32nd Annual Blue Ridge Undergraduate Research Conference

Hosted by Ferrum College

Friday, April 3, 2026

About

The 32nd Annual Blue Ridge Undergraduate Research Conference will be hosted by Ferrum College on April 3, 2026, beginning at 10:00 AM. Undergraduate students from colleges and universities across the Southern Appalachian region are invited to present their research in a collegial and engaging setting among fellow scholars and faculty mentors. The one-day event will feature oral presentations, poster sessions, and a closing reception for all participants and guests.

Originally established as the Southeastern Undergraduate Research Conference, the Blue Ridge Undergraduate Research Conference (BRURC) has a long tradition of providing an accessible and encouraging forum for undergraduate scholarship. Many of the participating institutions are members of the Appalachian College Association (ACA)—a consortium of 33 private liberal arts colleges located throughout Georgia, Kentucky, North Carolina, Tennessee, Virginia, and West Virginia. While the conference often rotates among ACA member schools, BRURC welcomes submissions from undergraduate researchers from all institutions.

The 2026 conference at Ferrum College continues this proud legacy, offering students an opportunity to share their scholarly work, strengthen their presentation skills, and build meaningful academic connections across disciplines.

Presentation Format and Guidelines

Presentation sessions at the 32nd Annual Blue Ridge Undergraduate Research Conference will be grouped by discipline, allowing students to share their work among peers with related academic interests. Each presentation type provides an opportunity to develop professional communication skills, gain feedback, and engage with faculty and students from across the Southern Appalachian region.

32nd Annual Blue Ridge Undergraduate Research Conference

Conference Schedule-at-a-Glance

Friday, April 3, 2026

10:00-10:30 AM	Registration and Check-in (Poster presenters set up posters in Blue Ridge Mountain Room) Light refreshments available	*Franklin Hall Atrium*
10:30-10:45 AM	Welcome and Opening Remarks	*Blue Ridge Mountain Room*
10:45-11:30 AM	Keynote Presentation **Undergraduate Research as an Opportunity, not a Destination** Caitlin Blaukovitch ’20, D.O. and Jacob Blaukovitch ’21, M.A.	*Blue Ridge Mountain Room*
11:30-11:45 AM	Break	
11:45-12:45 PM	Poster Session	*Blue Ridge Mountain Room*
12:45-1:45 PM	Lunch	*Franklin Hall Cafeteria*
1:45-3:15 PM	Concurrent Sessions – Oral Presentations	
	Biology	*Stanley Library Room 201*
	Molecular Biology, Chemistry, and Physics	*Stanley Library Room 203*
	Humanities and Social Sciences	*Stanley Library Room 204*
	Humanities and Social Sciences	*Stanley Library Room 205*
3:15-3:30 PM	Break	
3:30-4:30 PM	Closing Presentation Awards and Closing Remarks	*Blue Ridge Mountain Room*

32nd Annual Blue Ridge Undergraduate Research Conference

Keynote presentation

Caitlin Blaukovitch ’20, D.O. and Jacob Blaukovitch ’21, M.A.

Undergraduate Research as an Opportunity, not a Destination

Undergraduate researchers are often encouraged to identify a “dream project” early in their research careers. However, most successful research careers are built not on a single grand idea, but through mentorship and intentional skill development. This talk showcases undergraduate research as an opportunity to acquire new tools, rather than as a final destination. We will explore how early research experiences, whether highly aligned with long-term interests or not, provide essential skills, conceptual frameworks, and professional habits that will help lead to success. Attendees will learn practical strategies for choosing feasible projects, working effectively with mentors, and leveraging every opportunity to build a versatile research toolbox that supports their long-term goals.

Caitlin Blaukovitch

Caitlin graduated from Ferrum College in 2020 with a B.S. in Pre-Professional Health Sciences: Pre-Med and a B.S. in Chemistry & Biology. She then obtained her Doctorate of Osteopathic Medicine from Liberty University College of Osteopathic Medicine in 2025. She is now an emergency medicine resident at LewisGale Medical Center in Salem, Virginia. She married Jacob Blaukovitch in 2022, added their firstborn son, Oscar Mayer, in 2023, their first human son, Sammy, in April 2025, and they are expecting a daughter in August 2026.

Jacob Blaukovitch

Jacob graduated from Ferrum College in 2021 with a B.S. in Biology, a B.S. in Chemistry, and a B.S. in Pre-Professional Health Sciences: Pre-Med with a minor in One Health. Following this, he went on to graduate with a M.A. in Medical Science: Molecular Medicine in 2022. Currently, he is a Ph.D. Candidate in Translational Biology, Medicine, & Health at Virginia Tech working with Dr. Nicholas Rider, D.O., in the Computational Human Immunology Lab & Innovation Hub (CHILI). His dissertation work focuses on understanding the impact of rurality on Primary Immune Disorders using a mixed methods approach.

Poster presentations

30. Cuticle Stiffening as a Possible Defense Against Parasitoid Wasps in Drosophila
Karli Craighead, Hollins University (Fourth Year Undergraduate)

The correct recognition and response to environmental threats is critical for organismal survival. In nature, parasitoid wasps pose a significant threat to vinegar flies (Drosophila spp.). Female parasitoid wasps oviposit their eggs into fly hosts, and once the offspring hatches, the developing wasp eventually consumes the fly from the inside out. Flies have evolved numerous immunological and behavioral mechanisms to protect themselves, but the study of their possible physiological defense mechanisms have remained largely unexplored. In this study, I assayed various fly hosts for their ability to enhance their cuticle for protection against a wasp attack. A low-cost penetrometer assay was developed to determine the force required to pierce the fly cuticle with a fine metal pin, which mimics the wasp ovipositor. D. melanogaster and closely related species showed a trend of enhancing their cuticle stiffness when exposed to wasps. Additionally, flies had a higher survival rate when given advanced warning of an imminent wasp attack. These data suggest the possibility of a third defensive mechanism flies use to protect themselves, particularly at a vulnerable stage of their life cycle.

35. Fecal Cortisol as a Measure of Stress in Rehabilitating Bats
Gianni McGlasson, Johnson University (Fourth Year Undergraduate)

Wildlife Rehabilitation's (rehab) goal is to help injured or orphaned animals return to the wild. Rehab is increasingly positioned as a potential conservation tool that can maintain population numbers in vulnerable or declining species; however, reproductive potential in bats requires stress levels to remain low through the rehab process. This study seeks to analyze stress physiology data utilizing the fecal glucocorticoid metabolite (FGM) cortisol, offering quantifiable data on how bats respond to captivity and release. Fecal material was collected from six species of wild bats while in rehabilitation. A total of 60 fecal specimens were processed and analyzed for cortisol in duplicate using an ELISA assay. Three cameras were utilized for six weeks within the rehab facility to examine a variety of cage types from solo to collaborative bat occupancy. Behavior was indexed to indicate calm repositioning to high arousal, as we attempt to create a practical guide for rehabilitators to identify suboptimal conditions. Preliminary data indicates no significant difference in average cortisol between species. Initial patterns indicate that cortisol levels are high at admission to rehab, but gradually decline over time, with isolated increased peaks. Video analysis was used alongside the cortisol data to identify stress-indicative behaviors that also reflect these fluctuations and peaks. Based on the data, cortisol levels in bats receiving rehab declined over time, and arousal events are capturable using an FGM assay. Together, this study confirms fecal cortisol levels as a noninvasive measure of bat stress in rehab that could be employed for further study.

37. Biodiversity and Diet Patterns in Bird Communities in Ecuador
Holly Hylton, Fin Bolt, and Gracyn Herbst Hollins University (Fourth Year Undergraduate)

The current biodiversity crisis is of great concern, particularly to bird species in temperate and tropical areas. We examined avian biodiversity patterns in Ecuador, one of the most bird biodiverse countries in the world (1650+ species). In January 2026, birds were surveyed (visual and auditory) for 30 minutes on consecutive days in 4 different locations that differed in the degree of human development. As expected, species richness was much higher in undisturbed locations than urban locations. In addition, our comparison of dietary patterns between sites showed a much higher proportion of frugivorous and insectivorous species in areas with less human disturbance which is suggestive that these important resources decline with human alteration of habitat. Further, in areas with high levels of frugivory, more "gulper" than "masher" species were detected, which potentially bodes well for seed dispersal, a critical

forest ecosystem service. Given the limitations of time and resources, we only noted the presence of species, not population number. We hope that future surveys at these sites will allow us to detect changes in species composition in relationship to future development and climate change.

41. Impacts of human disturbance on moth populations in the Ecuador

Gianna Jones, Abby Miller, Esther Frederickson, Grace Glerum, Sabrina Gubbels-Wingo, Hollins University (Second Year Undergraduate)

Habitat disturbance in the temperate zone has been shown to negatively impact moth biodiversity and population size through a reduction in moth food resources and light pollution. Our study sought to understand how human activity impacts moth population numbers and diversity (# unique taxa) in the tropics. Specifically, we sampled moth population and diversity through the use of light traps on two different nights in a disturbed habitat (Mera township, Ecuador) and on two nights at a nearby ecolodge situated in dense tropical forest. Fewer moths were observed during trapping sessions in the township and many fewer distinct taxa were noted when compared to samples from the tropical forest. Further, we found that the foggy conditions on our second day of sampling in the tropical forest increased the attractiveness of our trap but did not seem to have the same impact in the township samples. Our study revealed that habitat disturbance is detrimental to moth biodiversity and population in the tropics and highlights the often hidden impacts of human activity on the ecosystem.

42. Patterns of Moth Diversity in relationship to human disturbance and forest type

Gianna Jones, Abby Miller, Esther Frederickson, Grace Glerum, Sabrina Gubbels-Wingo, Hollins University (Second Year Undergraduate)

Moths play a vital role in the health of tropical ecosystems, acting as important pollinators and food resources for a variety of species. Unfortunately, human habitat disturbance has been associated with declines in moth population and diversity. To explore the impacts of habitat disturbance on taxonomic diversity in the tropics we sampled moth populations at two different locations in the Pastaza Province (Mera township and an undisturbed forest at Tamandua ecolodge). Though small in population (<1000), Mera has light pollution, small scale agriculture and habitat loss which were not present in the dense forest surrounding the ecolodge. We found higher population number and moth diversity (at the Family level) in samples from the tropical forest habitat when compared to the township samples. Surprisingly, similar samples in a temperate forest (Botetourt County, Va, USA) with little light pollution had the lowest Family level diversity and population number. This study highlights the importance of moths in tropical ecosystems and suggests that even modest levels of disturbance can have large impacts on moth biodiversity.

51. Synthetic Biology Approaches to Nitrogen Fixation in Cereal Crops: Engineering Microbial Consortia for U.S. Agricultural Input Cost Reduction and Environmental Sustainability

Racheal Awintiti Braimah, University for Development Studies (Fourth Year Undergraduate)

Nitrogen fertilizer represents 40-50% of variable crop production costs while contributing substantially to greenhouse gas emissions and water pollution. U.S. agriculture consumes 12 million metric tons of synthetic nitrogen annually at costs exceeding $7 billion, with significant environmental externalities including Gulf of Mexico hypoxia and nitrous oxide emissions. Engineering biological nitrogen fixation into cereal crops offers transformative potential for farm profitability and sustainability—both USDA 2026 priorities.

We developed synthetic microbial consortia combining diazotrophic bacteria, rhizosphere engineering organisms, and plant growth-promoting fungi to establish functional nitrogen-fixing symbioses in wheat, maize, and rice. Advanced metabolic modeling optimized electron distribution,

oxygen management, and carbon allocation to achieve fixation rates of 45-68 kg N ha^{-1}, replacing 30-45% of synthetic fertilizer requirements.

Multi-site field trials across wheat-producing regions (Kansas, Montana, North Dakota) demonstrated grain yields equivalent to conventional fertilization at 35% reduced nitrogen input costs. Environmental benefits included 52% reduction in nitrate leaching and 41% decrease in greenhouse gas emissions per unit grain produced. Microbial persistence studies confirmed consortium stability across growing seasons without repeated inoculation.

Techno-economic analyses project technology adoption could reduce U.S. agricultural nitrogen expenditures by $2.1-$3.4 billion annually while mitigating environmental damages valued at $950 million per year. Intellectual property strategies and commercialization partnerships position this innovation for rapid deployment. These outcomes address economic pressures facing American producers while advancing national climate commitments and water quality objectives.

55. Effects of Wing-Patch Darkening on Mockingbird Foraging and Nestling Development
Anna Starman, Hollins University (Fourth Year Undergraduate)

Foraging efficiency may be enhanced by flashing patches of white wing and tail feathers and has been documented in several avian species. Northern Mockingbirds (Mimus polyglottos, NOMO) exhibit this "wing-flashing" (WF) behavior while foraging, during displays, and in response to predators. In NOMOs, WF has been hypothesized to increase foraging success, but previous findings are inconclusive. To further investigate the biological role(s) of WF behavior in NOMOs, the ventral surface of white primary feathers of male NOMOs were artificially darkened, and the foraging and provisioning rates of undarkened (control) males and their mates were compared. While foraging, undarkened males performed significantly more prey strikes than darkened males; however, when foraging without WF, prey strike success did not differ between darkened and undarkened males. There was no clear effect of darkening on the provisioning rate of males. Body condition (mass/tarsus3) of experimental nestlings was similar to control nestlings, but experimental nestlings had significantly lower mass and had shorter tarsus lengths compared to control nestlings. Additionally, experimental nestlings fledged significantly later than control nestlings. These findings suggest that artificial darkening of white wing patches of NOMO males may negatively impact the quality of parental care, contributing to lower mass, shorter tarsus, and a longer time to fledge for nestlings.

59. Measuring Foraging Load Size and Activity in Leaf-cutter Ants in Rural and Urban Ecuador
Natalie Tollison and Anna Starman, Hollins University (Fourth Year Undergraduate)

Leaf cutter ants are important ecosystem engineers in Neotropical forests, moving a significant amount of nutrients from the forest canopy to the soil. We were interested in understanding how time (day vs. night), weather, and level of human disturbance would impact foraging activity in leaf-cutter ants (Atta spp). To investigate, we sampled activity levels and leaf size in leaf-cutter ant trails in Mera (urban, N=17) and Tamandua (rural, N=27). During the daytime, ants in Mera carried significantly more leaves that were larger in size as well as more total items than did ants in Tamandua. Factors such as the level of anthropocentric disturbance and different surface gradients between urban and rural sites may have impacted the load size carried by leaf-cutter ants. Smoother surface gradients provided by sidewalks may allow for higher load sizes than more complex gradient trails in Tamandua. In Tamandua, average leaf size at night was significantly larger than average leaf size during the day. Understanding factors that impact such a critical group of organisms can provide insight on processes that might sustain tropical forest biomes and biodiversity.

25. EHR-Based Graph Neural Network Screening for Rare Genetic Disorders
Addison Varney, Milligan University (Fourth Year Undergraduate)

Rare genetic disorders (RGDs) are commonly underdiagnosed due to the lack of recognition by primary care providers and referral for a genetics evaluation. Electronic health records (EHRs) offer a promising avenue for large-scale diagnostic protocols but are limited due to unstructured clinical data. We developed an EHR-based diagnostic algorithm which uses Intelligent Medical Objects (IMO) technology and Graph Neural Networks (GNNs) to identify patients with possible RGDs. The algorithm was tested in a selected cohort of 1000 pediatric patients who underwent exome sequencing. We compared IMO algorithmic findings to data extracted from a manual chart review of these patients. Manual chart review results found a 29.8% positive diagnosis rate, that aligns with the expected clinical benchmark of 30%. In comparison to the IMO Algorithm, which found 81%. IMO presents challenges of false positives and negatives that result from outdated terminology and rare phenotypes. This approach highlights the potential of bioinformatics in enabling timely and cost-efficient diagnoses for RGDs, enhancing clinical outcomes for pediatric patients.

44. Digital Mindfulness Intervention Design for Adolescent and Young Adult Cancer Survivors
Aleena Kuriakose, Union College (Third Year Undergraduate)

Adolescent and young adult (AYA) survivors (ages 15-39) are typically siloed into a binary age classification system: “pediatric” (under 18 years old) and “adult” (over 18 years old). This obfuscates the unique needs that are tied to emerging adulthood, a developmental stage marked by changes in major life domains. Despite AYA survivors’ increased risk of poor mental health outcomes, there are few age-specific resources to support them with navigating survivorship. The use of digital health interventions (DHIs) to improve AYA survivors’ mental health has great promise, given that DHIs can increase accessibility to care and align with AYA patterns of technology use. The positive effects of such interventions, however, are moderated by engagement and adherence.

This study aimed to answer three research questions: (1) How do AYA cancer survivors manage stress in their lives?; (2) what are their experiences with mindfulness and meditation?; and (3) what features would facilitate AYA survivors’ engagement with and adherence to a mindfulness-based DHI that utilizes peer Coaching?

U.S.-based cancer survivors (ages 18-39) were recruited via Hackensack Meridian Health’s Cure and Beyond survivorship clinic and a national AYA advocacy non-profit. After screening eligibility, 19 semi-structured Zoom interviews were conducted. Transcribed interview data were analyzed using deductive thematic coding. The authors developed a list of codes based on concepts from the supportive accountability model and data was analyzed using this codebook. The authors then independently reviewed and grouped the codes and met to generate initial themes. Preliminary findings, conclusions, and implications will be presented.

58. Spatial and Temporal Patterns of Riverine Nitrogen:Phosphorus Ratios in the United States
Siqi Yu and Yifei Cui, Franklin and Marshall College (Second Year Undergraduate)

Rivers transport nitrogen (N) and phosphorus (P) from terrestrial landscapes to downstream ecosystems, directly influencing water quality and biogeochemical cycles. Excess and imbalanced nutrient inputs have become a major driver of eutrophication across the continental United States (CONUS). The molar N:P ratio provides a useful indicator of nutrient limitation and anthropogenic influence, yet large-scale spatial and temporal patterns of riverine N:P ratios remain insufficiently understood. This study investigates (1) how riverine N:P ratios vary across space and time in CONUS, and (2) which hydrological, climatic, and watershed factors explain this variability.

The project integrates large-sample datasets, including nutrient concentration records from the USGS National Water Information System (NWIS) and EPA Water Quality Portal (WQP), watershed nutrient input estimates from gTREND-N and gTREND-P, and river attributes from NHDPlus V2. Water-quality signatures will be calculated, including mean concentrations, Mann–Kendall trends, concentration–discharge relationships, and seasonal variability. Observed N:P ratios will be evaluated relative to the Redfield ratio (16:1) to assess patterns of nitrogen versus phosphorus limitation across hydroclimatic regions. Long-term monitoring records from established USGS programs will further support multi-decadal analyses of stoichiometric change. By linking nutrient inputs, hydroclimate, and watershed characteristics, this study aims to provide data-driven insights into the drivers of riverine nutrient stoichiometry at the national scale.

61. Effects of Energy Drinks on Heart Rate in Academic Settings

Victoria Serrano, Siena Heights University (Fourth Year Undergraduate)

This research explores the effects of energy drinks on heart rate among students in academic settings. Energy drinks, often consumed for their stimulating effects, are widely used by students to enhance focus and combat fatigue during studying or examinations. However, the physiological impacts, particularly on heart rate, are not well documented in the context of academic environments. This study aims to assess how the consumption of energy drinks affects heart rate variability and overall cardiovascular response during cognitive tasks in students. Using a controlled experiment, participants will be administered energy drinks containing 200 mg of caffeine and other stimulants, and their heart rates will be monitored at baseline, and at 10, 20, and 30 minute intervals while they engage in academic tasks. Participants will also complete pre and post consumption surveys in which they will self report any signs of stress, increased alertness, or jitteriness. Results from previous research on energy drinks suggest that these beverages can lead to a significant increase in heart rate, with variations observed across different subgroups based on factors such as age, gender, and habitual caffeine use. The study further investigates the implications of these cardiovascular changes on academic performance, stress levels, and cognitive function. Findings aim to provide a deeper understanding of the physiological consequences of energy drink consumption in students and contribute to informed recommendations regarding their use in academic settings.

38. Wild Birds as Potential Reservoirs of Clostridioides difficile

Isabella Keener, Lincoln Memorial University (Third Year Undergraduate)

Clostridioides difficile (C. difficile) is an anaerobic, endospore-forming pathogenic bacterium found naturally in the environment. The endospores are highly resilient but can germinate and colonize within the colon of humans and many animals. Toxins produced by toxigenic strains cause C. difficile infection (CDI), symptoms of which can range from diarrhea to life-threatening conditions, such as toxic megacolon. CDI has been heavily linked to nosocomial environments, with elderly and immunocompromised individuals being the most susceptible. However, community-acquired cases have risen during the past years. Many potential reservoirs of C. difficile outside of nosocomial environments have been investigated, including farmed animals and birds. The role of wild birds as potential reservoirs of C. difficile is not well studied yet, despite their mobility contributing to dispersal across the landscape. The purpose of this study is to determine if wild birds serve as a potential reservoir for C. difficile. Swab samples will be collected from public common areas (playgrounds, picnic tables, benches) with evidence of bird feces. C. difficile will be isolated, confirmed, and tested for pathogenicity and antibiotic resistance. If wild birds are determined to be a potential reservoir, then management of public areas can be updated to include C. difficile control.

26. pH, Metal Ions, and Small-Molecule Effects on α-Synuclein Assembly

Ananya Nair, Rice University (Second Year Undergraduate)

α-synuclein (α-syn) aggregation underlies synucleinopathies, yet the physicochemical de- terminants that govern which assembly states form under defined solution conditions re- main incompletely resolved. Here, we examine how pH and metal ions reshape α-syn self-assembly. Across acidic and physiological pH conditions, α-syn populates monomeric, nano-scale oligomeric, and meso-scale aggregate states whose relative abundances evolve over time. Fluorescence microscopy reveals robust meso-scale assembly at pH 5, minimal aggregation at pH 7, and transient assemblies at pH 3, highlighting the limitations of imaging-based detection alone. Therefore, we use dynamic light scattering (DLS) to resolve broader oligomeric populations and quantify pH-dependent redistribution of assembly mass. Small-molecule modulators altered α-syn assembly in a strongly pH-de- pendent manner. Anle138b increased the abundance of oligomeric species at low pH, whereas EGCG produced divergent effects at pH 5 and pH 3. We further examined the effects of metal ions, finding that Fe3+ stabilized higher-order assemblies under acidic conditions, Cu2+ delayed assembly at pH 5 while enhancing aggregation at pH 3, and Zn3+ increased oligomerization primarily at low pH. Overall, these results demonstrate that αSyn assembly is highly sensitive to coupled effects of pH, metal chemistry, and time.

27. Rare Driver Mutations in Gastric Adenocarcinoma

Pranav Ayyappan, University of North Carolina Chapel Hill (First Year Undergraduate)

Gastric adenocarcinoma exhibits marked molecular heterogeneity across distinct subtypes, yet rare driver mutations with frequency <2% remain understudied. This study characterizes rare driver mutations and their associations with molecular subtypes, gene co-occurrence patterns, mutation burden, and clinical outcomes. Somatic mutation data from 394 gastric adenocarcinoma samples from The Cancer Genome Atlas were stratified by molecular subtype. From a curated panel of 50 cancer driver genes, rare drivers mutated in fewer than 2% of patients were identified. Pairwise co-occurrence analysis using Fisher's exact test identified significant gene interactions. Eight rare driver genes were identified: MET, MYC, CCNE1, IGF2, KLF5, GATA6, GATA4, and CCND1, collectively affecting 34 patients (8.6%). Rare drivers demonstrated striking enrichment in microsatellite instability tumors, affecting 28.8% of microsatellite instability samples compared to 2.0% of chromosomal instability samples ($p<0.0001$). Rare driver-positive samples exhibited significantly elevated mutation burden (median: 9.0 vs 2.0 mutations, $p<0.0001$), with this association persisting within the microsatellite instability subtype ($p=0.0063$), indicating rare drivers mark an ultra-hypermutated subset. Co-occurrence analysis revealed two significant interactions: MYC-GATA4 (OR=77.0, $p=0.0016$) and IGF2-CCND1 (OR=48.4, $p=0.038$). No significant survival associations were observed. Rare driver mutations exhibit molecular subtype specificity and associate with elevated mutation burden even within hypermutated subtypes. Novel gene co-occurrence patterns suggest cooperative mechanisms. Comprehensive molecular profiling beyond common drivers may identify subtype-specific therapeutic vulnerabilities in gastric cancer.

32. Non-Nutritive Sweeteners and Lipid Accumulation in C. elegans

Clay Sherfey, King University (Second Year Undergraduate)

Obesity and type 2 diabetes are metabolic disorders that are becoming increasingly prevalent worldwide. These diseases are associated with excess caloric intake, particularly the overconsumption of processed sugars. To address this issue, public health organizations introduced non-nutritive sweeteners as alternatives to reduce sugar intake. Despite their widespread integration, the prevalence of metabolic disorders such as obesity and type 2 diabetes has continued to rise. Researchers are now investigating whether NNS may influence metabolic pathways beyond simple caloric replacement.

The metabolic effects of NNS remain poorly understood. This study investigates how NNS influence lipid accumulation and triglyceride/protein composition in the model organism Caenorhabditis elegans. Due to their genetic homology with humans and conserved metabolic pathways, C. elegans serves as an effective model for metabolic research.

Wild-type N2 C. elegans were exposed to aqueous sweetener solutions for 24 hours. Treatment groups included dH_2O and glucose as controls; stevia, monk fruit, and allulose as natural sweeteners; Sweet'N Low and Equal as artificial sweeteners; and erythritol and xylitol as sugar alcohols. After exposure, nematodes were transferred to plates seeded with E. coli for 24 hours to allow lipid accumulation. Lipid content was quantified using Oil Red O staining and imaging analysis to estimate lipid levels. Each group was compared to control groups to assess metabolic effects.

Previous results from this project showed that Sweet'N Low was the only treatment with a significant increase in lipid accumulation. This study further investigates sugar alcohols to determine whether they similarly influence metabolic outcomes.

45. AI-Assisted Engineering of Soluble Mammalian Glycosyltransferase Expression in E. coli

Leo Lin, Georgia Institute of Technology (Fourth Year Undergraduate)

The heterologous expression of mammalian glycosyltransferases in Escherichia coli is notoriously challenging, frequently resulting in insolubility and low yields despite the use of solubility tags or engineered host strains. This bottleneck has significantly restricted their utility in the chemoenzymatic synthesis of glycoconjugates. In this study, we leveraged the deep learning–based design framework, ProteinMPNN, to engineer porcine ST3Gal1 for enhanced expression in E. coli. Structural constraints were applied to residues within 10 Å of the catalytic center, while approximately one-third of the remaining sequence space was redesigned.

Of the ten top-scoring variants selected for experimental validation, nine demonstrated markedly improved solubility (4.3–36.2%), with four achieving expression yields of ~10 mg/L. Activity assays using Gal-β1,3-GalNAc-α-Thr-Fmoc as an acceptor substrate confirmed significant catalytic activity in five mutants. Notably, Mutant-9 exhibited a 1.5-fold increase in activity compared to wild-type pST3Gal1. To demonstrate practical utility, Mutant-9 was employed in a gram-scale synthesis, converting 1.1 g of Core1-O-glycan with a 94% yield within 2 hours using only 10 mg of purified enzyme. These findings establish the feasibility of generating soluble, active mammalian glycosyltransferases in E. coli and highlight the transformative potential of AI-assisted protein engineering for chemoenzymatic applications.

47. Non-Nutritive Sweeteners, Mitochondrial Function, and Lipid Metabolism in C. elegans

Magdalyn Worley, King University (Second Year Undergraduate)

Obesity is an epidemic taking over the world, especially in the United States. There are many different factors that can contribute to obesity, though excessive caloric intake is a common factor. Non-nutritive sweeteners (NNS) have been promoted as sugar alternatives to help combat the rise of obesity by decreasing caloric intake. However, these NNS might be contributing to the very disease they were made to prevent. Nutrition and diet studies are notoriously difficult, so we use the model organism Caenorhabditis elegans. Though simple, C. elegans have a high homology with human metabolic processes, and their simple digestive system, clear cuticle and short lifespan make them ideal. Previous research in the King Toxicology lab has shown that exposing C. elegans to the NNS Sweet N' Low leads to increased lipid accumulation.

The goal of this research is to investigate how NNS leads to the disruption of lipid metabolism. As lipid synthesis and accumulation is regulated by energy balance, we will start by looking at the function of the mitochondria, the organelle that control the energy balance of cells. As with previous work

synchronized C. elegans will be acutely exposed to NNS, then transferred to media with a food source (OP50 E. coli). Oil Red O lipophilic stain will be used to measure the lipid accumulation and mitochondrial function will be tested with the Tetramethylrhodamine ethyl ester (TMRE) and Promega Mitochondrial ToxGlo™ assays. By combining these assays, a relation between the function of the mitochondria and lipid accumulation can be made.

48. Expansion Microscopy for Three-Dimensional Visualization of Polytene Chromosomes
Margaret Booth, Sweet Briar College (Fourth Year Undergraduate)

Polytene chromosomes of Drosophila melanogaster have served as a foundational model for understanding chromosome structure, gene regulation, and nuclear organization due to their large size, distinctive banding patterns. However, traditional squash preparations provide only two-dimensional representations that often distort native nuclear architecture. The goal of this study is to modernize the visualization of polytene chromosomes, building off the research done by Hochstrasscher et al., by integrating expansion microscopy. We would execute this by using volumetric imaging and computational reconstruction to generate high-resolution three-dimensional models of chromosome organisation within intact nuclei.

In this project, third-instar larval salivary glands were dissected, fixed, and processed using expansion microscopy. Expanded glands will be imaged using confocal optical sectioning. This will produce detailed z-stacks of entire nuclei while maintaining spatial continuity and minimizing mechanical distortion.

Three-dimensional image datasets will be taken and analyzed using open-source image processing software. We expect that results will demonstrate that expansion microscopy preserves aceto-orcein–defined banding patterns and maintains large-scale chromosomal architecture, enabling clear visualization of chromosome territories and their spatial trajectories. Our goal is to continue developing a reproducible and accessible workflow for high-resolution three-dimensional reconstruction of polytene chromosomes. The resulting models will provide both scientific and educational value, offering an enhanced structure for visualizing nuclear organization in three dimensions.

50. Expression Screening of PIGL/Gpi12 Homologs for GPI Anchor Biosynthesis Studies
Prashansa Sharma, University of Georgia (Third Year Undergraduate)

Glycosylphosphatidylinositol (GPI) anchors are glycolipids that attach many proteins to the surface of eukaryotic cells. Disruption of GPI anchor synthesis affects both human health and parasite survival, making this pathway important to study.

Phosphatidylinositol glycan anchor biosynthesis class L (PIGL, or Gpi12 in parasites) is a conserved membrane enzyme that catalyzes the deacetylations of N-acetylglucosaminyl phosphatidylinositol (GlcNAc-PI) at the cytoplasmic side of the Endoplasmic Reticulum (ER) membrane. Despite its biological importance, full-length PIGL remains difficult to study due to the challenges associated with purifying integral membrane enzymes.

We performed an expression screening using different homologs of PIGL including Homo Sapiens, Plasmodium falciparum and Trypanosoma brucei. PIGL (Gpi12) homologs were expressed as fusion proteins carrying a Yellow Fluorescence Protein (YFP) fused to their C-terminus, extracted from membranes using detergents and analyzed by fluorescence size exclusion chromatography (FSEC) and in-gel fluorescence electrophoresis.

Among these homologs, the parasite proteins showed the most favorable properties, including improved solubility and more monodisperse FSEC profiles, with P. falciparum Gpi12 emerging as the strongest candidate for continued study. Detergent screening further identified DDM (10:2) as the most effective condition for maintaining protein homogeneity.

Ongoing work focuses on purifying Plasmodium falciparum Gpi12 using conditions guided by these findings. This work aims to support future biochemical and structural studies that will clarify Gpi12 function and its role in disease.

34. Synthesis of a fluorinated derivative of lacosamide

Emileigh Steele and Isabella Kirpan, Lincoln Memorial University (Fourth Year Undergraduate)

Lacosamide is an antiseizure medicine that is used for treating epilepsy, a neurological disorder. There is a correlation between lipophilicity and the ability of molecules to passively transit the blood brain barrier (BBB). Fluorinated derivatives of drugs frequently possess enhanced lipophilicity relative to their molecular parent without significant changes in the size and shape of the molecule. The greater electronegativity of fluorine relative to hydrogen changes the electron density distribution of the molecule, but the steric considerations of the molecules are similar because fluorine and hydrogen have comparable atomic radii. A fluorinated derivative of lacosamide is being synthesized from o-methyl serine to compare the lipophilicity of the fluorinated lacosamide to that of lacosamide using octanol-water partitioning. It is expected that the fluorinated derivative of lacosamide would have greater lipophilicity than lacosamide. This would suggest that the fluorinated derivative of lacosamide would have better BBB permeability than lacosamide.

36. Heteroleptic Copper(I) and Silver(I) Complexes for OLED Applications

Su Gursoy, Hollins University (Second Year Undergraduate)

Organic light emitting diodes (OLED) have shown significant promise as cost effective alternatives to their inorganic counterparts. Within the OLED field, there is currently an effort to replace iridium (III) sensitizers with cheaper and more earth abundant copper(I) and silver(I) alternatives. One issue that needs to be overcome is the pseudo Jahn-Teller distortion in copper(I) complexes, a major quenching pathway. In homoleptic complexes, it has been shown that sterically bulky ligands can be utilized to control Jahn-Teller distortion, resulting in longer emission lifetimes and higher quantum yields. This work aims to use Heteroleptic copper(I) and silver(I) complexes that contain strongly electron-withdrawing and sterically bulky trifluoromethyl groups as a way to tune the fluorescence of the complexes. Preliminary characterization of these compounds was completed with mass spectrometry and single crystal X-ray crystallography (SC-XRD). Heteroleptic structures for several compounds have been confirmed with SC-XRD, while others are still in progress. Additionally, the absorbance and fluorescence properties of the compounds were studied as films and in dichloromethane solutions.

40. The effect of fluorine substitution on the bond order of acetamides

John Keener, Lincoln Memorial University (Third Year Undergraduate)

The carbonyl bond of trifluoroacetamides has been shown to have greater double bond character than their acetamido structural analogues. Mono-, di-, and trifluoroacetaamido derivatives of acetanilide will be synthesized to explore how the different number of fluorine atoms affect the carbonyl bond order. Acetanilide was chosen because this effect of fluorine on the carbonyl bond has been reported for several molecules that are derivatives of acetanilide. In addition, the effect of the aromatic ring on will be explored by synthesizing molecules that lack an aromatic ring, mono-, di-, and trifluoroacetamido derivatives of N-propylacetamide. The bond order for the carbonyl bond of these molecules will be accessed using infrared spectroscopy (IR). Carbonyl bonds with greater double bond character produce IR peaks with higher wavenumbers than carbonyl bonds with less double bond character. This fundamental research will provide insight into why fluorinated derivatives of molecules frequently have greater lipophilicity, which is an important physical property for the bioavailability of drugs, than the parent molecule. Fluorinated derivatives of drugs has become an area of considerable interest because these

molecules often have improved physicochemical properties for drug action in comparison to the parent molecule.

46. Microwave-Assisted Synthesis of N-Methylsuccinimide as a Model for Antiseizure Drugs
Marissa Eccles, Lincoln Memorial University (Second Year Undergraduate)

Several succinimide derivatives are used to treat epilepsy, which is a neurological disorder that causes seizures. These succinimides are typically produced in a multistep synthesis that requires a significant amount of time. Microwave-assisted organic synthesis (MAOS) often provides shorter reaction times and result in products that require less time to purify than traditional synthetic approaches. MAOS of succinimide has been reported, but mesuximide and phensuximide are derivatives of N-methylsuccinimdie rather than succinimide. Therefore, a MAOS of N-methylsuccinimde was developed as a model reaction for synthesizing phensuximide and mesuxiimide. Succinic anhydride and N,N′-dimethylthiourea are irradiated using a domestic microwave in the absence of solvent to produce N-methylsuccinimide in excellent yield. The resulting product does not require purification based on nuclear magnetic resonance spectroscopy. This MAOS protocol is being applied to the synthesis of phensuximide and mesuximide.

52. Synthesis of a Doxorubicin-Vitamin B12 conjugate
Ragan Sanders, Lincoln Memorial University (Third Year Undergraduate)

Light-responsive molecules promise to improve the treatment of cancer. Photoresponsive molecules offer control over the location of activity within the body, which would potentially minimize side effects that result from off-target drug interactions. Alkylcobalamins, which are structurally related to Vitamin B12, are photosensitive molecules that accumulate preferentially in cancer cells relative to healthy cells because of the unique biology of cancer cells. Conjugation of a drug to the B12 molecular platform renders the drug inactive, but exposure to light causes the cleavage of the cobalt-carbon bond releasing the drug to have its normal biological effect. This provides molecules that kill cancer cells in a light-dependent manner. Alkylcobalamins can be rendered sensitive to near-infrared light, which penetrates tissue, by the attachment of an appropriate fluorophore. In addition to providing a means of controlling drug activity using light, the B12 molecular scaffold improves the solubility of molecules that have poor water solubility. Doxorubicin is a cancer agent that suffers from poor water solubility and significant side effects, including cardiomyopathy, from interactions of the drug with heart tissue. Therefore, a doxorubicin-B12 conjugate is being synthesized. This will render the doxorubicin light-activatable and will improve the solubility of this relatively hydrophobic drug.

53. Microwave-assisted organic synthesis of thalidomide
Rune Ossinsky, Lincoln Memorial University (Third Year Undergraduate)

Thalidomide is used to treat human immunodeficiency virus (HIV) and cancer as well as skin and other medical conditions. In addition, thalidomide is infamous as a teratogen, an agent that causes birth defects. The traditional synthesis of thalidomide is time intensive. Therefore, a microwave-assisted organic synthesis (MAOS) of thalidomide was developed. MAOS is frequently advantageous in comparison to traditional synthetic approaches because of shorter reaction time, more facile reaction set up, and simpler purification. This MAOS was completed in two reaction steps. Initially, phthalic anhydride was microwaved with glutamic acid in the absence of solvent for twenty minutes in a domestic microwave. Subsequently, ammonium formate was added and the reaction mixture was heated with microwave for another twenty minutes. This MAOS allows thalidomide to be synthesized via two reaction steps in less than one hour.

29. The Impact of Living Arrangements on Anxiety Levels Among College Students

Caroline Kelley, Ferrum College (Second Year Undergraduate)

Anxiety among college students has increased significantly in recent years, affecting academic performance, cognitive functioning, and overall well-being. While previous research has examined academic stress, financial strain, and peer relationships, less attention has been given to how living arrangements may influence anxiety levels. The present study investigates whether undergraduate students living off campus experience different levels of anxiety compared to those living on campus.

Participants (anticipated N ≈ 50) are undergraduate students aged 18–24 recruited through peer outreach, social media, and email. Using a quantitative, correlational design, participants complete an anonymous online survey via Qualtrics. Anxiety symptoms are measured using the validated Generalized Anxiety Disorder 7-item (GAD-7) scale. Additional items assess demographic characteristics, access to campus resources, peer support, and academic stress. The independent variable is living arrangement (on-campus vs. off-campus/commuter), and the dependent variable is anxiety level as indicated by total GAD-7 score.

Data collection is ongoing. Planned analyses include descriptive statistics and independent-samples t-tests to compare anxiety levels across living arrangements, as well as correlational analyses examining associations between anxiety and access to campus resources or peer support. It is hypothesized that students living off campus will report higher anxiety levels than those living on campus.

Findings from this study may help colleges better understand environmental factors contributing to student anxiety and inform targeted mental health and support initiatives for both commuter and residential students.

33. Examining the Relationship Between Food Insecurity and Academic Performance Among College Students

Danielle Wilburn, Ferrum College (Fourth Year Undergraduate)

Food insecurity has emerged as a significant yet often underrecognized barrier to student success in higher education. National estimates suggest that 30–40% of college students experience some level of food insecurity, with disproportionate impacts among first-generation, low-income, and marginalized populations. Although prior research links food insecurity to poorer psychosocial health and reduced academic outcomes, fewer studies have examined how varying levels of food insecurity severity relate specifically to grade point average (GPA).

The present study investigates the relationship between food insecurity severity and academic performance among undergraduate students. Participants (anticipated N = 30–50) will complete an anonymous online survey including the USDA Six-Item Short Form Food Security Survey Module and self-reported GPA ranges. Additional demographic and contextual variables (e.g., employment status, meal plan access, housing) will also be collected. This study uses a non-experimental, correlational design to examine associations between food insecurity levels and academic performance indicators.

Data collection is currently underway, and analyses will include descriptive statistics and correlation analyses to assess the strength and direction of relationships. It is hypothesized that higher levels of food insecurity will be associated with lower self-reported GPA.

By focusing on food insecurity severity rather than a simple yes/no classification, this research aims to contribute to a more nuanced understanding of how unmet basic needs influence measurable academic outcomes and inform institutional policy and support services.

39. Examining the Relationship Between Gender-Based Discrimination and Alcohol Use

Jasmine Cortes, University of Tennessee Knoxville (Fourth Year Undergraduate)

Discrimination has been associated with adverse health behaviors, including increased alcohol use; however, findings regarding gender differences in this relationship remain mixed. The current study examined whether experiences of everyday discrimination are associated with alcohol use and whether this relationship differs by gender. Participants (N=387) completed an online, IRB-approved survey assessing alcohol use using the Alcohol Use Disorder Identification Test (AUDIT) and perceived discrimination using the Everyday Discrimination Scale (EDS). It was hypothesized that (1) higher levels of discrimination would be associated with higher AUDIT scores, (2) males and females would differ in alcohol use, and (3) gender would moderate the relationship between discrimination and alcohol use.

A 3 (Discrimination: low/moderate/high) x 2 (Gender: male/female) ANOVA revealed a significant main effect of discrimination on AUDIT scores, $F(2, 381)= 4.52$, $p= .011$, partial $\eta^2= .023$, such that individuals reporting high discrimination demonstrated higher alcohol use than those reporting low or moderate discrimination. There was no significant main effect of gender, $F (1, 381) = 1.52$, $p = .219$, partial $\eta^2= .004$, and no significant gender by discrimination interaction, $F (2, 381) = 1.38$, $p = .252$, partial $\eta^2= .007$. Although males showed slightly higher mean AUDIT scores than females, these differences were not statistically significant.

These findings suggest that discrimination is associated with increased alcohol use overall, but this relationship does not differ by gender. Results highlight the importance of considering discrimination as a general psychological stressor linked to alcohol risk rather than one that disproportionately affects a specific gender group.

43. Examining the Relationship Between Gender-Based Discrimination and Alcohol Use

Kyra Russell, Jasmine Cortes, and Hollie Pellosmaa, University of Tennessee (Fourth Year Undergraduate)

Discrimination has been associated with adverse health behaviors. Prior research has found that individuals reporting higher levels of perceived racial/ethnic discrimination were more likely to engage in unhealthy coping behaviors, including greater alcohol consumption (Borrel et al., 2010). These findings suggest that discrimination may operate as a chronic stressor linked to substance abuse. However, findings regarding gender differences in this relationship remain mixed. The current study examined whether experiences of everyday discrimination are associated with alcohol use and whether this relationship differs by gender. Participants (N = 387) completed an online, IRB-approved survey, which included the Alcohol Use Disorder Identification Test (AUDIT) and Everyday Discrimination Scale (EDS). It was hypothesized that (1) higher levels of discrimination would be associated with higher AUDIT scores, (2) males would score higher on the AUDIT, and (3) gender would moderate the relationship between discrimination and alcohol use. A 3 (Discrimination: low/moderate/high) x 2 (Gender) ANOVA revealed a significant main effect of discrimination on AUDIT scores, $F(2, 381) = 4.52$, $p = .011$, partial $\eta^2= .023$, such that individuals reporting high discrimination demonstrated higher alcohol use than those reporting low or moderate discrimination. There was no significant main effect of gender or a significant gender by discrimination interaction. These findings suggest that discrimination is associated with increased alcohol use overall, but this relationship does not differ by gender. Results highlight the importance of considering discrimination as a general psychological stressor linked to alcohol risk rather than one that disproportionately affects a specific gender group.

49. The Role of Symbolic and Monetary Rewards in Sustaining Employee Motivation: The Mediating Effects of Competition and Social Comparison

Mario Ruiz, Ferrum College (Second Year Undergraduate)

Organizations have traditionally relied on monetary incentives to motivate employee performance. However, growing evidence suggests that financial rewards may produce short-term gains while potentially undermining intrinsic motivation over time. In contrast, symbolic rewards—such as recognition, status, and social visibility—may foster more sustainable motivation by engaging social comparison and competitive mechanisms. The present study examines whether symbolic rewards are associated with higher and more sustained work performance than monetary rewards, and whether perceived peer-group competition mediates this relationship.

Participants (anticipated $N \approx 50$) are recruited via social media and complete an anonymous online survey. Measures include a 7-item Perceived Peer-Group Competition scale, a 10-item Reward Orientation scale assessing symbolic and monetary preferences, and the 18-item Individual Work Performance Questionnaire. The study uses a correlational design to examine relationships among reward orientation, competitive orientation, and self-reported work performance. Planned analyses include t-tests, ANOVA, correlation, and regression to evaluate differences in reward preference and the mediating role of competition.

Data collection is ongoing. It is hypothesized that individuals with stronger symbolic reward orientation will report higher sustained performance, particularly in competitive environments characterized by structured social comparison.

Findings may inform organizational practices by identifying reward systems that promote long-term motivation without the potential drawbacks associated with financial incentives, contributing to more sustainable workplace performance strategies.

54. Tabletop Role-Playing Games and Social Cohesion in Higher Education

Sarah Melinsky, Milligan University (Third Year Undergraduate)

This study examines the relationship between participation in Tabletop Role-Playing Games (TTRPGs) and social cohesion among undergraduate students in higher education environments. Tabletop Role-Playing Games, such as the game Dungeons and Dragons, are often categorized as antisocial or introverted in nature; however, recent research suggests otherwise. This research compares three groups: five students participating in a Dungeons & Dragons campaign at a small private Christian university, five students participating in an identical campaign at a large public state university, and a four-person control group that did not engage in either campaign. The campaign consisted of 3 meetings over the course of three weeks (1 meeting per week), with the duration of each meeting being 2 hours long. A mixed-methods design was employed to collect data, using pre- and post-intervention surveys measuring trust, sense of belonging, and perceived group cohesion. Both the experimental groups and the control group completed the pre- and post-intervention surveys, with the data used to compare the three research groups and draw conclusions.

32nd Annual Blue Ridge Undergraduate Research Conference

Oral presentations

Biology *Stanley Library Room 201*

13. Wing Loading Determines Descent Rate in Silver Maple Samaras

Javad Dehghan, University of Evansville (Third Year Undergraduate)

Seed dispersal is a critical ecological process that influences plant population dynamics, colonization, and survival. In wind-dispersed species such as *Acer saccharinum* (silver maple), seed morphology plays an important role in determining how effectively seeds travel away from the parent tree. One key factor affecting dispersal is wing loading, defined as the ratio of seed mass to wing surface area. Seeds with lower wing loading are expected to remain airborne longer and potentially disperse farther, whereas seeds with higher wing loading are predicted to descend more rapidly due to greater gravitational influence relative to aerodynamic lift. This study examined the relationship between wing loading and rate of descent in silver maple samaras.

Two complementary experiments were conducted. In the natural experiment, thirty samaras were dropped from a height of 8.35 meters to measure fall time. Seed mass and surface area were used to calculate wing loading, while fall time was used to determine rate of descent. In the manipulative experiment, a samara with relatively low wing loading was selected and its mass was incrementally increased using small amounts of clay while maintaining a constant wing area. Each mass level was tested through three repeated drops to determine average descent rates. Linear regression analysis was used to evaluate the relationship between wing loading and rate of descent.

Results from both experiments supported the hypothesis that increased wing loading leads to a higher rate of descent. In the natural experiment, wing loading ranged from 0.184 to 0.366 mg/mm² and was significantly positively associated with rate of descent ($F_{1,28} = 18.5$, $P = 0.001$, $r^2 = 0.39$). The manipulative experiment showed an even stronger relationship ($F_{1,4} = 66.5$, $P = 0.001$, $r^2 = 0.94$). These findings demonstrate that wing loading is an important factor influencing seed descent dynamics and may play a significant role in determining dispersal potential in wind-dispersed plant species.

17. Climate-Smart Maize Production for U.S. Food Security: Physiological Responses to Combined Drought and Rising Atmospheric CO_2

Racheal Awintiti Braimah, University for Development Studies (Fourth Year Undergraduate)

Corn is the cornerstone of U.S. agriculture, yet climate change threatens production through increased drought frequency and intensity. Understanding how rising atmospheric CO_2 interacts with water limitation is essential for maintaining American food security and agricultural competitiveness. This field study evaluated maize photosynthetic responses, stomatal regulation, and yield performance under ambient (≈410 ppm) and elevated CO_2 (≈600 ppm) conditions, with well-watered and drought-stressed treatments representing future climate scenarios.

Drought reduced net photosynthesis by 42% (from 22.5 ± 1.2 to 13.0 ± 0.8 μmol CO_2 m^{-2} s^{-1}) and stomatal conductance by 55% under current atmospheric conditions. Elevated CO_2 partially compensated, increasing net photosynthesis by 28% and improving water use efficiency by 36% under drought. Canopy-level measurements confirmed that elevated CO_2 reduced drought-induced biomass losses from 38% to 22%, while grain yield penalties decreased from 46% to 36%.

These findings demonstrate that future atmospheric CO_2 concentrations will provide modest drought buffering for U.S. corn production. However, substantial yield losses persist under severe water limitation, necessitating integrated approaches combining CO_2-responsive breeding, precision water management, and climate-adapted agronomic practices to ensure American agricultural sustainability and global food supply stability.

21. Effects of Pest-Induced Hemlock Mortality on Growth in Neighboring Trees

Sidney Booher, East Tennessee State University (Fourth Year Undergraduate)

Trees provide many important products and services to humans. In particular, tree growth is critical to carbon storage, air and water quality, and helps determine demographic processes like population growth and reproductive success. Importantly, tree growth is sensitive to both abiotic (environmental) and biotic factors and is vulnerable to ecological disturbances. Understanding how tree communities respond to disturbances, like invasive pests, is therefore crucial to formulating timely and effective forest management practices.

My study uses dendrochronological (tree ring) analysis to investigate how competition for water between neighboring trees changes following the decline of Eastern and Carolina Hemlock trees due to the introduction of an invasive pest – the hemlock woolly adelgid (HWA). I expect to find that when hemlock trees have died due to HWA surrounding the focal tree, they will release it from competition for water and allow it to grow more annually. I suspect this effect will be most drastic where there are higher proportions of dying hemlocks and during dry periods, when competition for water is strongest.

22. Habitat Suitability Modeling of American Kestrels in Northeastern Tennessee

Simon Fillers, Lincoln Memorial University (Fourth Year Undergraduate)

The American Kestrel (Falco sparverius) has been steadily declining across the United States. Habitat changes and degradation are most commonly associated with these declines, with the most drastic reductions reported in the southernmost Floridian populations of the subspecies Falco sparverius paulus. Data on kestrel populations and habitat use in Tennessee are limited. Habitat suitability models developed in northeastern Tennessee using MaxEnt highlight areas of suitable habitat and identify key environmental variables influencing kestrel distribution. These results provide a foundation for assessing how habitat changes may be contributing to kestrel declines within the region. Following this modeling effort, field studies and observations will be conducted to test the accuracy of the models and further assess habitat suitability through the capture of kestrels, and assess home range and habitat use.

24. Bee Biomass and Plant-Pollinator Networks in Meadow and Forest-Edge Habitats

Timothy Damankah, Radford University (Fourth Year Undergraduate)

Bees are essential pollinators that sustain both wild plant communities and agricultural systems, supporting approximately 85% of cultivated crop species. Although habitat structure shapes bee diversity and biomass, comparative data across adjacent habitats remain limited. This study compares bee biomass and plant-pollinator networks between meadow and forest-edge habitats at Selu Nature Conservancy in Radford, Virginia—an Appalachian mixed forest–meadow mosaic.

Bees were collected weekly from May 14th to August 1, 2025, using standardized Blue Vane Traps (BVTs) placed in paired meadow and forest-edge sites. Specimens were preserved in 70% ethanol, weighed individually to determine biomass per sampling event (g), and subsequently pinned and identified by morphospecies using regional taxonomic keys.

Results revealed significantly higher mean bee biomass in meadows (1.85 ± 0.32 g) compared to forest edges (1.12 ± 0.22 g; $p = 0.0025$). Both habitats exhibited early-summer biomass peaks (late June–mid July), corresponding with periods of high floral abundance; however, meadows consistently supported greater biomass throughout the season. By late July, 31 species were represented in meadow regions and 22 species in forest edges. These findings indicate that meadow habitats provide more substantial floral resources that support bee abundance and diversity, while forest edges may contribute complementary nesting refuge and microclimatic buffering.

Overall, this study highlights the importance of habitat heterogeneity in shaping pollinator communities. Integrating floral phenology data with pollinator monitoring in future seasons will further

clarify plant–pollinator network dynamics and inform conservation strategies aimed at sustaining diverse and resilient bee assemblages in Appalachian landscapes.

6. Visualizing Vertebrate Biodiversity on Kauai, HI using Citizen Science Data: An ESRI StoryMaps Project

Connor Foster and Barbara C. Shock, Lincoln Memorial University (Fourth Year Undergraduate)

Kauai, Hawaii is home to nine state parks varying in habitat type and elevation. This study will conduct a comparative analysis of vertebrate biodiversity in these parks. I will gather citizen science from iNaturalist to create a species index for each state park and perform a biodiversity analysis to determine species abundances and heterogeneity. I plan to create an ESRI StoryMap (visualization software) for this project as public outreach. To do this I will incorporate key features of the habitats and diagrams of the different vertebrate species into my StoryMap. I predict that habitat types found throughout the parks will influence the species diversity and that I will find differences in species composition between parks, e.g., species that are adapted to the specific habitats, such as the Hawaiian Monk Seal (Monachus schauinslandi), or the Kaua'i 'Elepaio (Chasiempis sclateri). This work will improve accessibility in understanding Hawaiian species biodiversity.

Oral presentations

Molecular Biology, Chemistry, and Physics *Stanley Library Room 203*

5. Nicotine Protection Against Mancozeb-Induced Dopaminergic Degeneration in C. elegans
Cassie Lane, King University (Fourth Year Undergraduate)

Parkinson's Disease (PD), a prevalent neurodegenerative disorder, is characterized by tremors, bradykinesia, and impaired coordination and balance. PD results from the degeneration of the dopaminergic (DA) neurons in the substantia nigra. The complex etiology of PD is understood to be an interaction of genes and the environment, especially pesticide and heavy metal exposure. Mancozeb (MZ), a fungicide (active ingredient manzate) is known to disrupt neurotransmission and increase oxidative stress. Epidemiological studies have shown that PD is less frequent in chronic tobacco users. Nicotine has a high binding affinity to the nAChRs (nicotinc Acetyl-Choline Receptors) in DAergic neurons and has been shown to modulate DAergic signaling. To investigate the role of nicotine in pesticide induced DAergic degeneration, N2 (wild type C. elegans) and BY250 (GFP tagged dopamine transporter) were treated with nicotine or MZ individually, a dual treatment of nicotine followed by MZ, or a control. DAergic neuron function was monitored by two behavior-based assays. A mechanosensation assay with a nose touch targeting DAergic neurons, and the basal slowing response to monitor their locomotion in and out of food. For the BY250 fluorescence of the GFP-dat-1, was measured as an indicator of DA function. Mitochondrial function was monitored with the MitoToxGlo assay kit to measure the dead cell protease activity. Taken together, the combination of these assays provides important insight into the protective effect and potential mechanism of nicotine on pesticide induced DAergic neuron degeneration, leading to a better understanding of how nicotine may decrease the risk of developing PD.

2. Improved Zwitterionic Polymer Patterning for Hydrophilic Glass Surfaces
Aleya Ann ebner, King University (Fourth Year Undergraduate)

This research focused on increasing the hydrophilicity of glass surfaces patterned with regions of a grafted zwitterionic polymer by utilizing a more efficient grafted initiator molecule. Previously, 4-(chloromethyl)phenyltrichlorosilane (CMPTCS) was used to form an initiator monolayer coating on glass substrates due to its commercial availability. This g-CMPTCS coating was deposited via a PDMS soft lithography stamping process to create initiator regions for polymerization in a later step. The unmodified areas of the glass substrate were modified with an octadecyltrichlorosilane coating to produce hydrophobic regions. Subsequently, the g-CMPTCS regions were used to initiate the polymerization of sulfobetaine methacrylate (SBMA) via activators regenerated by electron transfer (ARGET) polymerization, yielding a hydrophilic grafted polymer on the surface of the glass microscope slide in the desired areas. The goal of this patterning process was to create a g-pSBMA/OTS patterned glass microscope slides with narrow, linear hydrophilic regions bounded by hydrophobic regions, designed to confine aqueous solutions of the model organism C. elegans for our collaborators in our institution's toxicology research. Patterned slides made previously were analyzed by measuring water contact angles via a goniometer, and the captured images were subsequently processed with the "Dropsnake" plugin for ImageJ. This data demonstrated that the g-CMPTCS-pSBMA produced low water contact angles (35.34108°) consistent with a hydrophilic surface coating; however, these water contact angles were higher than literature reports for comparable g-pSBMA surface coatings. Utilizing a different, more-efficient initiator monolayer formed from synthesized 3-(2-bromoisobutyramido)propyl(trimethoxy)silane (BrTMOS), the hydrophilicity of the subsequent g-pSBMA coatings on glass surfaces was improved.

8. Low-Cost PDMS Microfluidic Mazes for C. elegans Behavioral Assays

Evan King, King University (Third Year Undergraduate)

This research demonstrated the manufacturing and application of PDMS microfluidic "mazes" via low-cost photolithography techniques. Collaborators of our group utilize the microscopic nematode species C. elegans for various toxicological assays, such as neuronal testing, lipid accumulation, and behavioral response. These devices were created to test neuronal function by assessing transit times of the worms from a "Point A" to a "Point B" in the microfluidic mazes, utilizing E. coli as a food incentive for the C. elegans. Previous research by our group utilized polydimethylsiloxane (PDMS) contact printing for the patterning of glass microscopes slides with well-defined regions of hydrophilic and hydrophobic covalently-bound surface coatings. The purpose of these patterned surfaces was to control the location of deposited aqueous solutions containing the model organisms C. elegans on the glass surfaces. We found that the PDMS stamps produced for this prior patterning research could be easily modified to serve as microfluidic channels for aqueous solutions of C. elegans. In this research, the prior PDMS stamp manufacturing project demonstrated that the methods yielded patterned surfaces capable of successfully controlling the location of the deposited C. elegans. After using the aforementioned PDMS stamp making process, the stamp can be turned into a home-made microfluidic device.

14. Rapid Microwave-Assisted Synthesis of Luminol for Undergraduate Teaching Laboratories

Meredith Allen, Lincoln Memorial University (First Year Undergraduate)

Chemiluminescence, a phenomenon of light being emitted from a chemical reaction, is extensively utilized in forensic science to detect blood. In the presence of an oxidizing agent and a metal catalyst, such as iron in hemoglobin of blood, luminol (5-aminopthalhydrazide) undergoes an oxidation reaction to generate a molecule in an excited state. Relaxation of the excited molecule to the ground state results in the emission of blue light. The traditional synthesis of luminol that is used in undergraduate teaching laboratories requires using vacuum distillation glassware and a significant amount of heating time. Depending on the amount of time available for the laboratory class, this synthesis can be challenging to perform. Therefore, a microwave-assisted organic synthesis (MAOS) of luminol was developed. MAOS is advantageous because it often affords shorter reaction times, easier reaction set up, and more facile purification for organic reactions than traditional synthetic approaches. Hydrazine acetate was allowed to react with 3-nitrophthalic anhydride in the absence of solvent for 30 minutes in a domestic microwave. The nitro group of the resulting molecule, 3-nitrophthalhydrazide, was reduced to an amine by treatment with sodium dithionite under basic conditions. This MAOS of luminol can be completed by undergraduate students in less than two hours because of the relatively short reaction time and facile reaction, which allows this protocol to be used at institutions that have short laboratory periods.

32nd Annual Blue Ridge Undergraduate Research Conference

Oral presentations

Humanities and Social Sciences *Stanley Library Room 204*

3. Family Mythology and Gendered Power in Lolita and Twin Peaks
Shariah Alvarenga, East Tennessee State University (Fourth Year Undergraduate)

The 1950s nuclear family is perhaps one of the most lingering cultural mythologies in American consciousness. Despite its unachievable nature, the ideal family and its many predetermined roles has haunted the ideology of the past century, shaping our narratives around gender roles, propriety, and social sensibilities. While many narratives perpetuate these family ideals, others, such as Vladimir Nabokov's 1955 novel Lolita and David Lynch's 1990 television series Twin Peaks, showcase the many ways that the typical family system fails, most of all in its treatment of the daughter. Despite their differences in time, context, and form, these two narratives speak to the same cultural anxieties and flaws surrounding gendered expectations, familial abuse, and the ways that those most vulnerable are failed by their broader societies. This project compares these two key texts and discusses how they reflect one another, their core similar themes, and the wider cultural ideas that both texts speak to.

1. ADHD, Self-Doubt, Procrastination, and Sleep in Student-Athletes
Ashley Davis, King University (Third Year Undergraduate)

Student-athletes with Attention-Deficit/Hyperactivity Disorder (ADHD) face unique academic and athletic challenges due to symptoms such as inattention, impulsivity, and hyperactivity (American Psychiatric Association, 2013; Barkley, 2015). These symptoms can disrupt key psychological and behavioral processes, leading to increased self-doubt, greater procrastination, and poorer sleep quality (e.g., Hermann, Leonardelli, & Arkin, 2002). This study examines how ADHD relates to these three factors in collegiate athletics and how they can collectively affect performance in athletics, school, and everyday life. Participants were student-athletes aged 18–23 from a small private university in the southeastern United States, who completed an 80-item online survey using validated scales for Self-Doubt Scale, Procrastination Scale, The Pittsburg Sleep Disturbances Index, and Adult ADHD Self-Report Scale. We expect student-athletes with ADHD to report higher self-doubt and procrastination, as well as lower sleep quality, compared to peers without ADHD. These variables interact in a cycle: sleep problems increase inattention and impulsivity, which then can contribute to more procrastination and increased self-doubt in both academic and athletic settings. Over time, this cycle may undermine motivation, consistency, and performance (Niermann & Scheres, 2019). Understanding how these factors relate in collegiate athletics can guide the development of targeted interventions. The findings may help coaches, athletic departments, and academic support services implement structured scheduling, executive-function coaching, and sleep-focused strategies to improve well-being, retention, and performance for student-athletes with ADHD.

9. Public Knowledge, Misconceptions, and Stigma Toward Type 1 and Type 2 Diabetes
Eliana Bommarito, King University (Fourth Year Undergraduate)

Society's perceptions of diabetes are shaped by knowledge gained through media, advertisements, and informal education. These influential factors may be contributing to misinformation and social stigmas resulting in a negative view of the condition. Previous research has supported and documented misconceptions over diabetes management, stigmas towards people with diabetes, and confusion over methods and treatments. This study examines baseline knowledge, misconceptions, and attitudes toward Type 1 and Type 2 diabetes among participants without diabetes of various ages and educational backgrounds. It's hypothesized that offering a diabetes-focused intervention to participants without diabetes will reveal that basic knowledge of Type 1 and Type 2 diabetes is severely lacking, and result in

biased or incorrect views of diabetes. Participants were gathered from King University's faculty, staff, and students, while encouraging them to share it to others. Participants then completed an anonymous online survey measuring attitudes, misconceptions of diabetes, and the validated Diabetes Knowledge Test II. A within-subjects pretest–posttest design will be used, in which participants first complete the main sections of the test, and are then provided with corrective feedback before completing a subset of the questions again to determine if there was a change in their knowledge and attitudes. The goal of this evaluation is to encourage a change and advancement in education over diabetes to the public. This research can play a part in improving the way participants without diabetes learn about the condition, and in turn, develop a more accurate and positive view of diabetes.

10. Gender, Empathy, and Attitudes Toward Psychotherapy

Jamarius Koshko, King University (Fourth Year Undergraduate)

This study investigated gender differences in attitudes towards psychotherapy. Previous research has shown that females show more favorable attitudes toward psychotherapy. Additionally, empathy could also play a role in whether or not males or females seek therapy because research finds women typically reporting greater empathic concern than men and those with higher levels of empathy demonstrate more positive attitudes toward psychotherapy. The participants will include approximately 60 adults, recruited from King University. An online survey will be used to collect data, using three scales. The first scales that I will be using is the Attitudes Toward Seeking Professional Help and it measures an individual's beliefs about seeking help from mental health professionals. The second scale is the Prosocialness Scale for Adults and it measures the extent to which individuals engage in prosocial behaviors, such as empathizing and showing concern for others. The last scale is Personal Attributes Questionnaire and it measures traits like being independent, confident, caring, and open about emotions and may help show how these traits relate to someone's attitude toward going to therapy. The expected results may indicate that women show significantly more positive attitudes towards psychotherapy than men; the expected findings may also suggest that empathy relates to mental health seeking.

15. Religion, LGBTQ+ Identity, and Lived Experience in South Central Appalachia

Allison Monroe, East Tennessee State University (Fourth Year Undergraduate)

South Central Appalachia (i.e., Northeast Tennessee, Western North Carolina, Southwest Virginia) has been referred to as a high-stigma, low-resource geographic location for LGBTQ+ folks, likely due to deep cultural and religious beliefs that promote stigma. While previous research has looked at the impact of broader minority stressors and negative mental health outcomes for LGBTQ+ individuals, limited work has directly examined the presence of religious stress for this community or the religious journeys of these individuals. This study lies at the intersection of religion, LGBTQ+ identity, social support, and the overarching values of Appalachian culture and employs a feminist intersectional framework. The central research question that guides the exploration of these intersections is: How have experiences with religion influenced the lived experiences of minoritized LGBTQ+ individuals from rural South-Central Appalachia? A total of 25 individuals who identify as LGBTQ+ and have experience living in South-Central Appalachia completed a one-on-one phone interview guided by a semi-structured outline to share their religious journeys (i.e., experiences with organized religion, shifts in religious beliefs, importance of community). An inductive coding approach and reflexive thematic analysis were used with the aid of NVivo software for crafting initial codes and defining emergent themes. Themes communicate a wide array of experiences that impact or reshape LGBTQ+ individuals' approaches to religion and spirituality. This research is crucial in gaining a comprehensive understanding of how Appalachian culture, LGBTQ+ identity, and religion interact to influence the lived experiences of LGBTQ+ individuals in this specific geographic region.

32nd Annual Blue Ridge Undergraduate Research Conference

Oral presentations

Humanities and Social Sciences *Stanley Library Room 205*

12. Early Greek Drama Productions and Cultural Politics in America

Lauren McEldowney, East Tennessee State University (Fourth Year Undergraduate)

The first production of a Greek drama in North America has been a subject of scholarly debate for at least the last century. Some reference late eighteenth-century theater productions of Medea as the origin of the trend, some the Bowery's 1834 Oedipus, some the 1845 Philadelphia Antigone, and many Harvard University's 1881 Oedipus Tyrannus. Due to the large number of sources claiming Harvard's Oedipus as the kickoff production, likely in part because of its massive success and subsequent inspired productions and news articles, there lacks sufficient discussion on what earlier North American stagings of Greek plays can tell us about how and why the Harvard showing and those immediately following were so well-received. Analysis of responses to earlier, less successful showings, comparisons between previous productions and the Harvard Oedipus, and consideration of social contexts surrounding each performance exemplify a pattern of early American politicization of the ancient world.

16. Athletic Burnout and Authentic Happiness in College Athletes

Molly Turner, King University (Third Year Undergraduate)

The purpose of this research is to determine if athletic burnout in college athletes relates to overall authentic happiness. It is anticipated that authentic happiness will be negatively related to burnout. With recent focus being shifted to athlete mental health, the causes and effects of burnout must be determined. Understanding how the effects of burnout can shift an athlete's authentic happiness is increasingly important as rates of NCAA athlete suicides increase. It is important to understand this relationship to provide athletes with the best resources for success. Participants in this study will be college student-athletes, between the ages of roughly 18 and 24. With roughly 65% being female and 35% being male. The participants will take a 41-question survey, with questions from the Authentic Happiness Inventory and the Athlete Burnout Questionnaire. Conclusively, the overall authentic happiness of college athletes is negatively related to burnout. The expected outcome for this study is that satisfactory rest periods and a satisfactory level of intensity will have a positive relation to authentic happiness. It is also expected that the longer an athlete has spent in their respective sport, the more likely they are to experience burnout in college.

18. A Literature Review of Self-Esteem in Gifted Individuals Across the Lifespan

Reagan Oliver, Lincoln Memorial University (Fourth Year Undergraduate)

Previous studies on gifted individuals' general life satisfaction have produced inconsistent results. Some researchers report no correlation between giftedness and life satisfaction in adulthood, while others suggest that gifted individuals experience either greater or lower levels of life satisfaction. This literature review synthesizes existing peer-reviewed studies to examine potential confounding variables that may influence findings related to overall life satisfaction of gifted individuals. Factors such as self-worth, cultural influences, and social expectations are not always considered when looking at gifted individuals and their overall life satisfaction. A recurring theme in the literature suggests that gifted individuals may be impacted by interactions between the aforementioned factors. Thus, it is advised that more focus be put on the influence that location and culture have on gifted individuals' self-esteem, along with gender norms, and expectations such as "fulfilling" their potential or becoming "failed geniuses."

19. Barriers and Attitudes Toward Lung Cancer Screening

Dezara Seward, Virginia Commonwealth University (Fourth Year Undergraduate)

In 2025, 124,730 individuals died from lung cancer, which continues to be the leading cause of cancer-related mortality in the United States. Despite its substantial impact, adherence to recommended lung cancer screening remains among the lowest compared to other cancer screenings. This study explores knowledge, perceived barriers, attitudes, and intentions regarding lung cancer screening among adults who meet eligibility criteria established by the U.S. Preventive Services Task Force (USPSTF). Participants are completing a mixed-methods online survey designed to assess screening-related knowledge, perceived obstacles, attitudes toward screening and health care, and intentions to undergo screening. The study seeks to enroll a national sample of 350 eligible adults. Data collection is currently in progress, and planned analyses will evaluate relationships among psychosocial factors and screening intentions. Given that lung cancer is frequently diagnosed at advanced stages, when treatment options are more dire and survival outcomes are poorer, identifying determinants of screening behavior is crucial. Results from this study may guide the development of targeted interventions aimed at increasing screening uptake, promoting earlier detection, and ultimately reducing lung cancer mortality.

20. Social Media Use and Stigma Toward Mental Illness

Shelby Zvara, King University (Third Year Undergraduate)

The Pew Research Center reports an increase in social media usage in the past ten years (2025). With the rise in social media usage, one area where research may require more focus is how social media affects the perceptions of mental health According to Bialik from the Pew Research Center (2018), 14% of Americans report that their opinions are influenced by social media. With this heavy reliance on social media, misinformation on mental health can be very damaging. Abrams from the American Psychological Association (2024) more than 80% of TikTok videos are misleading and have persuasive undertones and another study found that 31% of social media posts related to mental health were not scientifically accurate and 14% of them were potentially damaging (Starvaggi,2024). This research will be used to understand how social media usage and content about mental health affect stigma toward mental illness. The research includes a survey of 51 questions that assess stigma toward mental illness and the frequency of social media usage. Participants will be sent a link to the survey via email or Canvas. The participants consist of adults from King University who are currently enrolled in psychology courses. While results have not been completed, I predict that there will be a positive correlation between social media usage and rates of stigma. The results from the study will help bring awareness to how media consumption influences opinions and increases awareness of misinformation.

23. Gender Differences in Romantic Partner Conflict Among College Students

Shaina Addair, King University (Fourth Year Undergraduate)

The purpose of this study was to investigate how gender relates to romantic partner conflict. The objective is to further validate documented gender differences, such as males tending to report more withdrawal strategies. Participants included college students, both males and females, aged 18–30, recruited from social media, across campus, and invited to participate in an online survey about romantic partner conflict. The survey was administered via Microsoft Forms. Romantic partner conflict was measured using the Romantic Partner Conflict Scale (RPCS) (Zacchilli, 2007), which assesses five subscales: intimacy, communication, power, conflict tactics, and problem solving. At the end of the survey, participants also completed a demographic section asking for their age, gender, ethnicity, academic standing, and relationship status. A series of independent-samples t-tests revealed significant gender differences in conflict behaviors. In this study, I expect to find that men reported higher levels of conflict tactics and power, whereas women reported higher levels of communication, intimacy, and

problem solving. These findings suggest that couples who exhibit poorer communication tend to experience higher conflict, linking the role of gendered communication patterns in romantic relationship conflict. I conducted this research to help further the understanding of how relationships are affected by gender differences in communication and conflict styles. By better understanding these styles, this study may help explain why certain conflict patterns occur in romantic relationships and how they can be addressed. Overall, these findings may highlight the importance of communication and problem-solving in reducing conflict and emphasize the role gender plays in romantic partner conflict among young adults.

32nd Annual Blue Ridge Undergraduate Research Conference

Closing presentation

KIRES Report

Deniz Aytun, King University (Fourth Year Undergraduate)

According to the National Committee on Pay Equity, Equal Pay Day was Tuesday, March 25, 2025. This date symbolizes how far into the year women must work to earn what men earned in the previous year. Because women typically earn less than men, they must work longer for the same amount of pay. This difference in pay is known as the gender earnings gap (earnings gap). For example, according to the Pew Research Center, in 2024, women working full-time year-round made 85 cents per dollar earned by men.

In the United States, women generally start their careers closer to wage parity; however, the earnings gap diverges with age. There are several explanations for the earnings gap: women are over-represented in lower-paying occupations, women are under-represented in leadership positions, household and parenting responsibilities are not shared equally, and gender discrimination, although the U.S. Department of Labor acknowledges this is difficult to statistically measure.

In this report, we examine the earnings of men and women of the Tri-Cities 1 and compare the size of the Tri-Cities earnings gap to the national earnings gap. Specifically, we consider differences in the earnings gap among selected industry groups and later by levels of education, both in the Tri-Cities and nationally.

Awards and Closing remarks