occur properly and can affect development. Somatic cell nuclear transfer is a cloning technique where the nucleus of a somatic cell is transferred into an enucleated egg cell to create an embryo. During this process, the somatic nucleus must be reprogrammed to an embryonic state, however, this reprogramming is often incomplete. PRDM14 is a protein that regulates gene activity and is important for pluripotency, germ cell development, and epigenetic regulation. Previous studies have shown that PRDM14 helps cells remain in a pluripotent state by preventing early specialization and supporting large-scale epigenetic reprogramming. In mouse models, PRDM14 has also been shown to regulate X-chromosome reactivation by repressing Xist. This study aims to quantify the relative expression of PRDM14 in in vivo blastocyst-stage bovine embryos and cloned bovine embryos using quantitative PCR (RT-qPCR). Gene-specific primers were designed and validated to ensure amplification specificity. Quantitative real-time PCR was performed using SYBR Green chemistry under standard amplification conditions and H3F3B as the internal control gene. Based on previous findings, I hypothesized that PRDM14 expression will differ between cloned and in vivo embryos, potentially reflecting differences in epigenetic reprogramming efficiency. Altered expression of PRDM14 in cloned embryos may indicate incomplete reprogramming and disrupted regulation of pluripotency-associated pathways. Studying PRDM14 expression could help explain why cloned embryos sometimes develop poorly and could help improve cloning technology.

Digital Equity Pathway Feasibility Study

Logan Konopka
Computer Engineering Technology
Advisor: Dr. Tony Deluca

Our project is a business-to-consumer program that connects donated computer equipment with local K-12 communities, with Central Connecticut State University acting as the hub. The study trying to see if something of this scale is possible using connections made at the CEGT department to give K-12 communities computer technology they might not have access to outside of the classroom. After receiving the equipment, student workers would clean and recycle parts to be used in build days or package the refurbished equipment and distribute to those K-12 communities. The study also includes an operational workflow, such as logisitics and protocols, and effective analysis and the risks that comes with a project such as this.

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Effects of Acetaminophen Exposure on Regenerative Growth in Planarian Worms

Alani Adams
Biomolecular Science
Advisor: Dr. Betsy Dobbs-McAuliffe

Planarian (Dugesia japonica) flatworms are often studied as a model organism for regenerative biology due to their capability to regrow complete body structures following amputation. They are also an emerging model system for toxicological studies. We are developing planaria as a model to study the toxicity of acetaminophen overdose. Acetaminophen (APAP) is a commonly used analgesic, pain reducer, and antipyretic, fever reducer. APAP is safe when used at therapeutic doses, but causes cell death due to accumulation of toxic metabolites during an overdose. By exposing planaria to APAP we can assess APAP impacts on regenerative processes. An essential part of planarian regeneration is re-establishing body proportions, which includes both production of new cells to replace missing tissue and the reduction in existing tissues to fit the new, smaller body size. In these studies, planarians were bisected and measured each day while being treated with APAP over the course of three days. Body proportions were quantified through daily measurement for the three days of APAP treatment, then periodically afterwards and compared to untreated controls. We hypothesize that planarians regenerating while treated with APAP would fail to re-establish normal body proportions. By developing a consistent assay for APAP toxicity in planaria, we can then use planaria for screening for interactions between APAP and other medications

Fluids in an Oriskany Sandstone Core from the Chestnut Ridge Anticline, Pennsylvania

Kaitlyn Cannon
Earth Science
Advisor: Dr. Mark Evans

The Middle Devonian Oriskany Sandstone is a prolific producer of natural gas and extends from northern Pennsylvania to West Virginia. The gas is commonly found trapped in anticline fold structures like the North Summit field located in Fayette County, Pennsylvania. Mineralized fractures were sampled from the Devonian Oriskany sandstone from well 114 in this field. The well is in an intensely fractured and faulted region at the northeast extent of the Chestnut Ridge Anticline which formed during the Alleghanian orogeny ~300 million years ago. Veins are 2 to 5 mm thick and consist of twinned calcite and quartz. Stable Isotopic Values for δ18O and δ13C from calcite vein samples were analyzed to constrain the history of how the fractures and fluids formed within the rock layers before and after large scale deformation. Vein calcite samples have isotopic values ranging from: -6.9 to -9.0 δ18O V-PDB and -0.5 to 1.1 δ13C V-PDB. These values are similar to those from the underlying Devonian Helderberg limestone in the Valley and Ridge to the east. Preliminary fluid inclusion microthermometry of two-phase aqueous inclusions from veins in the Oriskany gives two populations of homogenization data. The first group gives Th values of 100°C to 150°C and the ice melting temperatures range from -23°C to -30°C. The second group gives Th values of 170°C to 198°C and the ice melting temperatures range from -28°C to -30.5°C.

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Simultaneous determination of water-soluble Vitamins from Fruit Tissues of Jaltomata spp. using Ultra High Performance Liquid Chromatography (uHPLC) – Photo Diode Array (PDA) – tandem mass spectrometry (MSn)

Colby Perkins
Chemistry
Advisor: Dr. Chakraborty

altomata is a relatively rare South American genus within the Solanaceae family and is distantly related to tomato and potato. Fruits from several Jaltomata species are consumed in both the United States and South America; however, little to no information exists regarding their nutritional composition. Nutritional profiling is essential, as it directly relates to food quality and safety. In this study, we sought to quantify watersoluble vitamins in fruits from three Jaltomata species; J. darcyana, J. antillana, and J. procumbens. Plants were propagated from cuttings or seeds and grown in the CCSU greenhouses. Mature fruits were harvested and stored at – 80 °C prior to analysis. Samples were lyophilized and ground into a fine powder in liquid nitrogen using a mortar and pestle. A 100 mg aliquot of tissue was extracted using a sequential extraction protocol; first with 5% NH_4OH, followed by 1% acetic acid. For each extraction step, samples were sonicated for 15 minutes and centrifuged at 10,000 rpm for 5 minutes. Supernatants were collected, syringefiltered, and analyzed by uHPLC–PDA–MS^n. Vitamin separation was achieved on an aqueous reversedphase Hypersil C18 column (100 mm × 2.1 mm × 1.9 µm) using gradient elution. Preliminary analyses demonstrated effective separation of multiple watersoluble vitamins. Ongoing work includes targeted confirmation and quantification of these vitamins using LC–MS/MS.

Joint Attention Determination Using Eye Tracking and Neural Networks

Jacob Rulka
Computer Science BS
Advisor: Dr. Md Rafiul Hassan

Joint attention is the shared focus of two or more people on a certain object or event. In addition, it is fundamental in human communication and social intelligence. With systems becoming more intelligent and their introduction into interaction with humans, medicine, robotics and the detection of joint attention more research opportunities have arisen. The paper showcases a review of research regarding joint attention and its determination with the use of eye tracking and neural network technology. Twenty studies were analyzed gathering intel on the foundational concept of joint attention, deep learning architecture for gaze and head pose estimation, and the tracking of objects. This review shows how the field of eye tracking has transformed from eye movement analysis into deep learning and how convolutional neural networks (CNNs), networks, transformers, and architectures contribute to solving this. Many applications are considered in the survey such as the interaction between humans and computers, collaborative learning, segmentation, and social robotics. The key challenge is the computation cost, data, and accuracy of the model. This paper will end with a display of research of the twenty papers alongside the proposal of the research project.

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Supporting Bilingual Students in a Classroom Setting: A Field Experience

Damaris Rivera
Education-Spanish
Advisor: Dr. Werblow, Jacob

This project documents a community-based learning experience conducted during a classroom placement in a elementary school setting. The focus was on supporting diverse learners through small-group instruction in writing. The project involved planning and implementing targeted lessons using graphic organizers and structured writing templates. Observations and informal assessments showed that students demonstrated improved organization, increased confidence, and greater participation during writing tasks. Challenges included managing varying skill levels and maintaining engagement among all students. This project reflects on the effectiveness of differentiated instruction and highlights the importance of adapting teaching strategies to meet individual needs. The findings suggest that small-group instruction provides meaningful opportunities for personalized support and improved learning outcomes. Implications for teaching practice and future classroom applications are discussed.

Possible evidence for ancient earthquakes in central Connecticut

Raechel Bouchard
Environmental Earth Science
Advisor: Dr. Wizevich

The Jurassic East Berlin Formation consists of lake deposits in the Harford rift basin, which developed during the breaking apart of the supercontinent Pangea. At an outcrop in Berlin, CT extensive sub-vertical sediment-filled fractures were recently recognized. They appear to have formed in the sediments before the process of lithification. Our study of these features will lead to a better understanding of events that occurred during the development of the Hartford Basin. Samples were collected from the outcrop and brought back to CCSU for examination. The graphical abstract photo shows a polished slab with three distinct fracture fills (arrows). Fill composition is not the same in each, indicating three generations of fracture development. Dotted lines show layer off-set from faults that are consistent with extensional forces. Our initial outcrop study and analyses of cut and polished slabs of the samples indicate that the features are clastic dikes that formed by sediment liquefaction and extrusion through fractures in the weakly consolidated sediment and are not mudcracks as previously interpreted by others. Sediment liquefaction can be generated by various geological processes. Our hypothesis is that the liquefaction and sediment mobilization was caused by shaking from earthquake-generated seismic waves, creating soft-sediment deformation features commonly referred to as seismites. If correct, our study is the first to document seismites in the Hartford Basin.

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Design as Public Practice: Co-Authored Cultural Work in Public Contexts

Jeanne Criscola
Design (Graphic/Information)
Advisor: Dr. Jeanne Criscola

Central Design models undergrad design education grounded in practice-based learning and co-authored cultural production. Rather than isolated studio work, these projects embed students within civic and institutional contexts where their work is published and experienced beyond the classroom. Students engage design as public practice, working within existing systems and contributing to culturally and socially relevant outcomes. Four projects serve as case studies: Barbenheimer Syndrome, a book project examining media and cultural narrative through cover and exhibition design; a partnership with the New Britain Industrial Museum, where students develop identity systems and campaign materials; the CMHC Art Catalog, documenting artwork within a clinical and community setting; and Free Minds, a logo supporting the Clemente Course in the Humanities and expanding access to education. Across these projects, students engage in research, writing, image-making, and systems design with real partners and constraints. The emphasis is on design—books, exhibitions, identity systems, and communication frameworks that function in public contexts and circulate beyond the university. The poster reframes "community engagement" as co-authored public practice, positioning students as contributors to cultural work. It offers a model for integrating design education with public-facing outcomes, demonstrating how undergrads work in real-world projects while developing critical and creative skills.

Hooked on the Unknown: Analyzing the Rise of Blind Box and Subscription

Nida Khan
Graphic Information Design
Advisor: Dr. Yiru Wang

With the rise of "blind" consumerism, marketing departments must understand why consumers are drawn to the aspect of mystery, purchasing products without knowing exactly what they will receive. As blind boxes and subscription services trend upward, understanding this market shift is crucial for companies to maintain relevancy. This research investigates the psychological reasoning behind these purchases and the design choices used to hook an audience. The study began with a literature review of existing research on blind box and subscription consumerism, followed by an analysis of individual and group psychology regarding repeat engagement. Data was then collected through anonymous online surveys to understand the consumer mindset behind these purchases. The findings reveal a direct tie to the dopamine a consumer receives upon opening their first box. Consumers often choose a "safe" product series where they are likely to be satisfied with most options to mitigate the fear of disappointment. However, the physical process of opening the box triggers an adrenaline rush that kickstarts a "dopamine-loop." This loop becomes the primary driver, drawing consumers back to buy again, whether from the same series or a new one. The increase in these mystery purchases and the addictive cycle they introduce is vital to understand as the trend shows no signs of slowing down.

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Evaluating the Effectiveness of Training and Development Programs for Student Workers at Central Connecticut State University

Skylar Rutka
Management- Human Resources
Advisor: Dr. Heidi Hughes

This independent study examined the effectiveness and continuity of learning and development programs designed for student workers across on-campus organizations. In addition to evaluating the effectiveness of these programs, the study aimed to identify their structure and the extent to which they support student employee growth and performance. Using a quantitative approach, data were collected through surveys administered to student workers at on-campus organizations at Central Connecticut State University. The Kirkpatrick model was used to generate survey questions. The survey gathered insights on whether training programs are mandatory or optional, participants' perceptions of program effectiveness, and their views on the level of institutional support, guidance, and available resources. Ultimately, the study identified high-performing training models and uncovered opportunities to enhance university support, thereby contributing to more effective and cohesive learning and development strategies for on-campus organizations.

Approaches to Full Density Consolidation of Al and Al Alloy Powders

Jayson Arichavala
Mechanical Engineering
Advisor: Dr. Steven Johnson

Project Title: Approaches to Full Density Consolidation of Al and Al Alloy Powders Authors: J.O. Arichavala, S.C. Johnson, A. Dupuy Author Affiliations: Central Connecticut State University, Central Connecticut State University, University of Connecticut Abstract: Gas atomized pure aluminum (Al) and Al7075 powders were consolidated using conventional press and sintering (P + S) and spark plasma sinter (SPS) processes. Through P + S, Al and Al7075 underwent solid, liquid, and transient liquid phase densification in a controlled ultra-high purity nitrogen atmosphere. Consolidation using P + S processing to full density proved challenging due to powder particle surface oxide layers impeding solid and liquid phase densification. Alternatively, SPS is purported to upset powder surface oxide layers allowing for interparticle diffusion and densification well below the melting temperature. Through the sintering processes the goal is to increase the green density of the Al and Al7075 samples to near theoretical density. The P + S samples showed a decrease in sinter density compared to green density and the SPS'ed samples experienced an increase in sintered density. Spark Plasma Sintering (SPS) shows the ability to overcome the particle surface oxide layer allowing for the consolidation of loose Al and Al7075 powder to near theoretical density. Results presented here compare P + S and SPS on full density consolidation of Al and Al Alloy Powders and mechanical properties.

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Plant based bioremediation assay of gasoline contaminated soil

Brandon Foran
Molecular and cellular biology
Advisor: Dr. Micheal Davis

(the title you wrote yesterday is fine) Our lab has been developing protocols for microbial bioremediation of gasoline contaminated soil. Our methods utilize bacteria from our large collection of soil isolates which grow (reproduce) when provided with gasoline as the sole source of carbon and energy. Our assay for bioremediation relies on cultivation of plants in the presence and absence of gasoline contamination, with and without addition of gasoline-catabolizing bacteria. At this point, we are limited by two issues with our assay: the (slow) speed at which the plants grow to a size that reveals phenotypes sensitive to gasoline, and the germination rate of the seeds we're using. We started with Wisconsin FastPlants, which, though expensive, had high germination rates. Their growth rate was adequate but required two weeks for results. We recently investigated several strains of radishes (Raphanus sativus) and identified a few that grew faster, but had problematic germination rates. Recently we acquired an heirloom strain (De 18 Jours, Baker Creek Heirloom Seeds) which combined rapid growth with high germination. The effects of gasoline on growth of these plants and the bioremediation carried out by gasoline-catabolizing bacteria are being evaluated and will be presented.

A Multicultural Redesign of a Physics Unit: Energy, Inequality, and Natural Disasters

Renae Conneran
Phyiscs
Advisor: Dr. Jacob Werblow

This project redesigns a high school physics unit on natural disasters using a multicultural framework. The original unit centers on the idea that natural disasters result from the long-term build-up and storage of energy that is released rapidly through Earth's systems. Students investigate how energy is transferred through tectonic activity, water systems, and solar-driven weather processes. he redesigned unit maintains its focus on energy transformations and Earth systems while expanding to examine how natural disasters impact communities differently based on geography, infrastructure, and access to resources. This redesign deepens student understanding by connecting core physics concepts to real-world human experiences, supporting both scientific literacy and the development of critical awareness and agency.

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How does light scattering affect laser measurements for atmospheric studies and its impact on climate change?

Steve Hoyos
Physics
Advisor: Dr. Nimmi Sharma

Aerosol scattering phase functions show how aerosols scatter light in different directions at a particular location. They play a vital role in atmospheric studies and in Camera Lidar studies for computing Aerosol Extinction profiles and Aerosol Optical Depth (AOD). Calculating extinction profiles and AOD indicates to what extent aerosols are present in the atmosphere. The novel bistatic CCD Camera Lidar (CLidar) system provides for a cost-effective method for locally computing aerosol extinction at lower altitudes. Camera Lidar transmits a laser beam into the atmosphere and measures the side scatter returned off air molecules and aerosols at a scattering angle that varies with altitude. Converting this measurement to the traditional aerosol extinction measurement requires assumption of an aerosol phase function. A sensitivity study was conducted to illuminate the variation in retrieved aerosol extinction from camera lidar data when different phase functions were assumed. Results will allow for improvement in future work.

Optimizing the Electro-Optics of Polymer Dispersed Liquid Crystals for Smart Window Applications

Arden Chiucarello
Physics
Advisor: Dr. Yuriy Garbovskiy

Polymer-dispersed liquid crystal (PDLC) films have garnered recognition for their numerous applications, including privacy windows, light shutters, flexible displays, and sensors, to name a few. PDLCs have demonstrated their capabilities for smart window applications by providing dynamic control of light allowed to enter a room, thereby regulating privacy. The light scattering properties of PDLCs can be controlled via an applied electric field. This allows for PDLC films to transition between transparent and opaque states. Though research in PDLCs is long-standing, it is imperative to optimize the parameters that affect PDLC electro-optical performance. This presentation reports the spectrally-dependent electro-optics of PDLC samples of varying thickness. The presented results offer new insights into the optimization of electro-optical performance of privacy windows made of PDLC.

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Low-Cost Simultaneous Stellar Photometry and CLiDAR for Nighttime AOD Measurement: Langley-Plot Validation of a Multi-Modal Framework

Tess Masi
Physics, Compiuter Science
Advisor: Dr. Nimmi Sharma

Quantifying aerosol optical depth (AOD) remains critical for air quality, climate studies, and event monitoring. Conventional approaches employ unimodal instruments with high costs and limited nighttime measurement capability. To address this limitation, a novel, cost-effective dual-measurement system is presented: simultaneous passive stellar photometry and side-scatter detection via Camera LiDAR (CLiDAR). This approach enables direct cross-validation of independent AOD retrievals from the same atmospheric column at the same moment. The stellar photometry module uses CCD imagery to measure stellar intensities via box-method photometry. Intensities are converted to magnitudes through two-star calibration using catalog reference magnitudes, accounting for lens transmission curve and CCD quantum efficiency. Observations throughout the night, as stellar altitude changes, enable Langley-plot analysis, which consists of plotting observed magnitude versus air mass to isolate atmospheric extinction, which allows for AOD calculation. The CLiDAR module transmits synchronized laser pulses at 532 nm. Side-scattered photons are detected via CCD at a specified scattering angle, enabling AOD estimation from laser extinction through application of aerosol phase functions. The simultaneous dual measurements provide direct cross-validation of stellar versus laser AOD. The low total cost of this system gives potential for widespread deployment in networks, and long-term monitoring campaigns.

Bridging the Gap Between Natural Language and Machine-Readable Workflows: A Large Language Model-Based Approach

Tess Masi
Physics, Computer Science
Advisor: Dr. Haoyu Wang

Industrial and operational workflows are typically documented using informal natural language descriptions, yet converting these descriptions into machine-readable formats remains a time-consuming and error-prone manual process. This project explores the design and development of a Natural Language Workflow Parser (NLWP), a system that leverages Large Language Models (LLMs) to automatically transform plain English workflow descriptions into structured JSON flowchart format suitable for implementation in external programs. Our system architecture consists of four primary components: a command-line user interface for input capture, a formally defined JSON schema for workflow representation, an LLM interaction pipeline with prompts engineered for specific models accounting for model size and token limits to optimize results, and a validation layer that ensures output correctness. The JSON schema represents workflows as directed graphs containing nodes (start/end points, processes, and decision points) and edges, enabling representation of control flow constructs including sequences, conditionals, and loops. Key challenges addressed in this work include managing the probabilistic nature of LLM outputs to achieve reliable, consistent results from repeated inputs and validating generated JSON against the defined schema.

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The World of Skateboarding

Sam Green
Political Science
Advisor: Dr. Dr Diana Cohen

I dove into the world of skateboarding to get a better understanding of what power looks like in this community and how others view it. Two lenses that I focused on were age and economic class. To accomplish this, I performed three in-depth interviews with participants who identify as "younger" and "older" skaters. I wanted to get a sense of who these individuals are and the impact this sport has on them. I did so by asking them questions that focused on specific areas. These areas include personal connections with friends and family, age and power, economic class and power, and a reflection section. My finding consisted of three major themes. The first theme is community. In this community, there are a lot of small friend groups or "cliques". These friendships are a key component of community and how these individuals identify "self". The second theme that emerged was age can impact the involvement level of people. Age plays factor in the amount of access and time someone can spend. The third theme that emerged was economic class can impact people's access to this sport, but it does not influence their sense of belonging. I concluded that the power dynamic in skateboarding comes from the community within. It comes from the connections that people build, their lived experiences and their backgrounds. Through my interviews and observations, I was able to learn that age and economic class can play factors in the power structure of the community but are not the sole factors.

Adverse Childhood Experiences and Perception of Functioning.

Malaysia Rodriguez
Psychological Science
Advisor: Dr. Helena Swanson

Do adverse childhood experiences (ACE) cause individuals to underestimate their abilities even if they are performing well? A sample of undergraduate students at Central Connecticut State University was gathered to participate in the current study. Participants completed multiple surveys including a self-concept scale (Falkowski & Falk 1983), a self-perception measure (Gordon 2017), and a self-report measure of cognitive abilities (Jacobs et al., 2014). They also completed a perceived academic ability scale (Meagher 2012), a perceived academic performance scale (Verner-Filion & Vallerand 2016) and lastly, an adverse child experience questionnaire (Felitti et al., 1998). Participants were also asked to report both their perceived and actual Grade Point Average. The current study findings suggest a correlation between ACEs and academic performance. However, there is no correlation between ACEs, cognitive functioning, self-perception, or the prediction of underestimating cognitive functioning. Together, results indicate ACEs may influence how individuals evaluate their academic abilities but may not affect other aspects of self-evaluation or cognitive self-assessment. The discussion highlights how the study results differ in some ways from previous research and points out important limitations, including the small sample size and limited measurements. The study results highlight the role of ACEs in self-evaluation while identifying other areas for further research.

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Collaborative Learning Practices-Benefits and Drawbacks in the Secondary School Setting

Daniel Lenois

I plan to analyze and represent my observational field experience conducted under my project mentor's supervision, expanding upon the written research I've already written for my fieldwork-related coursework. My focus will be on the subject of collaborative learning practices within the content area. (English/Language Arts), encompassing both my own observations and data gathered from my host teacher and the host school I am serving under, being Southington High School.

Differences in Nonromantic Relationship Satisfaction Across Cultural Worldview

Jonathan Tulier
Psychological Sciences
Advisor: Dr. Wallace

Strong friendships and family relations are associated with greater life satisfaction (Kaufman et al., 2022; Yunong, 2012). Value of such relationships differs across collectivistic and individualistic worldviews (Bell et al., 1990). These values influence behaviors toward social relationships (Bell et al., 1990). This study sought to examine collectivistic (Afrocentric) versus individualistic (Eurocentric) cultural worldviews as predictors for nonromantic relationship satisfaction closeness. 1092 adults representing multiple races and genders were included in a survey-based study on social relationships. Participants completed measures of Afrocentric and Eurocentric cultural worldviews and satisfaction with non-romantic relationships. The results of multiple linear regression analyses indicate that expressing emotions in an Afrocentric manner positively predicted satisfaction with the amount of socialization among nonromantic relationships ($\beta = .218$, $p < .001$) and closeness with nonromantic others ($\beta = .213$, $p < .001$). Moreover, expressing emotions in a Eurocentric manner was negatively associated with feelings of closeness with nonromantic others ($\beta = -.133$, $p < .001$). Taken together, these findings suggest expression of Afrocentric values correspond with higher satisfaction of nonromantic relationship socialization and closeness, while expression of Eurocentric values correspond with lower feelings of closeness with nonromantic others.

TBD

A'ya Modni
Secondary Education/History
Advisor: Dr. Jacob Werblow

TBD

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Design and Fabrication of a Pulley-Drive Power Transmission System for Abrasive Disc Deburring

Jacob McCann
Robotics and Mechatronics Engineering
Advisor: Dr. Haoyu Wang

This project presents the design and fabrication of a pulley-drive power transmission system coupling a closed-loop control servo motor to an abrasive disc for part deburring and polishing. A three-member team evaluated multiple transmission concepts before selecting a belt-driven pulley system as the optimal solution, balancing performance, cost, and manufacturability. A primary design consideration was vibration isolation. The flexible belt drive mechanically decouples the motor from high-frequency vibrations inherent to abrasive operations, protecting motor components and extending service life. The design also features interchangeable shaft couplers to accommodate multiple input and output shaft diameters, allowing adaptation to varying motor and tooling specifications. Robustness and reliability were central to component selection, ensuring consistent performance under cyclical loading. Cost reduction was achieved through deliberate material choices and simplified geometries that minimize waste and machining time. The modular assembly is straightforward to manufacture using conventional processes and reduces both build time and maintenance effort. The fabricated system demonstrates that a well-engineered belt-drive transmission can meet the mechanical demands of abrasive disc applications while remaining practical and cost-effective, highlighting the value of systematic design decision-making in industrial tooling contexts.

A Multi-cultural and Constructivist Approach to "The Plastic Problem" and C02 emissions Unit

Lilli West
BSED, Bachelor of Science in Education
Advisor: Dr. Jacob Werblow

In Middle School, Seventh Grade, Students are expected to understand how our bodies produce and omit C02. Throughout this unit, students will be reading and listening to sources on the world's plastic problem and C02 emissions. The students will make a poster, flyer, or news caster segment on this issue and process. This unit holds the utmost importance as our world faces the uncertainty of global warming, but neglects an important aspect. In our presentation, we will utilize critical constructivism and multi-cultural practices/languages to enhance this unit to make it more applicable and enriching to the students' world knowledge and understanding. Most students do not understand the serious impact plastics and trash has on the daily lives of people in coastal developing nations. Changing the sources provided to highlight this impact and the negative impacts of C02 instead of the cycles ensures students understand the severity of the problem. By sharing these struggles and highlighting the importance of change students will utilize an open academic creative assignment to encourage world change and educate others on the life cycle of C02. Opening this dialog about plastic pollution may spark personal experiences to be shared and utilized during this unit, strengthening their connection and recall of this unit in the future. (Emma Boothby & Lillian West)

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From Observation to Instruction: Finding My Identity as an Educator

Madison Callis
Secondary Education concentrating in English
Advisor: Dr. Jacob Werblow

This presentation examines the critical role of observation in shaping my emerging identity as an educator during my fieldwork experience. While teaching placements are often associated with active instruction, my experience has been largely grounded in sustained, intentional observation. Rather than viewing this as a limitation, I argue that observation serves as a foundational and necessary stage in the development of effective teaching practice. Through close attention to classroom interactions, instructional strategies, and student behaviors, I have developed a deeper understanding of the complexities of teaching that are often overlooked in theoretical discussions. Observing how students respond to different teaching styles, classroom management techniques, and lesson structures has allowed me to critically evaluate what fosters engagement, inclusivity, and learning. These moments of observation have also encouraged me to reflect on my own assumptions about teaching—challenging idealized notions and replacing them with more nuanced, experience-based insights. Ultimately, I argue that observation is not separate from teaching but integral to it. It provides the space to critically engage with pedagogy before enacting it, allowing for a more intentional and reflective transition into instruction. This experience demonstrates that learning to teach begins not at the front of the classroom, but in the act of closely and thoughtfully watching it.

Western Expansion: Connecting Students to the Past

Julia Serafin
Secondary Education Social Studies
Advisor: Dr. Jacob Werblow

The Westward Expansion time period in a grade 9 United States history class is usually briefly mentioned compared to the other surrounding events, despite being an integral part of United States history setting up US culture, ideals and economics. The goal of this project is to show a sample unit plan that would encourage students to learn about this important part of history and engage them. The main idea is to connect this lesson with race, ethnicity and gender providing students with new perspectives and ideas on how people were affected in these changes. It will contain sample lesson plans, presentations for the lecture coinciding with the unit, a formative for each lesson and one summative assessment to finish off the unit, activities for in class work. It will also include primary sources from a diverse group of people and connections to other parts of US history. The unit plan will use different sources of technology and techniques from EDT 315 to help support SPED 315 and EDTE 316 principles.

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Language, Identity, and Belonging: Deaf Children from Deaf vs. Hearing Families

Jasper Kulinski
Secondary English Education
Advisor: Dr. Jacob Werblow

Have you ever wondered how being raised in a Deaf family vs. a hearing family affects a Deaf child's language development, academic success, and identity and sense of belonging? Deaf children raised in Deaf families often experience stronger early language development and cultural identity due to immediate access to sign language, while Deaf children in hearing families may face language delays and identity challenges, especially without early sign exposure. In this research project, I will be covering the topics of early language access and language deprivation, identity and belonging, and connections to education models while analyzing both perspectives of Deaf children from Deaf families and Deaf children from hearing families. I plan on conducting research in partnership with the American School for the Deaf in West Hartford, and potentially other Deaf schools in other states. I will be using a poster to display my research and to show off two parallel artistic pieces showing the lived experiences of both groups.

Western Exansion: Lesson to make Students Care

Julia Serafin
Social Studies Secondary Education
Advisor: Dr. Werblow

The Westward Expansion time period in 6-12 grade United State history classes is usually briefly mentioned compared to the other surrounding events, despite being an integral part of United States history setting up US culture, ideals and economics. The goal of this project is to show a sample unit plan that would encourage students to learn about this important part of history and engage them. The main idea is to connect this lesson with race, ethnicity and gender providing students with new perspectives and ideas on how people were affected in these changes. It will contain two sample lesson plans, two presentations, two formative and one summative assessment, activities for during class and various engagement forms. It will also include primary sources and connections to other parts of US history.The unit plan will use different sources of technology and techniques to help support UDL expectations and EDTE 316 teaching methods.

Writing Centers And The Gender Imbalance

Rosie LaRochelle
Strategic Communications
Advisor: Dr. Amanda Fields

Writing Centers are a consistently female-dominated space on campuses, both among tutors and their clients. This Personal Edification Project investigates some of the possible causes behind this pattern, demonstrating how my initial assumptions evolved through the research process, my questions about the imbalance, and my overall findings. This project aims to speak about gender stereotypes in academia and the culture amongst academic support.