Winthrop McNair Summer 2023 Research Presentations

13 Winthrop McNair Scholars will present their research projects on campus June 19, 2023. They will also present at the SAEOPP McNair/SSS Research Conference with students from all over the country. The high quality of their research is the result of the Scholars' work and their Mentors' support.

Here is the agenda for the June 19th Symposium in Tuttle Dining Room.

Winthrop McNair Summer Research Symposium in Tuttle Dining Room June 19th				
Time	**Presenter**	**Title**	**Mentor**	**Type**
1:15 PM	**Dr. Cheryl Fortner**	**Welcome & Recognition of Juneteenth**		
1:30 PM	**Carrie Vaughn**	The Impact of Straight Ticket Voter Option (STVO) on Residual Voting: A Comparison of Gaston County, NC and York County, SC	**Dr. Jennifer Disney**	Oral
1:40 PM	**Morgan Moore**	Effects of Structural Racism and Discrimination on Black College Students in Gynecological Health Decision-Making	**Dr. Joanna Jackson**	Oral
1:50 PM	**Ryan Carr**	The Use, Benefits and Satisfaction of Electronic Health Records for Healthcare Managers in Mental Health Facilities	**Dr. Joanna Jackson**	Oral
2:00 PM	**Maryah Lance**	Exploring the Impact of Movement on Mood	**Dr. Joni Boyd**	Oral
2:10 PM	**Panel 1: Q & A and Break**			**Q&A**
2:30 PM	**Abby Mervine**	Time Series Forecasting Models for Local Light Pollution	**Dr. Zach Abernathy**	Oral
2:40 PM	**Michelle Aguilar-Gaspar**	The Role of Promoter Methylation in Regulating RYBP Expression in Glioblastoma Cells	**Dr. Dan Stovall**	Oral
2:50 PM	**Leliana Bohanan**	Effects of Titanium Dioxide nanoparticles on Goldfish upper thermotolerance	**Dr. Sal Blair**	Oral
3:00 PM	**Julianne Phu**	Fabrication of gold-nanoparticle-ampicillin conjugate as drug delivery vehicles against *E. Coli*	**Dr. Timea Fernandez**	Oral
3:10 PM	**Panel 2: Q & A - Poster Session and Break**			**Q&A**
	Rachel Layens	Impact of Multiple Freeze/ Thaw Cycles on Nutritional Integrity of Human Milk	**Dr. Hope Lima**	Poster
3:40 PM	**Be Kuehn**	Investigating the Function of DUF 3310 Containing Mycobacteriophage Gene CAIN55	**Dr. Jason Hurlbert**	Oral
3:50 PM	**Morgan Dukes**	Exploring the Impact of Cadmium (II) on the Function of the Troponin Protein Complex	**Dr. Nick Grossoehme**	Oral
4:00 PM	**Jamia White**	The Dimerization of RitR Under Stable Oxidation Conditions	**Dr. Nick Grossoehme**	Oral
4:10 PM	**Skyler Allen**	Art Therapy Minded Interventions as a Means for Restorative Classroom Management	**Dr. Michelle "Liv" Livek**	Oral
4:20 PM	**Panel 3: Q & A and Break**			**Q&A**
4:40 PM	**Concluding Remarks & Guests Depart**			
4:45 PM	**Dr. Hope Lima shares her path to the PhD with Scholars and Alumni**			

Scholar: **Michelle Aguilar-Gaspar**

Mentor: **Dr. Daniel Stovall**

Presentation Category: Physical Science - Type: Oral

The Role of Promoter Methylation in Regulating RYBP Expression in Glioblastoma Cells

Abstract: Glioblastoma multiforme (GBM) is the most common and lethal tumor of the central nervous system and frequently silences the RYBP tumor suppressor gene through an unknown mechanism. To determine whether methylation of the RYBP gene promoter contributes to RYBP silencing, GBM cells were treated with a DNA methyltransferase inhibitor, 5-aza-2'-deoxycytidine, or vehicle control and RYBP mRNA and protein levels were measured by RT-qPCR and Western blot, respectively, after seventy-two hours. Genomic DNA was analyzed by methylation-specific PCR to confirm the presence of methylation in the RYBP gene promoter. Our findings suggest promoter methylation contributes to RYBP downregulation in GBM.

Scholar: **Skyler Allen**

Mentor: **Dr. Michelle "Liv" Livek**

Presentation Category: Education - Type: Oral

Art Therapy Minded Interventions as a Means for Restorative Classroom Management

Abstract: Art Therapy minded interventions as a means for classroom management within early childhood and elementary settings has the potential to positively overlap in various aspects of our society. It is widely known that art has therapeutic values which allow individuals to express themselves in ways that language does not allow. The use of action based research for this study allows for the demographics intended to be served to authentically develop and inform the various moving parts of the art intervention. Applying color psychology to classroom management offers the potential to change the way we think about connection, expression, and learning.

Scholar: **Leliana Bohanan**

Mentor: **Dr. Salvatore Blair**

Presentation Category: Life Science - Type: Oral

Effects of Titanium Dioxide nanoparticles on Goldfish upper thermotolerance

Abstract: Titanium dioxide nanoparticles (TiO2 NPs) are found in various industrial products including pesticides and sunscreens which can make their way into aquatic environments. These particles have bioaccumulative and toxic properties putting organisms at risk. This study aimed to observe the impact of TiO2 NPs on fish thermotolerance, as increased usage of nanoparticles presents a potentially harmful interactive effect alongside global warming. Using Ctmax tests, results showed TiO2-injected fish demonstrate significantly reduced thermotolerance and blood plasma osmolality, and lowered glucose concentrations compared to controls. These findings indicate that TiO2 nanoparticles will inhibit a fish's ability to tolerate increasing environmental water temperatures.

Scholar: **Ryan Carr**

Mentor: **Dr. Joanna Jackson**

Presentation Category: Business - Type: Oral

The Use, Benefits and Satisfaction of Electronic Health Records for Healthcare Managers in Mental Health Facilities

Abstract: Electronic health records (EHRs) can securely transmit patient data, improving safety and reducing medical errors and costs. EHRs are critical in mental health centers (MHC) and can improve managers' current challenges, such as increasing demand and cost. However, the use of EHRs in MHCs lags behind other areas of healthcare. This study examines the use, benefits, and satisfaction of EHRs from the management perspective in MHCs. We utilize a concurrent triangulation mixed-methods design, including primary quantitative data collection and semistructured interviews with MHC managers. The results of this study can improve the use of EHRs to support management in MHCs.

Scholar: **Morgan Dukes**

Mentor: **Dr. Nicholas Grossoehme**

Presentation Category: Life Science - Type: Oral

Exploring the Impact of Cadmium (II) on the Function of the Troponin Protein Complex

Abstract: Cadmium is a toxic heavy metal that has carcinogenic properties and is known to impact cardiovascular muscle function, a complicated mechanism that involves several protein complexes working synergistically to carry and regulate the process. One such complex is troponin, which serves as the link between brain signaling and muscle function. Typically, upon nerve impulse, calcium binds to troponin and signals muscle contraction. Notably, recent evidence shows cadmium can bind to troponin in place of calcium. The aim of our research is to understand the impacts of cadmium on troponin function and its implications for cardiovascular muscle contraction.

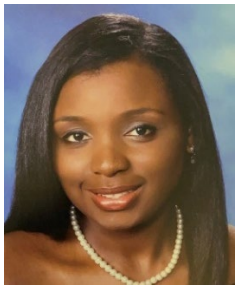
Scholar: **Be Kuehn**

Mentor: **Dr. Jason Hurlbert**

Presentation Category: Physical Science - Type: Oral

Investigating the Function of DUF 3310 Containing Mycobacteriophage Gene CAIN55

Abstract: Bacteriophages are infectious agents that infect specific host cells and make copies of themselves within the host cell. A bacteriophage was identified from soil that infected bacteria of genus Mycobacterium. A gene from that bacteriophage named cain55, was identified and demonstrated to be cytotoxic to host cells. Homology modeling of the predicted amino acid sequence of CAIN55 suggested that the protein may be a cellobiohydrolase. A two-hybrid assay conducted by our collaborator found that CAIN55 bound to NusA, a protein involved in transcription. We have expressed and purified both proteins and will use them to determine the function of CAIN55.



Scholar: **Maryah Lance**

Mentor: **Dr. Joni Boyd**

Presentation Category: Health - Type: Oral

Exploring the Impact of Movement on Mood

Abstract: Mental health is connected to an individual's mood states, which is a cumulative feeling of current emotions. This study analyzed the impact of certain movements on the current mood state. Participants were asked to complete an evaluation of current mood, then perform specific movements as directed in a video, and complete a re-evaluation of current mood. We analyzed changes in mood states from before and after the completion of the movement sequence. The findings of this research can increase the understanding between mental health and the movements of the body.

Scholar: **Rachel Layens**

Mentor: **Dr. Hope Lima**

Presentation Category: Life Science - Type: Poster

Impact of Multiple Freeze/ Thaw Cycles on Nutritional Integrity of Human Milk

Abstract: The objective of this research was to analyze the changes in protein and fat content of raw human milk after being frozen and thawed four times. An experimental study was performed with 20 raw human milk samples. The Creamatocrit Plus and Pierce BCA Protein Assay were used to analyze the macronutrients in the raw human milk. Data were analyzed using repeated measures one-way ANOVA on GraphPad Prism 9. The twenty raw human milk samples were frozen at -80C and thawed at 4C. After one freeze thaw cycle, creamatocrit, caloric content, and lipid content increased whereas total protein content decreased.

Scholar: **Abby Mervine**

Mentor: **Dr. Zach Abernathy**

Presentation Category: Physical Science - Type: Oral

Time Series Forecasting Models for Local Light Pollution

Abstract: This study addresses the lack of both awareness and mitigation efforts concerning light pollution by utilizing data from 2012-2022, collected by the VIIRS-DNB satellite, and time series forecasting to predict radiance values in the Rock Hill, SC, USA area. Using autocorrelation plots and the augmented Dickey-Fuller test, we selected parameters for and built an ARIMA forecasting model. Model accuracy was then compared with different models built by Python's auto_arima package and a test-train split was performed on the dataset to cross-validate the resulting model. This model was then used to build a 10-year forecast with 95% confidence intervals.

Scholar: **Morgan Moore**

Mentor: **Dr. Joanna Jackson**

Presentation Category: Health - Presentation Type: Oral

Effects of Structural Racism and Discrimination on Black College Students in Gynecological Health Decision-Making

Abstract: Exposure to structural racism and discrimination (SRD) is a leading risk factor for adverse maternal health outcomes among Black women, who are three times more likely to die of pregnancy-related causes. However, little is known about how SRD influences gynecological health decision-making in emerging adulthood. This study examines relationships between SRD and gynecological decision-making of Black college students. Primary quantitative data were collected from female college students aged 18-29 to assess the relationship between exposure to SRD and gynecological decision-making. This study can inform the development of pre-pregnancy interventions for Black women that will improve maternal health outcomes.

Scholar: **Julianne Phu**

Mentor: **Dr. Timea Fernandez**

Presentation Category: Physical Science - Type: Oral

Fabrication of gold-nanoparticle-ampicillin conjugate as drug delivery vehicles against *E. coli*

Abstract: As antibiotic resistance continues to grow, the need for alternative medication has become increasingly important for public health. Pharmaceutical focus has gradually shifted from developing cures for diseases to treating chronic illnesses, leading to a greater importance on rediscovering and repurposing old drugs. The long-term goal of this project is to use nucleic acid aptamer-nanoparticle conjugates as delivery vehicles for antibiotics to bacterial cells. My project investigated the production and usage of conjugates comprised of biotin-ampicillin aptamer bound with streptavidin coated gold nanoparticles to act as a "Trojan Horse" carrying ampicillin as treatment against *E. Coli 29522* cells.

Scholar: **Carrie Vaughn**

Mentor: **Dr. Jennifer Disney**

Presentation Category: Social Science - Type: Oral

The Implications of the Straight-Ticket Voter Option (STVO) on Residual Voting: A Comparative Study Using Gaston County, NC and York County, SC

Abstract: Votes uncast in certain contests limit the effectiveness of American democracy. Our research measures the effects of the straight-ticket voting option (STVO) on residual voting in midterm and presidential elections. STVO allows voters to choose a party's entire slate of candidates with one mark. To measure this effect, we compared two bordering counties (Gaston, North Carolina, and York, South Carolina) with similar demographic data, one with and one without STVO, in the 2020 and 2022 elections. STVO decreases residual voting. Voters are more likely in a presidential election to vote on each contest; during a midterm election, residual voting increases.

Scholar: **Jamia White**

Mentor: **Dr. Nicholas Grossoehme**

Presentation Category: Life Science - Type: Oral

The Dimerization of RitR Under Stable Oxidation Conditions

Abstract: Iron is an essential micronutrient for the fitness of living organisms. Its ability to alternate between the +2 and +3 oxidation states makes it critical for many redox processes; however, it also makes iron accumulation cytotoxic. Surprisingly, the common human pathogen *Streptococcus pneumoniae* lacks any of the well-characterized iron regulatory systems. The orphan response regulator, RitR, from this organism has emerged as the central component of novel class bacterial iron regulation, which relies on phosphorylation and oxidation/dimerization to attune transcriptional regulation. This project aims to quantify the relationship between RitR oxidation, phosphorylation, and DNA binding.

Thank you

- **Scholars**, for saying "yes" to McNair this summer and graciously adapting to a variety of obstacles this summer.
- **Mentors** for recruiting, guiding, supporting, teaching, celebrating, and creating opportunities for our Scholars
- **Dr. Matthew Hayes**, our Stats and Methods Coach, who supported project design, analyses and interpretation, and presentation development, and taught about effective poster design
- **Stephanie Bartlett**, our Writing Coach, for supporting the Scholars' research and written work
- To the many experts who helped the Scholars succeed as summer researchers, learn how to give award winning presentations, and prepare to succeed in graduate study: **Dr. Jason Hurlbert, Dr. Gloria Jones, Dr. Jordan Lewis, Amanda Cavin, Cody Walters, Maryssa Shanteau-Jackson, Dr. Mike Sickels, Dr. Joni Boyd, and Lydia Rodriguez**
- McNair staff: **Amanda Cavin (Programming Coordinator), Jennings Cavin (Program Assistant), Haley Drolshagen (Spring GA), and Madison Bray (Summer GA)**, for your constant support of our Scholars and the program.
- The **McNair Advisory Board** that identifies, selects, and supports outstanding first-generation college students from low-income families and undergraduates from underrepresented races and ethnicities with the potential to succeed in doctoral programs: Dr. Victoria Frost, Rose Gray, Dr. Wenonah Haire, Dr. Jason Hurlbert, Dr. Joanna Jackson, Dr. Joshua Kirven, Dr. Willis Lewis, Dr. Tenisha Powell, Molly Quetel, Dr. Karen Stock, and Dr. Janet Wojcik.

It takes a village to pull this off and we owe a deep debt of gratitude to so many folks across campus who bent over backwards to help us support the Scholars: **Dean Leigh Poole, Deborah Broome, Michelle Hare and JC Cunningham, Dawn Sayer, Michele Smith, Dr. Jeremy Lopuch (IRB Chair), Vlad Markarov, Records & Registration, Facilities, Connie - our Custodian, Printing Services, Accounts Payable, Purchasing, Dacus Library, IT, and Lars Larsen. Thank you!**

Juneteenth

The 2023 Winthrop McNair Summer Research Symposium will be held on June 19th, Juneteenth.

> *Juneteenth is a day to reflect on both bondage and freedom — a day of both pain and purpose. It is, in equal measure, a remembrance of both the long, hard night of slavery and subjugation, as well as a celebration of the promise of a brighter morning to come. On Juneteenth, we remember our extraordinary capacity to heal, to hope, and to emerge from our worst moments as a stronger, freer, and more just Nation. It is also a day to celebrate the power and resilience of Black Americans, who have endured generations of oppression in the ongoing journey toward equal justice, equal dignity, equal rights, and equal opportunity in America.*[1]

Please explore resources about Juneteenth, like "Juneteenth in STEMM and The Barriers to Equitable Science," an article from the journal *Cell*[2] that Dr. Dan Stovall (Biology) shared with McNair Staff. Here's the abstract.

> *We are 52 Black scientists. Here, we establish the context of Juneteenth in STEMM and discuss the barriers Black scientists face, the struggles they endure, and the lack of recognition they receive. We review racism's history in science and provide institutional-level solutions to reduce the burdens on Black scientists. (p. 2510).*

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[1] Downloaded 6/14/23 from https://www.whitehouse.gov/briefing-room/presidential-actions/2022/06/17/a-proclamation-on-juneteenth-day-of-observance-2022/

[2] Mays, A., Byars-Winston, A., Hinton, A., Marshall, A. G., Kirabo, A., August, A., ... & Clemons, W. M. (2023). Juneteenth in STEMM and the barriers to equitable science. *Cell, 186*(12), 2510-2517. https://doi.org/10.1016/j.cell.2023.05.016