



ASMS SPRING RESEARCH FORUM

The Spring Research Forum is an academic conference presenting the scholarly activities of the ASMS Research Fellows Program. It is the culmination of an immersive research experience, conducted with campus faculty mentors and off-site scholars, that results in a unique contribution to a field of study. The Spring Research Forum is a program of Paper Presentations and Poster Sessions highlighting the rigorous and varied accomplishments of our Research Fellows.

Schedule of Events

Keynote Speaker

Dr. Michael Chambers, J.D., PhD.

Location: Auditorium

Time: 2:15 pm

Paper Presentations

3:00 pm – 4:00 pm

Location: B208

- 3:00 pm *African Americans in Mobile, Alabama and the Struggle for the Double V* - **Shayla Abrams**
3:20 pm *Crime and the Perception of Crime in Mobile County and Surrounding Gulf Coast Communities* - **Lucinda Barber**
3:40 pm *Gamma and Riemann Zeta Function* - **Ajay Wallack**

Location: B126

- 3:00 pm *Differing Portrayals of Femininity in "The Great Gatsby"* - **Marina Roddy**
3:20 pm *The Nuyorican Experience: A discussion of cultural retention in Puerto Rico through the eyes of the poet, Pedro Pietri* - **Asiel Torres**
3:40 pm *Sapphic Language and Symbols in the Poetry of Emily Dickinson and H. D.* - **Emma McSpadden, Venus (Tatiana) Radoslovich**

Location: Media Room

- 3:00 pm *Game Theory in Student Life* - **Zoi Moon**
3:20 pm *The Relationship Between Math and TikTok Dances* - **Ella Nichols**
3:40 pm *Generating Families of Islamic Star Patterns Based on K-uniform Tilings* - **Sophia Neno, Marlan Zha**

Location: B129

- 3:00 pm *Programming a Voice Assistant in Java* - **Oscar Presnall**
3:20 pm *Hyperuniformity in Amorphous Silicon* - **Carter Swafford**
3:40 pm *Use of Tissue Decellularization as an Organ Transplant Alternative* - **Mosin Adeyemo, Mason Bayles, Eugene Min, Muhammed Shalan**

Poster Session

3:00 pm – 4:15 pm

Locations: Bedsole Library Hallway and Art Gallery



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Abstracts (alphabetical order)

African Americans in Mobile, Alabama and the Struggle for the Double V

Shayla Abrams

This paper will examine the condition of African Americans in Mobile, Alabama during World War II, also the heart of the Jim Crow Era, and the societal battles they had to overcome due to their second-class status in the United States. Although African Americans were ostensibly fighting for freedom abroad, the cruel irony was they still had to fight the same battle for themselves on the home front. The lack of respect, discrimination, and violence that African Americans endured in Mobile, Alabama is a microcosm of the struggle of African Americans in the United States to achieve the Double Victory over oppression abroad and at home. *Mentor: Derek Barry, Ken Robinson*

Air Pollution Studies Along the Gulf Coast

Kelsey Cox, James Yang

Even though there are laws that have been created to regulate several pollutants such as the Clean Air Act of 1970, in which the Environmental Protection Agency (EPA) sets and reviews standards for carbon monoxide and two sizes of particular matter: smaller than 10 microns (PM10) and smaller than 2.5 microns (PM 2.5), in outdoor air, we wanted to test the levels of CO, PM 10, and PM 2.5 in areas near the Gulf Coast by designing and developing a series of experiments to using a portable air quality monitor. The rationale of this experiment is to ultimately determine if the laws and regulations that are currently in place are fulfilling their goal of maintaining healthy pollution levels in the Gulf Coast and other areas in Alabama and detecting if there are any trends in specific locations and times of the day having higher levels of pollutants. *Mentor: Kevin Dolbeare*

AMP: A Comparative Analysis of Two Eukaryotic Motor Proteins' Evolutionary Histories Obtained Through the use of Bioinformatics Tools

Liz Womble

Motor proteins are essential transport proteins that hydrolyze ATP to "walk" across certain filaments while carrying cellular cargo. Information is limited about how these motor proteins have evolved. The research goal is to determine the evolutionary histories of motor proteins and to investigate how these relationships add to the understanding of a common eukaryotic ancestor. The genomes of two families of motor proteins, Kinesins and Myosins were investigated using NCBI (National Center for Biotechnology Information) and analyzed via MEGA-X. For each motor protein family, the sequences were chosen from the same twenty species. The gene sequences were selected to maintain the highest level of homology possible. Those sequences were aligned and then used to create maximum likelihood phylogenetic trees for Kinesin and Myosin. In the kinesin tree humans were on the same branch as brown algae, while for myosin the humans were on the same branch as a parasitic amoeba. On the kinesin tree, *Arabidopsis thaliana* is closely grouped with an English oak and rice in a monophyletic relationship, but for myosin *Arabidopsis thaliana* is further removed from the English oak and rice in a paraphyletic relationship. The Chinese rose in both cladograms comes from a predicted sequence, and in both cases MEGA-X placed it much further away from the other three plants. This is likely due to the error that comes with using predicted sequences and is why having additional sequence analysis is necessary. Despite developing alongside each other, the data suggests that the two motor proteins evolved independently. *Mentor: Dr. Natalie Ortell*

Crime and the Perception of Crime in Mobile County and Surrounding Gulf Coast Communities

Lucinda Barber

Crime and the Perception of Crime in Mobile County and surrounding Gulf Coast Communities is an examination of the prevalence, perception, and prescriptions for crime in Mobile County and nearby communities. Crime is "behavior, either by act or omission, defined by statutory or common law as deserving of punishment." (Cornell



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Law School) Although all communities will experience some level of crime, prevalence and perception, as well as prescriptions, vary by community. By analyzing the prevalence, perception, and prescriptions for crime in Mobile County and surrounding Gulf Coast communities, this research project, through the use of statistical data, relevant interviews, and a wide array of source material, will seek to provide an effective and useful portrait and roadmap for community stakeholders. *Mentor: Ken Robinson*

Designing a Device for Origami Precreases

Nicholas Kim

This experiment aims to create a device that will make mountain and valley precreases for a Miura Ori origami crease pattern. A set of rollers was designed using computer-aided design software, Fusion360. They were then 3D printed and qualitatively evaluated for functionality, after which the design process was repeated. The process has progressed to the current. The designed rollers are capable of distinguishing between mountain and valley creases, but there are still design modifications needed before experimentally testing the rollers with origami paper. *Mentors: Dr. Jessica Alexander and Kristal Webb*

Differing Portrayals of Femininity in "The Great Gatsby"

Marina Roddy

F. Scott Fitzgerald is well-known for his unconventional approach to gender expression within his writing, often depicting strong-willed women and sentimental men in his many novels and short stories. My research over the past months particularly focuses on the presentation of Jordan Baker and Daisy Buchanan in *The Great Gatsby* as two contrasting examples of femininity. This research is important because it addresses a growing conversation surrounding Fitzgerald's unusual approach to gender, providing a unique standpoint which can assist readers in better understanding Fitzgerald's methods. In my writing, I argue that Jordan Baker serves as an effective and valuable foil to Daisy Buchanan, largely in the fact that she exposes Daisy's dangerous and corrupt personality. By creating an unconventional, assertive female character to balance Daisy's feminine passiveness, Fitzgerald provides readers with two female models who are strikingly different, and who, in turn, can emphasize the flaws of one another. I reference the work of various scholars in my writing, drawing on previous discussions in order to develop a new, cohesive argument. I also note the importance of certain metaphors in the novel, acknowledging the role that they play in refining the characters of Jordan and Daisy. This argument is an important one to make because, in my writing, I examine a timeless work and make a claim that is relevant to today's society, studying *The Great Gatsby* through the lens of gender studies, a discipline which did not emerge for decades after the novel was published. I believe that, in this, my work adds a unique argument to a collection of already-developed research regarding Fitzgerald and his writing. *Mentor: Dr. Mitch Frye*

Game Theory in Student Life

Zoi Moon

Game theory is a popular mechanism combining mathematics and rationalization to work through decision-making. Although mainly used in economics it can be applied to common life situations as well, from daily occurrences to uncommon happenings. Modeling decisions in a game-theoretic way can help rationalize through everyday life circumstances. Previous game theory research has shown how game theory can be an essential tool for decision making and has shown how to evaluate all possible outcomes in a situation and find the best possible strategy for said situation. In this paper, we use game-theoretic reasoning and mathematical concepts to evaluate situations in the common students' life. *Mentor: Natalya Prokhorova*

Gamma and Riemann Zeta Function

Ajay Wallack

Study properties of Gamma and Riemann Zeta functions and their connection with distribution of prime numbers, as well as symmetry properties, Euler's product representation and functional equations. Two specific properties that will be focused on in relation to the Gamma function are Legendre Duplication and Euler Reflection. These properties will be proven and later used to demonstrate and prove further properties of the Riemann Zeta. For



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the Riemann Zeta function I will provide and prove several different representations of its value that can be used to study it. I will also derive several functional equations relating the Riemann Zeta function to the Gamma function.

Mentor: Dr. Vasily Prokhorov, University of South Alabama

A Gendered Performance: Understanding Gender Presentation Through Semiotic Analysis

Ligaya Gapud

My project explores the concept of "gender as a performance," as a discussion about the semiotics surrounding gender—how it is constructed and how it is impactful on all parties. Gender is simultaneously performed and received by everyone, and there are many different elements that make up gender identity whether that be by clothes, hair, makeup, or attitude. This leads into the semiotic analysis of the social and visual framework of gendered self-expression as explored artistically through a series of my own artworks. These artworks aim to portray gender as an abstract concept with multiple perspectives and subjectivity. *Mentor: Orren Kickliter*

Generating Families of Islamic Star Patterns Based on K-uniform Tilings

Sophia Neno, Marlan Zha

Islamic star rosette patterns of a variety of symmetries are built on polygons and tangent circles in their underlying Euclidean compass constructions. We present an algorithm for building variable-angled star rosette patterns by situating the star polygons of these rosette patterns inside the circles of a packing whose intersection graph is any k-uniform tiling. *Mentor: Kristal Webb*

Hyperuniformity in Amorphous Silicon

Carter Swafford

We explain importance of heterostructure materials in semiconducting devices such as photovoltaics, thin film semiconductors, etc. We introduce the concepts of disorder and hyperuniformity and explain how these properties can be changed by changes in the nano-structure, such as slicing and doping. *Mentor: Dr. Durga Paudel*

Liquid Phase Exfoliation of 2-D Tin Sulfide Nanoparticles

Sanjana Mupparaju

Two-Dimensional tin monosulfide (SnS) nanosheet is successfully isolated using probe sonication, and hand grinding method in water which explore cost-effective & environmentally friendly exfoliation process in semiconducting material research. It is cost effective and toxic free process which can be useful in commercial application. The exfoliated nanosheets using ultrasound waves in probe sonication and hand grinding methods are compared. Our result show probe sonication is more effective exploration method than hand grinding in terms of lateral size of nanosheet. *Mentor: Dr. Durga Paudel*

The MIM Diode, Energy from Passive Cooling

Patrick Decker, James Weaver

As the world gradually shifts to sources of renewable energy, many people look towards solar panels as the main energy provider of tomorrow. However, recently, a new technology has been created which may be able to rival, and even prevail over, the iconic array of photovoltaic cells in a future setting. This new technology is a metal-insulator-metal (MIM) diode "rectenna" (rectifying antenna) which uses quantum tunneling to produce an electric current when exposed to heat. This technology was discovered by a research group from University of Colorado, boasting an efficiency of 100 times that of the next best "rectenna". Our research explores the potential of this new technology around the world as an energy provider, with a particular focus on its potential to revolutionize home cooling in both first and third world countries. *Mentor: Dr. Elisa Rambo*



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Molybdenum Disulfide Nanoparticle Synthesis

Tuyako Khristoforova, Rima Patel

Molybdenum Disulfide (MoS₂) nano particles are used for various applications, such as energy conversion, storage, hydrogen evolution reaction (HER), in transistors, photodetectors, etc. Cheap and environmentally friendly methods of MoS₂ production are still in high demand. We used probe sonication method with isopropyl alcohol and deionized water to prepare MoS₂ nano particles. *Mentors: Dr. Durga Paudel and Dr. Arjun Dahal, University of South Alabama*

The Nuyorican Experience: A discussion of cultural retention in Puerto Rico through the eyes of the poet, Pedro Pietri

Asiel Torres

Although Puerto Rico shares much in common with the Dominican Republic and Cuba, the two other Spanish-speaking islands of the Caribbean, its invasion and seizure by the United States, which subsequently granted all Puerto Ricans born after 1898 U.S. citizenship, make it unique. As an Estado Libre Asociado (Free Associated State) of the United States and a former colony of Spain for 400 years whose population derives from indigenous (Taino), European, and African people, Puerto Rico is culturally diverse. Both Spanish and English are spoken widely. Moreover, today one may speak of a transnational Puerto Rico whose population is not simply confined to the island but consists also of a large and growing Puerto Rican diaspora living abroad, particularly in the mainland United States. This migration of the Puerto Rican population led to a growing concern among the population of the island that their culture would be lost at the hands of the US. Since these Puerto Ricans moved to the United States at a time when the economy was rigid and capitalist, and ideas of racism and xenophobia were perpetuated, there were serious concerns that Puerto Rican culture would be lost as Puerto Ricans grew numb to these oppressive and offensive conditions that they experienced in the United States. Among the many Puerto Ricans who expressed their concerns on this issue is Pedro Pietri, a Puerto Rican poet who was raised in New York. Despite having an American upbringing, he was never afraid to speak out against the United States, and he took much pride in his Puerto Rican heritage. He worked to spread awareness on cultural retention among the Puerto Rican-American population by poetically contrasting the beauty of the island with the dark, desolate, poor streets of New York City. He also used his poetry to comment on several different challenges faced by Puerto Rican-Americans, such as racial identity, religious identity, and discrimination within the workplace. His writing presented very rigid ideas on cultural retention that are still embraced by Puerto Rican families, both in Puerto Rico and in the United States. *Mentor: Dr. Keith Lindley*

Programming a Voice Assistant in Java

Oscar Presnall

Voice assistants have become a normal part of our daily lives. We use them everywhere, from occasionally using Siri to set a timer or remind yourself of an upcoming occasion, to asking Alexa the weather forecast for the day to better plan your outfit. This project intends to explore what is involved in building a simple voice assistant from the ground up, diving into the logic and processes involved in capturing voice input, processing it, and returning a result. Starting from a blank slate and working in the Java programming language, this project involved pulling together many online libraries to construct Bumblebee, the AI capable of performing basic tasks entirely offline, using as little closed-source software as possible. *Mentors: Deborah Gray and Dr. Travis Atkison, University of Alabama*

Properties of Stieltjes-Rogers Polynomials and Random Polynomials

Jacob Kim

The research project is related to rational approximation, continued fractions, probability, combinatorics, and labeled Dyck paths. One of the topics of the research project is an investigation properties of Stieltjes-Rogers polynomials associated with the following continued fraction $A(z) = 1/z - a_1/z - a_2/z - a_3/\dots$. In 1980 Flajolet introduced Stieltjes-Rogers polynomials A_n as coefficients of the power series expansion of the continued fraction $A(z)$ at infinity. Project approach is combinatorial, and the starting point of the analysis is a formula of Flajolet for



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weight polynomials associated with labelled Dyck paths. Moreover, properties of weight polynomials W_n associated with labelled flawed Dyck paths that contain some steps under the x -axis are investigated. In the case when an are iid random variables, properties of $E A_n$ and $E W_n$ (expected values of random variables A_n and W_n) are also investigated. Properties of the sequence $(E W_n)_{n=1}^{\infty}$ are specially important since $E W_n$ is the limit of the average moments constructed by zeros of random polynomials $Q_k(z)$ generated by the three-term recurrence relation $Q_{k+1}(z) = zQ_k(z) - aQ_{k-1}(z)$. To investigate properties of weighted polynomials, Mathematica and Sage softwares are used. Special algorithms to find weighted polynomials $A_n, W_n, E A_n$, and $E W_n$ associated with the limit distribution of zeros of random polynomials, are created. *Mentor: Dr. Vasily Prokhorov, University of South Alabama*

The Relationship Between Math and TikTok Dances

Ella Nichols

Dance plays an important role in almost every culture and country. There are many forms that have stayed true to tradition while others have formed throughout the years to be something that did not exist a century ago. Different dance forms have influenced each other as they were forming, even in ancient times. However, in the most recent years there has been a social media app that has taken the world by storm: TikTok. TikTok is a platform where people can post sixty-second clips of them doing whatever they want and show their passions for the world to see, like dancing. Users have been creating "TikTok dances" to different popular songs and post them for people to learn and "hop on" the trend. Though many people do not realize, math plays a large role in dance. The symmetry and geometric patterns are seen all throughout dance, even in TikTok dances. Though TikTok "moves" may seem like a new form of dance, there are influences from cultures' dancing forms. By analyzing the symmetry of these cultures' traditional dances, it can be seen that how TikTok dances are influenced by different cultures, while also sharing a relationship with math. *Mentor: Mitch Frye*

Sapphic Language and Symbols in the Poetry of Emily Dickinson and Hilda Doolittle

Emma McSpadden, Venus (Tatiana) Radoslovich

In this project, we have researched the use of Sapphic language and symbols in 19th century poetry. We will begin by defining this language and these symbols through an examination of Sappho's works and other relevant primary sources. Then, we will examine works by the 19th century poets, Emily Dickinson and Hilda Doolittle while situating them within the context of contemporary criticism and interpretation of Sappho's influence, particularly the impetus to move the focus from Sappho's orientation to her intellectual pursuits. We will also focus on the different symbols and language that Dickinson and Doolittle utilize that connect and mirror Sappho's own writing. *Mentor: Dr. Elizabeth Jones*

A Semiotic Analysis on the Representation of Narcotics in Advertisement and Propaganda since the 20th Century

Katherine Echeverri

This cultural investigative research peruses the Representation of Pharmaceutical and Recreational Substances throughout its history of use in Western society, observing the events that defined its perception in modern culture. I explored the semiotics behind the representation of illicit substances, deconstructing its portrayal and internal message with all semiotic elements of sign, symbol, and index, in order to create a project in which I explore and take advantage of these elements to convey a specific message to my given audience. It was demonstrated during the course of this study that different messages emitted via online media under specific circumstances may induce viewers into adopting a particular perspective or bias. *Mentor: Orren Kickliter*

Use of Tissue Decellularization as an Organ Transplant Alternative

Mosin Adeyemo, Mason Bayles, Eugene Min, Muhammed Shalan

Worldwide the demand for organ transplants is increasing. Access is out-of-reach for many who require this vital procedure to live a healthy life. Social, economic, and biological factors impact access to organ transplantation for many individuals. But what if an alternative solution existed, one that avoided the long wait list for a donor or



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the concerns of tissue rejection? Tissue decellularization could very well be that alternative. Utilizing an in vivo titrated removal process of damaged organ tissue to provide a native scaffold of extracellular matrix, tissue decellularization can facilitate the reseeding of a damaged organ with a person's own stem cells, alleviating an individual's suffering from organ disease or the emotional and physical stress of waiting for a donor. *Mentor: Dr. Elisa Rambo*

Understanding Learning Difficulties and Resulting Emotional Processes in Programming Courses

Isabella Wu

Introductory programming courses suffered from low retention rates and poor student performance, which is one of the most significant challenges in broadening participation in computing (BPC). However, it is extremely challenging to motivate the students in programming courses since they have heterogeneous levels of knowledge, motivation, interest, and different learning styles. Few attempts have successfully developed pedagogical changes to achieve such. In fact, a most recent review has reported that some of these activities increase the instructor's burden and hurt the students as much as they helped. Therefore, it necessitates the investment to gain in-depth knowledge of students' differences in motivation, cognitive needs, and learning difficulties and explore appropriate intervention strategies considering instructors' costs and students' benefits. The long-term goal of this project is to develop an empowerment tool based on Artificial Intelligence for computer science instructors to gauge the individual learning difficulties and the resulting emotional processes and then utilize this information to adapt instructions to motivate and arouse students' interests in programming courses. The project includes three phases. Phase 1 involves study design, meta-analysis of existing learning theories, and interviews and surveys of students and instructors to understand their perspectives on learning difficulties and emotional processes. Phase 2 involves the experiment protocol, smartwatch app development, and computational models to predict the moments when students encounter learning difficulties. Phase 3 will deploy the smartwatch app and implement the empowerment tool for instructors. This year, I worked under the supervision of Dr. Gong to participate the Phase 1 of the project. My major contributions include a literature review of learning theories, assisting in study design, including experimental protocol development and data collection processes. *Mentor: Dr. Jiaqi Gong, University of Alabama.*

The Visual Semiotics of Birds

Sofia Lagulli

My project is an exploration into the semiotics behind birds and how through nearly every culture they have come to signify something greater than themselves, from their appearances as ancient religious symbols to their modern use in the media. During my research I conducted a semiotic analysis of birds as symbols throughout art history, and using techniques and methods I learned, I created a series of artworks in which I experiment with the relationship between the icons, indexes, and symbols of birds, playing with what they signify within their context in order to convey an intended message to my viewer. *Mentor: Orren Kickliter*

WWOZ New Orleans 90.7 FM: The Global Voice, Archive, and Emissary of New Orleans Music and Culture

Parker James

Independent radio station WWOZ New Orleans FM 90.7 is a guardian, tastemaker, and broadcaster of the city's high-spirited and funky musical heritage and culture. The station plays a curated concoction of jazz, blues, zydeco, soul, rock, and world music while supporting local musicians who often perform live. WWOZ began operating from a beer storage closet above the famed Tipitina's nightclub in 1980 but has since expanded into a multimedia organization fronted by a colorful cast of eccentric on-air personalities who promote and preserve New Orleans music and culture locally and worldwide. WWOZ's modern streaming model - including its new intermedia "Groovapedia" portal and traditional audio and video streams - redefines how a city's culture perseveres in an ever-changing, contemporary audio landscape. As the influence of local radio continues to die and streaming



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services and podcasts become more omnipresent, WWOZ has answered this shifting context by offering listeners an authentic sense of place. WWOZ's DJs are fiercely independent and are provided ample license to deliver eclectic playlists while showcasing their offbeat on-air personalities, many of which are tied to cultural characteristics found throughout the city's diverse neighborhoods. This paper will explore the significance of WWOZ's worldwide outreach model as well as the on-air luminaries who jazz historian Jason Berry identified as "a kaleidoscope of voices, rich in oral imagery – jazzmen, composers, Cajun fiddlers, parades, grand marshals, gospel artists and R&B bluesmen, writers, occasional filmmakers, historians, Mardi Gras Indians, fathers and sons and mothers and daughters of musical families. WWOZ provided intimacy between the musicians and listeners, immeasurably broadening the sense of place." *Mentor: Dr. John Hoyle.*