



ALABAMA SCHOOL OF MATHEMATICS AND SCIENCE

2023 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

ASMS Dragon Legacy Distinguished Alumni Lecture

Ryan L. Shelby, Ph.D.

2:15 pm - Auditorium

Paper Presentations

3:00 pm - 4:00 pm

Media Room

- 3:00 pm *Small Angle X-Ray Scattering Intensities in BCN Compounds* - **Tuyako Khristoforova**
- 3:20 pm *Small Angle X-Ray Scattering for Structural Characterization of Glutathione-S-Transferases* - **Shayla Abrahms**
- 3:40 pm *Hulk Studies: Gender and Politics in Marvel's Hulk Media* - **Dayne Birdwell, Guils Holbrook, Lex Mroczko, Lily Smith**
- 4:30 pm *Alumni-Student Networking Panel: Engineering*
- 5:00 pm *Alumni-Student Networking Panel: Medical*

B208

- 3:00 pm *Proposing a Practical Solution to the Lack of Pedestrian and Biking Infrastructure in the US* - **Ugie Alilonu**
- 3:20 pm *Walkability Project - Future Fellows Special Presentation* - **Ella Brochu, Reagan Constantine, LeahGrace Feirman, Kimberly Gregson, Emily Imperato**
- 3:40 pm *Walkability of Mobile and Its Effect on Sustainability - Future Fellows Special Presentation* - **Emma Hunter, Chaselyn Martin, Esha Patel, Mary Whittington, Jenna Wood**
- 4:30 pm *Alumni-Student Networking Panel: Business / Tech*
- 5:00 pm *Alumni-Student Networking Panel: Academia / Research / Graduate School*

B126

- 3:00 pm *Mobile's Antebellum Ambassadors: The Old South Symbolism of the Azalea Trail Maids* - **Mia Brown, Andreea Trifas**
- 3:20 pm *"I Want to Break Free": How Music Reshaped Perceptions of the LGBTQ+ Community* - **Kaylie Hull**
- 3:40 pm *Finding the Driving Factors Behind Belief in Climate Change in the Mobile/Baldwin County Area* - **Wyatt Aiken**
- 4:30 pm *Alumni-Student Networking Panel: Law / Education / Non-Profit / Leadership*
- 5:00 pm *Alumni-Student Networking Panel: Art / Architecture / Design*

B129

- 3:00 pm *Use of Sodium Ascorbate to Neutralize Stratospheric Chlorine Radicals* - **Wei Cui, Sara John, Ayah Shalan**
- 3:20 pm *CiliaBuilder: A Hair Prosthetic for Your Ears* - **Gabriel Gurt, Marlan Zha**
- 3:40 pm *Using Genetic Algorithms to Create Magic the Gathering Decks* - **Sebastian Grieves**

Poster Session

3:00 pm - 4:15 pm

Bedsole Library Hallway



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Abstracts (alphabetical order)

A Yeast Genetic Model for Targets That Suppress a Premature Termination Codon Mutation

Violet Morin

The yeast oligomycin resistance gene (YOR-1) in yeast corresponds to the Cystic Fibrosis transmembrane conductance regulator (CFTR) gene in humans. Yeast is used as a model organism to analyze the function of gene expression in humans. Further methods can be used to obtain haploid double mutants, such as the R1182X- YOR-1 and the knockout strand of each other gene. Once the double mutants are obtained, quantitative high-throughput cell array phenotyping (Q-HTCP) methods developed in the Hartman lab, are used to measure genetic interactions and find targets for PTC, or premature termination codon, suppression. Yeast is useful for testing a wide range of genetic targets with specific assays. These can then be analyzed to see if the targets are conserved in the human genome, linking to application with Cystic Fibrosis. These targets are required for protein termination, and when their gene function is impeded, protein translation proceeds irregularly. PTCs work to stop the translation of genetic code before the intended termination location. Locating these PTCs for suppression serve as a target for possible correction of Cystic Fibrosis in humans. Mentors: Dr. John Hartman IV, Mr. Ryan Mancinone, University of Alabama at Birmingham; Ms. Kristal Webb

CiliaBuilder: A Hair Prosthetic for Your Ears

Gabriel Gurt, Marlan Zha

The World Health Organization has projected that one in four people - 2.5 billion people - will experience hearing loss by 2050. Although hearing loss is becoming a more pressing issue to society, an adequate solution to hearing restoration has still not been realized. CiliaBuilder, a prosthetic hearing implant, is a solution to this impactful problem. One major cause of hearing loss is the degradation of stereocilia, which are hair-like appendages on the outer hair cells in the cochlea. Stereocilia receive sound vibrations, which are then converted into nerve signals. However, when stereocilia become truncated, the ability to process vibrations as nerve signals becomes inhibited. CiliaBuilder will selectively attach to stereocilia by binding to protein conjugates that are determined to be unique to stereocilia. Therefore, CiliaBuilder aims to repair damaged stereocilia and restore hearing ability. *Mentor: Dr. Elisa Rambo*

CoffeeMath, A Java-Based Multi-Tool for the Struggles of Mathematics

Zachary Desmond

CoffeeMath is a student-led and student-created mathematics tutoring program made to compile various math subjects into a single tool and give centralized resources for practice and study. Over two terms, peer feedback on which mathematics topics caused the most struggle was used to construct a Java program best geared toward assisting students in any they needed help with. The product is a prototype with all relevant functionality and a foundation in various studies on game-based learning, using gain or loss of score and positive feedback as a launching point for subject confidence. Based on current feedback, the project helps as designed in all areas, acting as a well-balanced tutoring software that negates most any need to access external sites. This point with not conclude the project, however, as the program will be polished into a full version, expanded with more complex areas of study, and fitted for public release. Data on its effectiveness across the web will then be collected, and its usefulness to all types of users can be gauged. *Mentor: Mr. Grey Gaillard*



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Comparison of Heavy Metal Toxicity in Commercially Important Vascular Plants

Pariz Lumpkin

Organic metals play a key role in cellular and metabolic processes in all living organisms. Heavy metals such as iron, cobalt, copper, and zinc aid in the functioning and mechanism of plant cells. While they are essential, it is important for them to be utilized in moderation because prolonged exposure may result in metal toxicity, emulating catastrophic effects. It is important to know and see how organisms respond when faced with metal toxicity. To visualize how these metals affect plants when at high concentrations, iron was added to the soil of 3 different plant species, and growth, aesthetic/disorder, and production were observed over 6 weeks. Through the weeks, plant health began to decline; leaf color changed, leaves wilted and even began to fall from their stems, suggesting that the iron addition posed a serious threat to the integrity of the plants. *Mentor: Dr. Rebecca Domangue*

Creating Glowing Vesicularia dubyana through Absorption of Green Fluorescent Protein

Destiny Buchanan

Biologists have proposed that creating natural sources of light, rather than electric, could ameliorate the negative impacts of light pollution. Genetically engineering plants to glow has been successful, however this practice is inaccessible, and expensive for municipalities. Less is known about the use of non-engineering methods of creating bioluminescent plants. In this study, the effects of Green Fluorescent Protein (GFP) on moss *Vesicularia dubyana* was observed to see if it is possible to create bioluminescent plants without the use of bioengineering. To do this, a liquid GFP dosage is given to *V. dubyana* over a period of time. However, we have concluded that *V. dubyana* is also luminescent naturally under UV blacklight, which made this experiment rather difficult. After dosage, bioluminescence was observed under a Dark Reader, rather than a UV flashlight to remove the influence of the pigmentation of the moss. It was found that no luminescence was observed in the control but could be found in the senesced samples from the treatments. Therefore, we cannot entirely conclude that this resulting pigmentation difference in the treated senesced samples was the bioluminescence, rather that it could be a negative cellular response to the GFP. This experiment has proved that this methodology for creating bioluminescent plants is inconclusive and requires further study on varying organisms to fully support this conclusion. *Mentor: Dr. Rebecca Domangue*

Defect Characterization of Ti3Al Using Small-Angle X-Ray Scattering

Anya Doyle

Small-angle X-ray technique is a powerful technique for characterizing materials. In this research, I used this technique to understand the variations in X-ray patterns based on the material compositions and model sizes by using various computer simulations for Ti₃Al compound. Within the basis of the experimental data from a material research project database, I have simulated the different sizes of Ti₃Al compounds and average linear size of internal defects in simulated materials are characterized by using Guinier approximation in Small-Angle X-Ray Scattering Intensities. Knowing the internal defects along with the interstitial gap (octahedral and tetrahedral), roughness and porosity, this material can be used in medical osseointegration medical technique. Ti₃Al is also the most promising implant material such as in dental implant and hip, knee joint replacement and equally applicable in the aerospace industry, but its internal morphology variation based on sample size, and other variables need to be studied. In this work, I have studied Ti₃Al material of sized 1700-27000 atoms where I have observed the linear size of the gaps in the material ranged from 5.83Å - 7.86Å, which yield gap (defect) volume more than the packing fraction of the material. *Mentor: Dr. Durga Paudel*



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Find the Face: Analysis of Facial Recognition Algorithms for Live Face Detection

Trinity Causey

Given the scenario of needing a more efficient manner of checking students into and off campus, I compared multiple facial recognition algorithms to find which would be best able to identify people in live time. Principle Component Analysis (PCA) transforms variables into a coordinate system and compares the principal component axis to the plotted points to find the maximum variance in the data. Independent Component Analysis (ICA) converts signals into coordinates where each component's independence is maximized. Linear Discriminant Analysis (LDA) separates and classifies data across a transformed space for better distinctions. Elastic Bunch Graph Matching (EBGM) compares two graphs of information and finds the best possible between points. Convolutional Neural Network (CNN) based algorithms, such as FaceNet and LightCNN, learn to extract hierarchal and spatial features of face images to compare to datasets. Of the algorithms, CNN-based algorithms are highly accurate when recognizing faces under various conditions of lighting, pose, and expressions. *Mentor: Mr. Grey Gaillard*

Finding the Driving Factors Behind Belief in Climate Change in the Mobile/Baldwin County Area

Wyatt Aiken

The effects of Climate Change are beginning to be felt around the world. Belief in Climate Change from everyday people greatly impacts how governments are able to work to reduce its effects. This study aims to find out what influences people's beliefs in Climate Change in the Mobile/Baldwin County area. A survey was distributed to collect demographic information, perceptions about environmental impacts, and beliefs surrounding Climate Change. Data was analyzed with statistical software (STATA) and will be used to present correlations between certain factors and varying levels of belief. Moving forward, this will be impactful, as it will be important to convince the whole population that Climate Change poses a true threat to enact real change. *Mentors: Dr. Thomas Shaw, University of South Alabama; Ms. Kristal Webb*

Hulk Studies: Gender and Politics in Marvel's Hulk Media

Dayne Birdwell, Guils Holbrook, Lex Mroczo, Lily Smith

Marvel's Incredible Hulk character has appeared in comics and other media since 1962. Throughout its publication history, the character has often embodied prevalent fears of the cultural moment, from nuclear warfare to mental illness. In an effort to examine how depiction and reception of the Hulk character have evolved over time, students in this humanities research project collaborated to produce interdisciplinary papers in literary criticism, pop culture studies, gender studies, and psychoanalysis. They considered a variety of print texts from authors including Stan Lee, Peter David, and Al Ewing, as well as visual media such as the 2022 She-Hulk television series. The students originally presented their work at the 2023 Louisiana State University English Graduate Student Association Conference. *Mentor: Dr. Mitch Frye*

"I Want to Break Free": How Music Reshaped Perceptions of the LGBTQ+ Community

Kaylie Hull

My research is called: "I Want to Break Free": How Music Reshaped Perceptions of the LGBTQ+ Community. I am researching music from the 70's and 80's, more specifically, how said music brought to light the lives of LGBTQ+ people, and thus caused real political change regarding their freedom expression in America. Some examples of songs that fit into this category are "It's raining men", "I'm coming out", and "I will survive." *Mentor: Mr. Daniel Commander*



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Ions of the Gulf Coast

Brian Jeong, Conan Lin, Olivia McDonald, Allen Wright

The Gulf Coast water quality has differed for decades and is very rarely questioned on what may be in it. Our research is testing the types and amounts of ions in the different environmental water locations and times that can affect the overall water quality on the Gulf Coast. We will be doing this by using an ion chromatographer to separate ionic species by separating them based on their interaction with a resin that will be inside the ion chromatographer. These sample solutions will pass through a pressurized chromatographic column where the ions will be absorbed by column constituents. We want to find exactly how the different locations and times can affect the quality of the water in the Gulf Coast with four different locations all over Alabama of water samples.

Mentor: Mr. Kevin Dolbear

Investigating Effects of Various Aluminum Shields in Mutual Inductance for Wireless Power Transfer Systems

Sara John

This project proposes the use of aluminum shielding with flex ferrite cores to increase the efficiency of a wireless power transfer system. Wireless power transfer (WPT) systems are a developing technology limited by distance and alignment between the inductors in the system. WPT systems will utilize cores, usually ferrite, to minimize losses in the transfer of electromagnetic power transfer. However, ferrite cores are heavy and bulky, leading to design limitations in their use. There has been some research in the use of aluminum shielding with ferrite cores, but there is little research on the use of flex ferrite paired with aluminum shielding in WPT systems. This pairing proposed a lighter alternative to the use of ferrite cores. Power transfer was observed by measuring the mutual inductance of two coils with the varied cores and shields. The results display that the aluminum foil (allow of aluminum, iron, and silicon), and the aluminum sheet shields with the flex ferrite both had lower inductance in comparison to the flex ferrite by itself. This lower inductance correlates to a lower power transfer, meaning that this shielding method decreased the efficiency of the power transfer. *Mentors: Dr. Jessica Alexander; Dr. Daniela Wolter Ferreira Touma, University of South Alabama*

Measuring the Effects of Microplastics on Soft Corals

Hakeem Meniffee

Scleractinian corals have been recently found to incorporate microplastics into their calcium carbonate skeleton once they have been consumed¹. However, Alcyonacea or Soft corals do not have these skeletons. There is some evidence that microplastics are unhealthy for scleractinian corals but little is known of their effects on soft corals¹. Research on the effects of microplastics on coral health can deepen the current understanding of the effect microplastics may have on reefs. *Mentor: Dr. Rebecca Domangue*

Measurement of Dielectric Constant in Fe-Substituted Cr₂WO₆

Mary Ellis Barton, Thomas Carmichael, Brantley Howard, Julia Taylor,

Magnetodielectric materials are useful in several computing devices, particularly for use in random access memory (RAM) systems. By using Magnetodielectric properties for components in RAM systems, a better system with faster speeds and more efficient and effective memory transfer methods can be achieved, however this requires the synthesis of such magnetodielectric compounds capable of exhibiting a large dielectric constant at or near room temperature. Towards this goal, we have investigated compounds related to Cr₂WO₆ and Fe₂WO₆ which have previously been observed to exhibit magnetodielectric properties at their Néel temperature, with that transition occurring well below room temperature for both materials. Previous studies have demonstrated that increasing amounts of iron in the Fe_{2-x}Cr_xWO₆ series leads to an increase in the Néel temperature, with the composition we have chosen as the focus of our study, Fe_{1.7}Cr_{0.3}WO₆, having a Néel transition above 300K which would be suitable for room temperature applications if the material exhibits a large dielectric constant. To determine whether this material exhibits magnetodielectric properties, powder samples of the material have been



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synthesized and studied via impedance spectroscopy to obtain a dielectric constant for the material at room temperature. *Mentors: Dr. Matthew Davenport; Dr. Adam Hauser, University of Alabama*

Microneedle Lenses: An Effective Treatment for Wet Macular Degeneration

Retaj Shaalan, Joseph Sherrod

Age-related macular degeneration (AMD) is an eye disease observed in many older individuals that distorts one's central vision. The two types of AMD are wet AMD and dry AMD. Wet AMD is caused by the growth of abnormal blood vessels, which leak blood, damaging the macular region. Dry AMD is caused by the deaths of macular cells, which damage one's vision over time. The goal of this proposal is to develop a treatment for wet AMD that eliminates the negative effects of current treatments and offers a more mainstream approach to treat macular degeneration. The proposed treatment aims to use a contact lens with an interior of PCI microneedles containing nitric oxide to expand the macular blood vessels, allowing proper blood, nutrient, and oxygen flow throughout the eye. While the lens may require adjustments for each patient's physical characteristics, these lenses could reduce many risks associated with eye injections. *Mentor: Dr. Elisa Rambo*

Mobile's Antebellum Ambassadors: The Old South Symbolism of the Azalea Trail Maids

Mia Brown, Andreea Trifas

The Azalea Trail Maids have been iconic to the "Azalea City," or Mobile, Alabama ever since the founding of the Azalea Trail in 1929. In its early years, the Trail Maids were a small selection of high school girls whose purpose was to attend the grand opening of the Azalea Trail each year, wearing pastel, ruffled dresses with matching bonnets and parasols in debutante fashion. Historic articles describe predominately white Trail Maids appearing at events to "Smile, look pretty, and pose for photographs in their large antebellum dresses."—responsibilities that embody an outdated and derogatory view of women. Today, the organization has expanded to fifty girls from high schools in the Mobile area, selected through a competitive application process. Recently, there have been a number of objections over the Maids' presentation at events, including former Alabama NAACP president publicly associating the Trail Maids' representation with a "shameful past." Through analyzing depictions of the role of the Trail Maids in past newspaper articles, discourse surrounding their message, accounts of former, present, aspiring Trail Maids, and members of the Mobile community, we will address "Old South," Confederate imagery and controversy and examine the Azalea Trail Maids in a modern, 21st century awareness. *Mentor: Mr. Derek Barry*

New Insights into the Cranial Osteology of a Pan-Cryptodiran Turtle from the Upper Cretaceous of Alabama, USA

Dori Do, Omar Hernandez, Rita Tran

Pan-Cryptodires are one of the most understudied groups of fossil turtles despite their evolutionary significance. Several members of this clade closely approximate the hypothetical ancestral condition for Cryptodira and may represent the most recent common ancestors of multiple extant lineages of Testudine. Here we describe the skull of pan-cryptodiran turtle from the Upper Cretaceous Mooreville Chalk of Alabama, USA using micro-computed tomography to provide the anatomical basis for future phylogenetic analyses. Preliminary investigations into the cranial osteology of this species have revealed the presence of features similar to those found in "macrobaenid"-grade turtles from the Upper Cretaceous of Alberta (*Judithemys sukhanovi*) such as enlarged foramen posterius canalis carotici basisphenoidalis and other features which more closely approximate those found in pan-chelonioid marine turtles such as *Ctenochelys acris* and *Toxochelys moorevillensis* including a large contribution to the secondary palate by the palatine and the presence of a lateral bulge along the anterior margin of the postorbital. This combination of characteristics provides additional evidence supporting not only the proposed close evolutionary interrelationship of "macrobaenids" and americhelydians but also the North American origin of stem chelonioids during the Late Cretaceous. *Mentor: Dr. Andrew Gentry*



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Predicting Future Trends in Programming

Ajay Wallack

Throughout computing several programming languages have overtaken all others in uses, only to be mostly forgotten about. When starting any project, an important step is deciding what program language to use. One way to go about this is to see what is in use today, what is dying, and what is going to become more popular. Using data from a stack overflow survey, we can visually see not only current popularity, but also growing popularity. By recognizing trends along age groups, we can analyze the past and predict the future for a great number of programming languages. *Mentor: Mr. Grey Gaillard*

Proposing a Practical Solution to the Lack of Pedestrian and Biking Infrastructure in the US

Ugie Alilonu

The United States is very vehicle-centric, putting walkability and bike-ability aside to better suit cars. This is damaging to the country in terms of people's health, their connectivity, and the environment (through greenhouse gas emissions). The goal of this project is to propose a practical solution to the lack of pedestrian and bicycle infrastructure in the United States. I first researched current transportation trends in the United States, then developed five potential road layouts that would improve walking and biking infrastructure. I then created a transportation survey, including questions about the five proposed road layouts and administered it in my school community. About half of respondents did not have accessible sidewalks around their home, and about 22% had minimal sidewalks in their area. 65% of respondents used their car daily for trips further than one mile away, while 79% do not use bicycles at all for transportation in general. The main reasons respondents did not bike as a main source of transport was that it takes too long, not enough lanes, and their lack of ownership. The most popular layout among driving, biking, and walking was Layout 1, directly followed by Layout 2. This research will benefit society, increasing pedestrian and cyclist access and lowering many of the disadvantages of having an overproportionate reliance on motor vehicles. The engineering goal was met, and the next steps is to meet with civil engineers and urban planners to see if these solutions could be put into practice. *Mentor: Dr. Jessica Alexander*

Small Angle X-Ray Scattering Intensities in BCN Compounds

Tuyako Khristoforova

The Small-Angle X-ray Scattering technique can be used to probe the crystal defects of simulated BC₂N bulk compounds, which is prepared using the VESTA software. With the detailed and systematic analysis of the X-ray patterns from this material, it can help to akin the defect size; This allows us to understand the variations in elastic properties of BC₂N compounds. My results show that there exists density fluctuation in the simulated crystal using the VESTA software. Defect sizes are numerically estimated with the SAXS pattern with the Guinier approximation. This result suggests that naturally, present crystal defects in this material should be considered to estimate Young's Modulus constant calculation. *Mentor: Dr. Durga Paudel*

Small Angle X-Ray Scattering for Structural Characterization of Glutathione-S-Transferases

Shayla Abrahms

Small-angle X-ray Scattering (SAXS) technique is used to probe the structure variation in Glutathione S Transferases (GSTs) that have been obtained from the protein data bank (PDB). The real space information and the reduced radial distribution function (RRDF) of intrinsically disordered GST proteins are extracted in momentum space by calculating the Static Structure Factor using the Fourier transformation. It is observed that, in small wave vector regions, there is structural variations in GSTs proteins. However, the 3D visualization of protein and RRDF of all used configurations are not distinctly different. The SAXS technique was able to detect the structure and morphology of the GSTs proteins. Scattering intensities patterns analysis and the Kratky plot suggest



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that 14GS assembly is the least folded (almost unfolded) configuration while 9GSS is a highly folded configuration. All other GST proteins are of partially folded configurations that exhibit both globular and flexible characteristics.
Mentor: Dr. Durga Paudel

SumIt Puzzle Analysis

Ava Dowden

SumIt is a mathematical summing puzzle created by Dr. Steven Clontz. In this puzzle, a five digit number and a four digit number are added together and result in a second five digit number. The four digit addend and the five digit sum will contain each of the digits 1-9 once within the numbers, and the puzzle can leave up to all nine spaces blank in some cases and still create a unique puzzle. In this project, the proofs for the minimum and maximum numbers of the addends and sum are given so that the puzzle will result in a unique solution. *Mentors: Dr. Steven Clontz, University of South Alabama, Ms. Kristal Webb*

Use of Sodium Ascorbate to Neutralize Stratospheric Chlorine Radicals

Wei Cui, Sara John, Ayah Shalan

Ozone is a fundamental component of Earth's atmosphere, found distinctly in the lower stratosphere. The ozone layer acts as a vulnerable shield to protect humans and other life forms from harmful shortwave ultraviolet (UV) radiation. However, chlorofluorocarbons, used in commercial and industrial applications, have been a main source of free radical species that have been damaging the ozone layer for over two decades. Chlorine radicals, in particular, can have a devastating effect on the level of ozone in the stratosphere. Efforts to preserve declining ozone levels have been tenuous and speculative. This project presents a method to neutralize free chlorine radicals using sodium ascorbate absorbed onto a porous framework and carried into the stratosphere by weather balloons. Used in conjunction with governmental regulations, this proposed technology will provide long-term and dependable protection of Earth's ozone layer. *Mentor: Dr. Elisa Rambo*

Using Genetic Algorithms to Create Magic the Gathering Decks

Sebastian Grieves

Genetic algorithms are used throughout computer science to estimate optimal solutions to problems that have infinite or near-infinite solutions. In this case, we are looking at creating Magic the Gathering decks, because of its unique features as a test case. For example, within the standard format, there are 2000+ cards that come together in decks of 60, the number of possible decks and the resources to analyze them is nearly infinite. The difference between this genetic algorithm compared to a classical version is that instead of a generational approach, I am using a continuous strain of procedurally generated decks. Taking this approach is meant to stray away from local optima and find the global optima, but there are assumptions made during development that don't hold true when run, so the algorithm falls short of desired. *Mentor: Mr. Grey Gaillard*

Walkability Project

Future Fellows Special Presentation

Ella Brochu, Reagan Constantine, LeahGrace Feirman, Kimberly Gregson, Emily Imperato

To answer the question, "Is Mobile a walkable city," this project involved an audit of streets in the historic midtown neighborhoods of Old Dauphin Way and Oakleigh to determine walkability and sustainability. All over the world, urban planners and urban residents are working to make city streets more walkable. Our Human Geography class decided to conduct research on the streets surrounding ASMS to gauge the walkability of our streets. We answered this question by using both quantitative data, such as the walk score, and collecting qualitative data for an audit which involved taking pictures of built features such as sidewalks, bus stops, street lighting, curbs, and buildings. We used the 40- STEPS Field Audit to examine the streets according to six elements: pedestrian infrastructure, tactile calming and streets, building characteristics, transit, bicycling infrastructure, and aesthetics or disorder. To assess our streets, we personally visited each selected street segment and used Google Street View on Google Earth to create a more inclusive and extensive study of our area. In addition to scholarly articles,



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we also conducted interviews with professionals, Jeff Specks and Carol Hunter, to learn how streets in Mobile compare to others in the United States and better understand how the national trend of creating more walkable streets is an important factor in developing sustainable and growing cities like Mobile.

Mentor: Dr. Diane Gerard

Walkability of Mobile and Its Effect on Sustainability ***Future Fellows Special Presentation***

Emma Hunter, Chaselyn Martin, Esha Patel, Mary Whittington, Jenna Wood

An assessment on the walkability of streets in two of Mobile's historic neighborhoods provides a glimpse into how the lack of walkable streets may affect the population's health, the city's economic condition, and the city's sustainability overall. The walkability of a city creates the opportunity for residents to spend time outside and walk rather than drive to nearby places, which creates a healthier population. This healthier population can serve as a healthier workforce and support the city's economy, promoting the city's overall sustainability. A 40-step qualitative audit divided into six categories was used to assess the conditions of streets and the built environment at the street level. In addition to the audit, urban planner Jeff Speck's walkability theory that a walkable street must serve a purpose, be safe, provide comfort, and show signs of humanity was implemented throughout the analysis. The streets audited did not fulfill all of the desired features of walkability and some were very unclean with uneven and cracked sidewalks, creating the possibility of an injury. Nevertheless, the streets of the Old Dauphin Way neighborhood were close to shops and restaurants and also at a safe distance from the road. Our group concluded that improvements can most definitely be made to fix many of the problems making Mobile a more walkable, and therefore, a more sustainable city. *Mentor: Dr. Diane Gerard*

X-ray Scattering Technique for Structural Investigation of Disorder Proteins

Alejandro De Los Santos Gallegos

The Small-X-ray Scattering Technique (SAXS) and the Guinier Law (GFM) were used to analyze the properties of proteins by measuring the intensity of X-rays scattered by a sample on the Protein Data Bank (PDB). SAXS is a small-angle scattering method used to assess macromolecule size and shape, pore diameters, and the characteristic distances of partly ordered materials, while the GFM is used to predict particle sizes in a variety of scientific fields. The VMD Software was used to calculate pore dimensions of the holes through molecular structures of ion channels and find the XYZ coordinates of the HER-Binding Kinase protein found in breast cancer cells. By knowing the structure factor of the protein, we can better analyze the source of oncogene findings in breast Cancer cells. *Mentor: Dr. Durga Paudel*