

Andrews University Honors Scholars & Undergraduate Research Poster Symposium



February 28, 2020

2:30-4:00 p.m.

Buller Hall Lobby

 J.N. Andrews
Honors Program

 Office of Research &
Creative Scholarship

Welcome

This symposium celebrates the efforts of undergraduate researchers and their faculty mentors which now culminate in the public presentation of their projects. Many of the students presenting today have worked over the course of several semesters or even years on the research topics they have chosen. We hope that their passion for their field, persistence despite unexpected results, and dedication to in-depth and integrated learning inspires you to be better administrators, educators, mentors, and students.

Since its founding in the 1960s, the J. N. Andrews Honors Program at Andrews University has fostered enthusiastically the challenges and discoveries of undergraduate research. By means of the Honors Thesis, the Honors Program requires its students to engage in substantive primary investigations in which students take an active role in posing research questions, designing and refining methodologies, collecting data and results, and critically analyzing the significance of their conclusions.

The Undergraduate Research Scholar Award was established in 2002 to facilitate more opportunities for students to engage in research and creative scholarship in greater depth than required by their individual programs of study. The Award enables students to work closely with faculty mentors, participate in disciplinary conferences, and develop important professional skills.

The Honors Program gladly joins hands with the Office of Research and Creative Scholarship in sponsoring the annual Honors Scholars and Undergraduate Research Poster Symposium, which recognizes the achievement of Honors Thesis scholars as well as other undergraduate students engaged in substantial research projects. A team of highly engaged faculty research mentors makes possible a rigorous program of undergraduate research. We thank each mentor for the commitment of time and energy invested in Andrews University's young scholars. Each year at the Spring Student Awards Assembly, we honor three exceptional faculty research mentors. Citations for the 2019 Undergraduate Research Mentor Awardees are given on page 18.

The J. N. Andrews Honors Program and Office of Research and Creative Scholarship thank heartily the Andrews University faculty members and Honors Council members who give willingly of their time and energy to support and evaluate undergraduate research. The Honors Council Members include: Sonia Badenas, Karl Bailey, Vanessa Corredera, Ryan Hayes, James Hayward, Shandelle Henson, Naeha Inapanuri, Katherine Koudele, Beverly Matiko, Andras Muranyi, Benjamin Navia, L. Monique Pittman, Darah Regal, Davide Sciarabba, Rodney Summerscales, Tiffany Summerscales, Karin Thompson, and Robert Zdor. We also thank our administrative assistant, Maxine Umana and research staff, Jeff Boyd and Mordekai Ongo, as well as our student assistants, Isabelle Dias and Elianna Srikureja, for their hard work in helping to make this event a success.

Many thanks for working together!



L. Monique Pittman
Professor of English
Director of the J.N. Andrews Honors Program



Gary W. Burdick
Professor of Physics
Dean of Research

Honors Thesis Poster Presentations

P-01 *Lectin Properties of Synthetically Produced Glucuronate, Alginate, and Related Boronates*

Vanessa Angel (Karen Reiner, Medical Laboratory Sciences)

J.N. Andrews Honors Scholar

In the nineteenth century, researchers discovered the ability of some proteins to agglutinate red blood cells (Goldstein, 1980). The proteins were found mainly in the seeds of leguminous plants and were named phytohemagglutinins, or hemagglutinins. Particular hemagglutinins were able to agglutinate red blood cells (RBCs) of a particular blood type. Lectins are proteinaceous macromolecules of nonimmune origin, capable of interacting with carbohydrates to form complexes (Goldstein, 1980). Lectins derive mainly from leguminous plants, animals, fruiting bodies of fungi, and bacteria. This research focuses on identifying the lectin characteristics of synthetic compounds through agglutination of red blood cells of known blood group and type. Lectins continue to be the focus of research due to their potential diverse applications, specifically for blood grouping, mitogenic activity, and even stem cell transplantation.

P-02 *The Boricua Dialogues: Puerto Rican Identity in Conversation & Photography*

Jonathan Borton (David Sherwin, Visual Arts, Communication & Design; Vanessa Corredera, English)

J.N. Andrews Honors Scholar and Undergraduate Research Scholar

The Boricua Dialogues began from a desire to engage with my identity as a Puerto Rican who has always felt out of place in Latinx environments. This research project uses 50 35mm film photos and 11 interviews to articulate aspects of the shared cultural narrative between Puerto Ricans with different experiences. The project does not establish a set definition of being “Puerto Rican” but rather brings together a group of Puerto Rican voices into a photography book that highlights the lived experience of being Puerto Rican.

P-03 *Gender Role Beliefs and Intercultural Romantic Relationships*

Jessica Bujor (Karl G. D. Bailey, Behavioral Sciences; Sonia Badenas, International Languages & Global Studies)

J.N. Andrews Honors Scholar

We investigate gender role beliefs and romantic relationship quality and how those beliefs influence willingness to engage in intercultural relationships. The online survey will be distributed to the university campus and through researcher’s social media. This study furthers research on the factors that influence intercultural relationships and quality thereof.

P-04 *Design & Music: A Synergetic Experience*

Letitia Bullard (Douglas Taylor, Visual Arts, Communication & Design; Adriana Perera, Music)

J.N. Andrews Honors Scholar

This Honors thesis project, in combination with my Senior Bachelor of Fine Arts (BFA) Exhibit, explores the ways in which both graphic design and music convey certain ideas. For this research I have created original songs that incorporate musical elements that lend to the message embedded in the lyrics. Each song is accompanied by design work that visually interprets the meaning of the lyrics. This project will provide the viewer with a synergetic visual and auditory experience.

P-05 *Sihon, Pools, and Disaster: The Memory of Biblical Heshbon*

Alma Cortez-Alvarez (Rahel Wells, Religion; Øystein LaBianca, Behavioral Sciences)

J.N. Andrews Honors Scholar and Undergraduate Research Scholar

Cultural memory is a recent development within biblical studies. Recent research advocates the observance of the biblical text as a basis for the study of cultural memory, in order to engage its historical value. The biblical site of Heshbon in TransJordan serves as a case study to examine how cultural memory interacts with the Bible. In a content analysis design, I engage the biblical cultural memory of Heshbon by evaluating the themes in the text. Based on data collected from 38 verses within 19 passages across the Hebrew Bible, I conclude that the biblical text reflects different narratives and cultural memory emphases for the site of Heshbon.

P-06 *Synthesis of Pyrazolones and the Novel Hybrid's Effects on Glioblastoma Cancer Cells*

Joanna Deonarine (Denise Smith, Biology; Desmond H. Murray, Chemistry & Biochemistry)

J.N. Andrews Honors Scholar

The purpose of this research is to develop a new technique to synthesize a heterocyclic compound using fruit puree, investigating its anti-cancer activity on glioblastoma cancer cells. Recently, there has been interest in heterocycles due to their anti-cancer properties, and they have been used in almost two-thirds of novel molecular anti-cancer agents. Varying fruit purees have been used to synthesize the compound 3-methyl-1-phenyl-5-pyrazolone and tested for their anti-cancer activity on glioblastoma brain cancer cells. The compounds tested for cell viability had notable anti-cellular effects of varying potencies. In future studies, more fruits could be tested for their effectiveness in synthesis and tested to determine the novel hybrid's efficacy in inhibiting the initiation of tumors as well as its anti-invasive properties.

P-07 *Evaluation of Anticancer Activity of Heterocyclic Arylidenes on the U87MG (Brain) Cancer Cell Line*

Bernadette Flores (Denise Smith, Biology)

J.N. Andrews Honors Scholar

Glioblastoma multiforme is a type of brain cancer that develops from glial cells, which surround neurons and provide support and insulation. Previous investigation has shown that some heterocyclic compounds are key in improving the properties of anticancer drugs by enhancing lipophilicity, polarity, and other varying physiochemical features. Synthetic heterocyclic compounds used as anticancer drugs attempt to imitate naturally-occurring ligands and substrates so as to disturb the natural balance in cells. Testing was done to determine the anticancer abilities of boronic acid and non-boronic acid substituents at various positions on the aromatic ring of the compounds using a cell viability count.

P-08 *A Comparative Analysis of National Identity Construction and Rhetorization in Shakespeare's Henry V and Aphra Behn's Oroonoko; Or, The Royal Slave*

David Forner (L. Monique Pittman, English)

J.N. Andrews Honors Scholar and Undergraduate Research Scholar

Positioned at the climax of both William Shakespeare's *Henry V* (1600) and Aphra Behn's *Oroonoko* (1688) are dynamic calls for battle: while King Henry rallies his forces against the French, Oroonoko—an enslaved African prince—ignites a slave insurrection against English colonial masters. King Henry and Oroonoko's battle cries provoke the study of appeals to the pursuit of honor, constructions of masculinity, and a political body's collective identity. A comparative analysis of these speeches reveals the impact of racialized difference on each rhetor's ability to craft and manifest his national identity and access the structures necessary for political mobilization.

- P-09 *The Blame Game: Complicity and Rape Culture in Margaret Atwood's Novel and Hulu's Adapted Series The Handmaid's Tale*
Hannah Gallant (Vanessa Corredera, English)
J.N. Andrews Honors Scholar and Undergraduate Research Scholar

Margaret Atwood's *The Handmaid's Tale* (1985) and the Hulu award-winning televisual adaptation (2017-Present) portray a dystopic, theocratic regime known as Gilead. The regime's focus on female bodies and reproduction exemplifies what Kate Harding calls rape culture, a culture Gilead perpetuates through sexual violence, rape, and surveillance. Using critical race theory, media and close-textual analysis this project examines both works, arguing that complicity within the novel must be discussed in relation to rape culture and that while the series accounts for rape culture, it problematically manifests a type of feminism that privileges white women over women of color.

- P-10 *Exploring Soil Texture Effects on Mustard Seed Meal Suppression of the Weed Velvetleaf*
DahEun Harning (Robert Zdor, Biology)
J.N. Andrews Honors Scholar

The use of mustard seed meal (MSM) as a biofumigant in managing weeds in agricultural settings has been well documented. Previous work with MSM has shown that soils with higher sand content were better at weed suppression. It was hypothesized that the elevated sand content created more air space for the volatile inhibitory compounds to spread and work. Although initial results from bioassays systematically testing the comparison of 5 differing levels of sand showed support for this hypothesis, further testing with micron-sized glass beads showed that loss of airspace did not reduce the effectiveness of MSM in suppressing velvetleaf.

- P-11 *Novel Heterocyclic Arylidene Derivatives as Anticancer Agents against U87 Human Glioblastoma Cells*
Benjamin Hiramoto (Denise Smith, Biology; Desmond H. Murray, Chemistry & Biochemistry)
J.N. Andrews Honors Scholar

The primary objective of this research study was to investigate the efficacy of novel hybrid heterocyclic arylidenes as anticancer agents against the proliferation and invasiveness of glioblastoma cancer cells. A group of novel heterocyclic arylidenes were produced from a set of aryl aldehydes and rhodanine acetic acid in a pancreatin-catalyzed controlled reflux reaction. These compounds were subsequently administered to U87 glioblastoma cancer cells at different concentrations in a 12-well cell viability assay to determine each compound's LC_{50} . Compounds showed various levels of efficacy and were dependent upon the substituent composition.

- P-12 *The Effects of Docosahexaenoic Acid on INM1 Gene Expression*
Haley Kang (Marlene Murray, Biology)
J.N. Andrews Honors Scholar

Bipolar disorder is associated with abnormal inositol levels, and preliminary studies show omega-3 fatty acids alter intracellular inositol levels. However, the cellular mechanism behind this process is unknown. Therefore, the focus of this study is to determine the effects of the omega-3 fatty acid docosahexaenoic acid (DHA) on the expression of INM1 which encodes inositol monophosphatase. Using yeast as our model system, cells were grown in varying concentrations DHA and the expression on INM1 was determined by RT-qPCR. The results showed that INM1 expression increased with increasing concentrations of DHA, and effects of DHA on inositol levels may be exerted via its impact on INM1 expression.

- P-13 *Class and Gender Relations in “Beauty in the Beast” in two Film Adaptations by Jean Cocteau and Christophe Gans*
Adair Kibble (Sonia Badenas, International Languages & Global Studies; Vanessa Corredera, English)
J.N. Andrews Honors Scholar and Undergraduate Research Scholar

This paper will examine the two major French film adaptations of “The Beauty and the Beast”, one directed by Christophe Gans (2014), and one by Jean Cocteau (1945), as they re-imagine a story conceived in folklore, then written and published, and finally, put to film. The medium’s influence on the story will be analyzed, as well as that of historical context. This paper will scrutinize primarily the gender and class relations portrayed in these films, and how this tale designed to inculcate domestic values in 18th century bourgeois women evolved over time in its treatment of class and gender relations.

- P-14 *“They Called Me Kimchi Breath” and Other Short Essays: A Study in Composing Asian American Short Narrative Essays*
Teddy Kim (Beverly Matiko, English)
J.N. Andrews Honors Scholar

I write five research-supported personal narrative essays addressing Asian American experience. Specifically, I center these experiences on food, particularly from my upbringing, which features a dynamic range between American and Korean food. As someone who has had non-American food juxtaposed to my American-ness for the entirety of my childhood, I have been a witness to the unique interactions between my native Americanness and my distant Asian identity. I hope to create a space in literature for the strife in my identity, using the historical and social context of food to represent the striving for integration between family and culture, and ultimately provide an extension into a larger study of culture.

- P-15 *Emergence and Development of Human Rights in Medieval Europe*
Benjamin Koch (Stephanie Carpenter, History & Political Science)
J.N. Andrews Honors Scholar

This project explores medieval human rights by examining legal codes and proclamations in Europe from 500 AD to 1215 AD. While most legal scholars see the emergence of human rights with the Magna Carta, this conclusion neglects an analysis of the beginnings of European human rights from the early years of the medieval period. My research, using the historical method of legal research and close textual analysis, will analyze documents for the development of human rights in the subtext of legislation from the Code of Justinian to the Magna Carta.

- P-16 *Academic Performance of Andrews University Black Undergraduate Students*
Joiliana Lecointe (Herbert W. Helm Jr., Behavioral Sciences)
J.N. Andrews Honors Scholar

What is the relationship between supplementary educational tools and the success of undergraduate minority students of Black descent at Andrews University? Andrews University provides a greater quality of education than public colleges and universities (Scholarships.com). Still, our Black students yield lower graduation rates (The Chronicle of Higher Education, 2013). This study’s participants will be Black undergraduate students at Andrews University. The current study seeks to determine what factors are correlated with greater performance of Black students at Andrews University. Once identified, those elements can ultimately be implemented across the campus to improve the academic success of Black students.

P-17 *Is the Relationship Between Religiosity and Emotional Reactions to Religious Music Mediated by Personality?*

Jasmine Logan (Karl G. D. Bailey, Behavioral Sciences)

J.N. Andrews Honors Scholar

Are there relationships between emotional reactions to religious music, personality, and religiosity? The music that we choose to listen to elicits emotion and reinforces what we already believe to be true about our own personalities and self-identity. We surveyed college students at a religious university and found all factors of personality and emotional reactions to religious music to correlate with religiosity, but only some factors of personality were related to emotional reactions to religious music. I plan to next examine whether emotional reactions to religious music mediate the relationship of any of the personality factors with religiosity.

P-18 *Evaluation of Aggregation Induced Emission in PAMAM Dendrimers*

Anthony Miller (Ryan Hayes & David Nowack, Chemistry & Biochemistry)

J.N. Andrews Honors Scholar and Undergraduate Research Scholar

PAMAM dendrimers exhibited fluorescence with corresponding maximum excitation and emission wavelengths of 334 nm and 413 nm, respectively. As these molecules were not conjugated, as was expected among fluorescent compounds, the theory behind the fluorescence of PAMAM dendrimers required further investigation. Quantification of fluorescence was performed by evaluating relative quantum yield values under the different solution conditions. During this study, PAMAM dendrimer were exposed to a variety of ionic strengths while in solution as part of exploring consistency with a conjecture that a mechanism of aggregate induced emissions (AIE) was involved in the fluorescence of dendrimers.

P-19 *Natural Rights, Literary Accommodation and the Successful Social Justice Movement: Thomas Reid's Natural Law Philosophy and Early English Abolitionists Olaudah Equiano and Ottobah Cugoana*

Patrick Miller (Stephanie Carpenter & Gary Wood, History & Political Science)

J.N. Andrews Honors Scholar

In this project I will examine how natural law philosophy lead early English abolitionists Olaudah Equiano and Ottobah Cugoana to prioritize a literary style that seeks common ground on a basis of universal human identity. Connections between Equiano and Cugoana's thought and Thomas Reid, founder of the Scottish School of Common Sense and natural law scholar, who elucidated the importance of mutually recognized language and logical structure to a functioning framework of natural rights, have been neglected in the history of natural law philosophy. A renewed emphasis on natural law's importance to early social justice movements could revitalize our perspective for the development of modern civil rights.

P-20 *Assessing Amino Acid Racemization in Avian Eggshells through Reverse Phase Liquid Chromatography*

Nikitha Nelapudi (Lisa Ahlberg, Chemistry & Biochemistry)

J.N. Andrews Honors Scholar

The extent of amino acid racemization (AAR) observed in organic material offers insight into geochronology. Within the scope of AAR research, Avian eggshells are reliable sources of data due to retention of indigenous amino acids through calcification. This project develops a robust quantification methodology for up to 9 D/L amino acids using reverse-phase HPLC (RP-HPLC) with precolumn derivatization. Reliable quantitation is established via statistical assessment of detectability and calibration curves. To date, progress has focused on obtaining adequate enantioseparation and reproducible data of single D/L amino acids.

P-21 *Express Yourself: A Study on Expressive Writing and Trait Anxiety*
Emerald Norman (Harvey Burnett, Behavioral Sciences)
J.N. Andrews Honors Scholar

This study is on the efficacy of expressive writing interventions utilizing a randomized control study. The study will examine the effect of affect, insight and time orientation word usage on state anxiety levels across time through an expressive writing condition compared to a control writing condition. The data will be compiled and analyzed by the Linguistic Inquiry and Word Count analysis program. We expect that subjects who had higher usage of positive emotion, insight, and present time orientation words and lower use of negative emotion words will have lower levels of state anxiety over time compared to the control condition.

P-22 *Synthesis and Anticancer Activity of Potential Hybrid Aspirin Drugs*
Frentzen Pakpahan (Desmond H. Murray, Chemistry & Biochemistry; Denise Smith, Biology)
J.N. Andrews Honors Scholar

Aspirin acts primarily as an anti-inflammatory drug, but recent research has demonstrated a side effect of reducing the risk for certain types of cancer, notably colorectal cancer. Modification of aspirin's chemical structure to include other drugs may increase aspirin's anticancer potency. A novel synthesis of a halogenated aspirin acylal via electrophilic carbonyl addition has been tested and found successful using NMR and IR testing. It is further hypothesized that the modified hybrid aspirin would increase its native potency against cancer. Both aspirin and the hybrid will be tested on glioblastoma cells grown in vitro to determine their anticancer potency.

P-23 *Finding Optimal Input Parameters for BayesWave*
Kelsey Rook (Tiffany Summerscales, Physics)
J.N. Andrews Honors Scholar

This project involves data analysis for LIGO with the goal of finding optimal input parameters for the BayesWave analysis pipeline, which is an algorithm for detection of un-modelled gravitational wave transients. In this project, we add binary black hole gravitational waveforms to LIGO noise with different combinations of parameters to find the best method of separating gravitational waves from noise and glitches. From the results we will calculate various statistical measures including confusion matrices and F1 scores for each parameter combination in order to determine which allows for the most accurate classification of gravitational wave transients.

P-24 *Effectiveness of Novel Heterocyclic Aurone Drugs in the Treatment of Glioblastoma*
Jangwon Seo (Denise Smith, Biology)
J.N. Andrews Honors Scholar

This research project involved synthesis of novel aurone heterocycle, and then testing their anticancer properties on glioblastoma cell lines. Glioblastoma is a deadly form of brain cancer, and upon diagnosis, the average survival time is only 15 months, with current treatment only extending it for a few additional months. Aurones are a subset of flavonoids, which are secondary plant metabolites known to have anticancer properties. This project was interested in seeing if different hybrids of these compounds would have an additive or synergistic anti-cancerous effect on the glioblastoma cells.

P-25 *The Adventist Musician Experience*

Tiffany Steinweg (Karl G. D. Bailey, Behavioral Sciences; Karin Thompson, Music)
J.N. Andrews Honors Scholar

This phenomenological study seeks to better understand the lives of Adventist musicians within the wider classical music community. Adventism is defined by Laurence R. Iannaccone as a 'strict' religion—one which impacts multiple aspects of its members lives and requires strong commitment. Similar to a study by Annabelle Fung on Christian musicians, this study explores what happens when an Adventist chooses or is 'called' to a musical career, especially the interactions between their unique religious and professional identities. Interviews were conducted with each Adventist musician and themes were identified from the data by a content analysis.

P-26 *Optimal Experiment Design for Effective Learning in Undergraduate Organic Chemistry Labs*

Maya Turon (Lisa Ahlberg, Chemistry & Biochemistry)
J.N. Andrews Honors Scholar

This research project pilot study examines the aspects of organic chemistry laboratory experiment and curriculum design and how they increase student learning. Two individual experiments, a midterm and a final, were designed for performance by the undergraduate organic chemistry students. Surveys to measure students' opinions on their laboratory learning experience were prepared based on the literature; the studies use descriptive statistics to analyze student responses to labs. By determining students' laboratory experiences and expectations through this survey and descriptive statistics method, changes to the lab curriculum and experiments were made to meet both student and professor learning goals.

P-27 *Design of a Novel Isoxazoline Class Drug for the Suppressive Treatment of Malaria*

Peyton Ware (Lisa Ahlberg, Chemistry & Biochemistry)
J.N. Andrews Honors Scholar

Design of a novel isoxazoline class drug for the suppressive treatment of erythrocytic malaria through the inhibition of *Plasmodium Falciparum* Glyceraldehyde-3-phosphate Dehydrogenase (*Pf*GAPDH) gave rise to creation of a synthetic plan for the proposed target molecule, α -amino-3-bromo-4,5-dihydroisoxazol-5-yl propionic acid. A literature-based analysis of the moieties targeting the *Pf*GADPH active site led to the design of the target molecule. Subsequently, an exploration of the literature yielded a possible bifold synthetic plan. Attempts at a model epoxidation reaction using mCPBA were shown to be successful using mass spectrometry. Further efforts towards the synthesis of a 3-bromoisoxazoline will be described.

P-28 *El Sistema for, or Against, Benton Harbor*

Dana Wilson (Adriana Perera, Music)
J.N. Andrews Honors Scholar

My research investigates the pre-adaptation of *El Sistema*, a famed music program, into the community of Benton Harbor, Michigan. Members of the Southwest Michigan Symphony Orchestra envision *El Sistema* as a fit model but this study reevaluates the efficiency of the program's revolution and uncovers the sensitivity of providing resources for an underprivileged city through comparative analysis of both ethnic cultures, definition and description of *El Sistema*, examination of the program's application to other urban centers, and assessment of interviews with individuals instrumental to the provision of a free music program in Benton Harbor.

P-29 *Are Florida Manatees (Trichechus Manatus Latirostris) Wearing Their Teeth Beyond Functionality? Interspecific and Intraspecific Mesowear in Manatees*

Nina Woodard (Daniel Gonzalez-Socoloske, Biology)

J.N. Andrews Honors Scholar and Undergraduate Research Scholar

Florida manatees experience greater levels of mesowear and have fewer functional teeth than other manatee populations. Decreased functionality may mean they spend more time feeding and less time in other behaviors, decreasing their fitness. Skulls were analyzed to determine if there is variation in mesowear between manatee taxa. Average number of teeth, number of functional teeth, and mesowear were statistically analyzed in order to see if they vary between taxa. If they have significantly more worn teeth, Florida may not only be a marginal habitat due to the cooler winter waters, but also because of the greater dental burden.

Undergraduate Research Poster Presentations

P-30 *Simulating General Relativity Using the Einstein Toolkit*

Alexander Navarro (Tiffany Summerscales, Physics)

J.N. Andrews Honors Scholar

This research involves performing simulations of gravitational events using the Einstein Toolkit. The Einstein Toolkit uses a programming environment called Cactus that enables simulations and computations by running many different highly specialized modules, or thorns, at the same time. The Einstein Toolkit itself is a set of thorns designed to simulate various cosmological events, from stars going supernova, to stars colliding to form black holes, as well as the gravitational waves that would be produced by such extreme events. By performing such simulations, this study seeks to clarify the nature of astrophysical objects.

P-31 *LIGO Classification with Machine Learning*

Avetik Badalyan (Tiffany Summerscales, Physics)

Due to the popularity of probabilistic approaches to solving classification problems in interdisciplinary research environments, I propose to work on classifying LIGO data using a machine learning classification approach. I will be able to use training and testing datasets to classify whether the data contains gravitational wave signals, which will help the physicists at LIGO perform and analyze their experiments.

P-32 *Classifying Glitch Types with Gravity Spy: How Everyone Can Help Improve LIGO*

Kara Shepard (Tiffany Summerscales, Physics)

J.N. Andrews Honors Scholar

Gravity Spy is an online resource that anyone can use to help advance LIGO gravitational wave research. It uses the power of human pattern recognition to classify different types of glitches that occur in the LIGO detectors, allowing LIGO scientists to find the origin of these glitches and to correct the issue in the detectors that is causing them. At present, the project is 14% complete, with over 16,000 citizen scientist volunteers working daily since October 2016. I am currently working on Level 6: Virgo, where I identify glitches from the Virgo interferometer in Italy.

- P-33 *LIGO BayesWave Signal Algorithm*
Wesley Martin (Tiffany Summerscales, Physics)

One of the tools that the LIGO Scientific Collaboration uses to analyze data is the BayesWave algorithm. Due to the sensitivity of LIGO's instruments, signals that appear in the data are more likely to be a glitch in the system than a gravitational event. BayesWave analyzes collected data to find signals and categorize them appropriately. Our role is to test whether the algorithm is working properly, which we do by generating data with fake signals and submitting them to see if the algorithm detects and sorts them correctly.

- P-34 *Classifying Links Obtained by Strong Fusion*
Benjamin Dronen¹, Jonathan Homan² & Gabriel Palacios¹ (Anthony Bosman, Mathematics)
¹Undergraduate Research Scholar, ²J.N. Andrews Honors Scholar

Band fusion modifies a link by fusing together two link components with a band, and its effect on links has been tabulated. We extend this work with an original analysis of the effects of strong fusion, a modified form of fusion that preserves the number of components of a link by introducing an unknotted component around the fusion band. In particular, we determine the exact effect of strong fusion on several link invariants, including the Q polynomial. We then use link invariants to classify which links are the result of strong fusion, tabulating all such links with up to 9 crossings.

- P-35 *Double Involute of Rectifying Curves*
Devin Garcia (Yun Myung Oh, Mathematics)
Undergraduate Research Scholar

In this project, we investigate the properties of the involutes of involutes of curves in Minkowski space. The properties of involutes of curves in Minkowski space were first investigated by B. Bukcu and M.K. Karacan. In addition, we investigate the properties of the involutes of rectifying curves.

- P-36 *Identifying Common and Persistent Misconceptions Held by Remedial Math Students*
Lisa Johnston (Lynelle Weldon, Mathematics)
J.N. Andrews Honors Scholar

This research built off our previous research from the summer of 2018, when we gathered a true random sample of 1,200 exams from remedial math courses at Andrews over the past 15 years. We then tabulated the frequency of incorrect responses for each concept covered on the exams. Using our results from 2018 and this initial frequency analysis, we created a framework for data collection. The data collection and analysis involved reviewing student work, recording the data within our designed framework. This data is currently being used as a resource in editing the curriculum of the remedial math courses at Andrews.

P-37 *The Effect of Synchronous Egg-laying on Gull Population Dynamics while Tracking the Egg-laying Order*

Yosia Nurhan (Shandelle M. Henson, Mathematics)

J.N. Andrews Honors Scholar and Undergraduate Research Scholar

During years of high sea surface temperature, food resources for glaucous-winged gulls (*Larus glaucescens*) are scarce. In response, male gulls cannibalize the eggs of neighbors. When this occurs, female gulls in dense areas of the colony adopt a tactic called egg-laying synchrony, in which they lay eggs synchronously on an every-other-day schedule. Field observations show that the first-laid egg of each clutch is the most likely to be cannibalized. We analyzed a mathematical model of egg-laying-behavior that tracks egg-laying order. We found that the system begins to oscillate synchronously when the colony is sufficiently dense. We demonstrated that synchronous colonies produce more eggs than non-synchronous colonies in the presence of cannibalism.

P-38 *Synthesis of Hybrid Lipometallo Molecular Transporters*

Yosia Nurhan (Desmond H. Murray, Chemistry & Biochemistry)

J.N. Andrews Honors Scholar and Undergraduate Research Scholar

Lipids are a broad class of biological compounds that are soluble in organic solvents (such as ethanol) but insoluble in water. They are characterized by a long carbon chain. Calcium phosphate is a popular method of transfection, a process of delivering nucleic acid into eukaryotic cells. This poster provides exploration data of different methods to synthesize a molecule that can have the best capabilities of both lipid and calcium phosphate. As a general rule, alkyl halide will be reacted with secondary/tertiary amine. The expected product will have a lipophilic chain with a nitrogen cationic head. Depending on the choice of secondary/tertiary amine, the expected product is predicted to be able to form complexes with calcium or other metals.

P-39 *Correlating Neural and Behavioral Responses in an Insect Model*

Brandon Shin¹ & Bryan Ashley (Benjamin Navia, Biology)

¹J.N. Andrews Honors Scholar

Female crickets (*Acheta domesticus*) respond phonotactically to model calls. Underlying neural networks are activated when the cricket recognizes a call that it deems attractive. The current study seeks to evaluate in the same animal both behavioral and neuronal responses to such calls. This approach allows us to establish a correlation between the neuronal activity and the behavioral response. Previous studies suggest the L3 auditory neuron influences phonotaxis. Contrary to prior studies, we are assessing phonotaxis on a spectrum rather than in a binary scale. Preliminary results support a positive correlation between phonotaxis and decrement levels in L3's neuronal response of *A. domesticus*.

P-40 *Modeling Morphometrics of West Indian Manatees (Trichechus Manatus) to Estimate Body Mass*

Juliane Johnson (Daniel Gonzalez-Socoloske, Biology)

J.N. Andrews Honors Scholar and Undergraduate Research Scholar

Currently, there is not a way to estimate West Indian manatee (*Trichechus manatus*) weight. This project parameterizes multiple models that calculate manatee mass from morphometric measurements, such as length and girth. It uses already obtained data which include multiple morphometric measurements, as well as weight. The accuracy of each model is approximated using half of the data to parameterize equations and the other half to validate. This allows for a comparison of each equation to determine which most accurately computes manatee weight. Such a model has multiple applications in cases where manatee weight would be advantageous over other measurements but is cumbersome to harness.

P-41 *The Role of the Prodomain in Folding of Carboxypeptidases*

Masy Domecillo (Peter Lyons, Biology)

J.N. Andrews Honors Scholar and Undergraduate Research Scholar

Carboxypeptidase A1 (CPA1) is a digestive enzyme produced by the pancreas. Previous research has suggested that one part of CPA1, the prodomain, is necessary for the rest of the carboxypeptidase to assume proper form and function enzymatically. However, a related carboxypeptidase, CPO, does not require a prodomain. In order to confirm the need for a prodomain in CPA1, the protein was tagged using recombinant DNA techniques with an HA-tag for detection. HEK293T cells were transfected and the enzymatic activity of these tagged proteins was measured. Future work will involve removal of the prodomain for comparison.

P-42 *Sensitivity Analysis of [Ru(bpy)₃]²⁺/TPPrA Based ECL Reaction Kinetics*

Nicholas Navarro (Hyun Kwon, Engineering)

Undergraduate Research Scholar

A series of DAEs (differential algebraic equations) was developed to model electrochemiluminescent (ECL) reactions. This model was specified for the Ru(bpy)₃²⁺/TPPrA reaction. Various parameters for the steps of the reaction were determined from a literature review. Uncertainties in the ECL reaction mechanisms make it difficult to develop a mechanism-based model. To compensate for this, an attempt to use machine learning was made. This was applied to determine critical reaction factors through performing sensitivity analysis on these parameters. This work demonstrated that the method of applying a hybrid of traditional and machine learning modeling could be effective in understanding or verifying reaction mechanisms and determining kinetic parameters. Further, this method could aid in a biosensor design application of the ECL phenomenon.

P-43 *Rapid Synthesis and Characterization of Naked Silver Nanoparticles and Their Applications in Antibacterial Activities*

Tsion Getahun (Getahun Merga & Desmond H. Murray, Chemistry & Biochemistry)

Undergraduate Research Scholar

This study describes the rapid microwave assisted synthesis of “naked” silver nanoparticles upon the reduction of silver oxide (Ag₂O) by molecular hydrogen. These nanoparticles were also compared with the well-established reduction of silver nitrate by trisodium citrate which gave similar UV-Vis absorption spectral, the latter being suspended by organic molecules. By this method, it was found that silver nanoparticles can be synthesized in seconds or a few minutes while the reported “naked” silver nanoparticles took two – eight hours at relatively elevated pressure of 1.5 – 1.7 atmospheres. Further, their application as antibacterial activities will be explored.

P-44 *Synthesis and Production Increase of Perylenediimide-core PAMAM Dendrimers*

Colleen Staniszewski (Ryan Hayes, Chemistry & Biochemistry)

J.N. Andrews Honors Scholar and Undergraduate Research Scholar

PAMAM dendrimers possess a plethora of uses in various fields because they function as protective agents, can enhance solubility, and include a number of functional groups that allow binding of other molecules to change properties. Colored dendrimers are valuable for uses in tracking, marking, and printing, and the Andrews University chemistry lab synthesizes one by building a PAMAM dendrimer around fluorescent chromophore, namely perylenetetracarboxylic dianhydride (PTCDA). The PTCDA is converted into a diamine and then, using the traditional method of adding methyl acrylate and ethylenediamine, branches are attached to form the structure of the PAMAM dendrimer.

- P-45 *Analysis of Heavy Metal in Hair Samples using ICP-OES*
Paul Thompson (Ryan Hayes, Chemistry & Biochemistry)
Undergraduate Research Scholar

Non-communicable diseases such as stroke, heart diseases, cancer, and chronic respiratory diseases amount to nearly two-thirds of the total deaths caused by an unhealthy environment. Michigan ranks 25 out of 56 states nationwide in producing total Toxic Inventory releases per square mile, which could be linked to various diseases in our county. Our research aims to develop the methodology for heavy metal analysis in biological samples like hair and nails using Inductively Couple Plasma spectroscopy. Initial analytical studies focus on methods for processing hair samples, calibrating standards, establishing limits of detection, and ensuring reproducible results.

- P-46 *The Distribution of Food Preparation Artifacts in Field D at Tall Jalul*
Rebecca Bates (Randall W. Younker, Archaeology)
Undergraduate Research Scholar

The Andrews University Institute of Archaeology Madaba Plains Project houses many of the artifacts that were found, recorded, sketched, photographed, and brought to the Siegfried H. Horn Museum for further research. These artifacts are then used to help archaeologists understand the history of the Madaba Plains, Jordan, and its significance to the Bible. Food preparation artifacts like grinders, pounders, mortar and pestles, and stone bowls, are some of the most frequently excavated artifacts at Tall Jalul. This poster examines the relationship between domestic living spaces and food preparation artifacts suggesting that the concentration and distribution of these artifacts can give us insight into the use of certain domestic living spaces found in Field D Square 3.

- P-47 *Correlation between Client Behavior, Therapy Productivity, and Statistical Improvement after a Three-Week Auditory Processing, Language and Literacy Intensive Intervention Program*
Joyce Figueroa (Darah Regal & Lara Scheidler-Smith, Communication Science & Disorders)
Undergraduate Research Scholar

During the course of a three-week intervention program, the professors and graduate clinicians in the Department of Communication Sciences and Disorders at Andrews University used therapy programs, Color my Conversation, Differential Processing Training Program, Lindamood Phoneme Sequencing Program/Lively Letters, Visualizing and Verbalizing, outdoor games, and snack craft as interventions within areas of communication. Specific areas addressed included language, articulation, phonological awareness, and auditory processings, all of which are essential components of communication development. In order to measure the efficacy of the program, pre- and post-test results were collected from school-aged children who have some level of difficulties in the areas of communication stated previously. In addition, behavioral observation was documented to determine a correlation between behavior, therapy productivity and statistical improvement.

- P-48 *Relationship Between Dark Triad Traits and Moral Judgment*
Gabrielle Bianco (Herbert W. Helm Jr., Behavioral Sciences)
Undergraduate Research Scholar

A replication of Arvan's (2013) study was done to look at Dark Triad traits and moral issues. A high level of agreement was found between the two studies suggesting those who score higher on Dark Triad personality traits will have more conservative judgements on some moral issues.

- P-49 *Sexual Orientation, Mental Health and Suicidality*
Trevor Furst (Duane C. McBride, Behavioral Sciences)
Undergraduate Research Scholar

In the spring of 2018, the Institute for the Prevention of Addictions conducted a survey of students at Andrews University (N=650). While a wide variety of health data were collected, this study focused on survey questions relating to sexual orientation and mental health. Mental health was measured using the DASS depression, anxiety and stress scales. Sexual orientation was determined from the survey data. Bisexual students were significantly more likely to be classified in the extreme categories of the DASS and be at risk for suicide than heterosexual students. These large differences indicate a significant mental health issue that the university needs to address.

- P-50 *Religiosity, National Circumstances, and Well-Being in a Strict Religion*
David Sherman (Karl G. D. Bailey, Behavioral Sciences)
Undergraduate Research Scholar

Across the globe, religiosity is positively related to subjective well-being (SWB) among individuals but not always nations. We replicate this pattern within a strict religion with high-cost behaviors that promote group solidarity, suggesting that in-group religious membership does not inhibit the effects of circumstances on religiosity and well-being. This project contributes to the larger Seventh-day Adventist Global Church Member Survey project by defining geographical regions of interest and creating a process for linking those regions to existing cultural indicators. We also report a new reliable multidimensional cross-cultural measure of Adventist religiosity as part of this project.

- P-51 *The Impact of Screen-Time on Perceived Relationship Quality*
Jasmine Kim (Kristin Witzel, Behavioral Sciences)
Undergraduate Research Scholar

Is there a relationship between the amount of time individuals spend on their phones and their perceived relationship quality? The objective of this study was to find out whether increased screen-time negatively affects individuals' perceived quality of relationships. We ran a Pearson product-moment correlation coefficient and found that screen-time had no significant negative correlation to the relationship quality total score (see table 1), which was inconsistent with previous literature. Additionally, under the conflict category of the survey, there was a significant negative correlation between screen-time and the conflict component of relationship quality (see table 2). This indicates that less screen time is associated with more conflict.

- P-52 *Psychology Students' Perspective of Classroom Trigger Warnings*
Jasmine Kim (Herbert W. Helm Jr., Behavioral Sciences)
Undergraduate Research Scholar

Sensitive, often unsettling topics are inherent, especially in psychology education (Boysen et al., 2018). We replicated Guy A. Boysen's "Trigger Warnings in Psychology Classes: What Do Students Think?" in order to examine whether students at a religious institution will be more conservative when it comes to rating the appropriateness of sensitive topics and warnings thereof in psychology classrooms. Participants (N=78) rated their level of discomfort for the 16 different topics covered in psychology courses, their perception of the necessity of trigger warnings and whether warnings have been issued in their psychology classes, and their attitudes toward the appropriateness of sensitive topics and warnings in psychology education.

- P-53 *Student Stress and Relationship Status*
Farah Ghanem (Karl G. D. Bailey, Behavioral Sciences)

Do stress levels differ in college students depending on their relationship status? To collect data, we will use an online survey of college students at a religious university. Our study will highlight the significance of social support theory during college experience, particularly through romantic relationships.

- P-54 *Crowdfunding for Victims of School Shootings: Factors Influencing Campaign Success*
Aubrey L. Kibble^{1,2}, Malachi Regis², Jasmine Achoki & Abigail Lopez² (Kristen Witzel, Behavioral Sciences)
¹J.N. Andrews Honors Scholar, ²Undergraduate Research Scholar

After an emergency, crowdfunding campaigns are often organized to raise money for victims' healthcare costs. In 2019, GoFundMe.com, claimed that it hosted over 250,000 medical campaigns, raising \$650 million (2019). While crowdfunding can be tremendously helpful to individuals, previous research has suggested that it may also deepen existing social inequalities by providing greater benefit to white, wealthier, and younger beneficiaries. Our research examines factors that influence crowdfunding success among victims of high school shootings. We have created a database of all GoFundMe campaigns for victims of U.S. high-school shootings between 2010 and 2019, and will present our preliminary findings here, including statistics on crowdfunding success by gender, race/ethnicity, age, injury-type, shooting size, title 1 status, community income, electoral records, and community attitudes on gun-control.

- P-55 *Intercultural Competencies in Undergraduate Andrews University Students*
Sarai Sumner (Pedro Navia, International Languages & Global Studies)
Undergraduate Research Scholar

The goal of this research is to measure the level of intercultural competence in undergraduate Andrews University students. The findings of this research will either show the areas in which students have a high level of competence or will reveal the areas in which certain competencies need to be developed. Through these findings, I hope to determine if Andrews University students are equipped with the necessary skills to work and interact with people across multiple cultures or if the university needs to foster a more inviting atmosphere where students are better able to express their cultures and feel accepted.

December Honors Thesis Poster Presentations

- D-01 *Tales of Minden, Louisiana: Collecting and Compiling the Elkins Family Oral Tradition*
Elizabeth Bates (Sonia Badenas, International Languages & Global Studies; Beverly Matiko, English)
J.N. Andrews Honors Scholar and Undergraduate Research Scholar

The oral tradition is often undervalued in comparison with its sister arts of the written and performed word, especially those which claim the title "true." Yet these tales have inherent value through the connections they create between those who tell them and the people and places featured in their stories. The purpose of this project is to preserve the oral tradition of the Elkins family of Minden, Louisiana, through the collection and editing of three stories. To determine which stories constitute family lore, four of five siblings of the eldest generation of Elkins were interviewed. Their stories were recorded and transcribed. From the transcriptions, motifs were identified, and three cohesive stories were created and published for redistribution among the Elkins family and the public.

D-02 *Capturing Oral Voice*

Jessica Bates (Douglas Jones, English)

J.N. Andrews Honors Scholar and Undergraduate Research Scholar

The sound of a narrator telling a story can be difficult to depict in written prose, and yet both Ovid and Twain were able to capture the sound of an old man telling a story; Twain in “The Celebrated Jumping Frog of Calaveras County” and Ovid through “Nestor’s Story” in *The Metamorphoses*. Ovid’s *The Metamorphosis* involves several stories within a story and utilizes a more “chaotic” structure than other epics, allowing him the freedom to capture Nestor’s rambling. Nearly two centuries later, Twain uses a frame story, but unlike other contemporary works, he respects the subject’s style of speaking and represents both the dialect and the rambling way of which the narrator communicates.

D-03 *Is Natural Selection Shaping Florida Manatees? An Investigation into the Body Shapes Between the Subspecies of the West Indian Manatee*

Juliane Johnson (Daniel Gonzalez-Socoloske, Biology)

J.N. Andrews Honors Scholar and Undergraduate Research Scholar

The West Indian manatee (*Trichechus manatus*) is currently divided into two subspecies: the Antillean (*T. m. manatus*) and Florida manatee (*T. m. latirostris*). Florida manatees (FM) primarily inhabit the waters around the Florida peninsula, while the Antillean manatee (AM) inhabits from the Caribbean islands to western Brazil. Water temperature drops below 20°C during the winter in Florida, and these manatees have to seek warm water refuge for thermal regulation. Allen’s rule predicts that in colder climates animals will adapt to have smaller surface area to volume ratios (SA:V). On average, FM are larger in absolute body size than AM; however, no one has explored differences in body shape independent of size between the two subspecies. This study proposes that FM have stockier body shapes (smaller SA:V) compared to AM. Data on FM morphometrics (n=543) were obtained from the Florida Fish and Wildlife Commission, while AM measurements (n=90) came from live captures in Quintana Roo and Tabasco, Mexico. SA:V of FM was significantly smaller even when controlling for body length (p=0.004). Our results lend further support for Allen’s rule and indicate that FM and AM are diverging on separate adaptive trajectories.

D-04 *A Comparative Study of ESL Children’s Improvement in Reading, Writing, Listening, and Speaking Using the GrapeSEED Program*

Morgan Mainess (Darah Regal, Communication Sciences and Disorders)

J.N. Andrews Honors Scholar

GrapeSEED is a program currently administered in the Berrien Springs Public School System that is specifically designed to improve literacy, listening, and speaking skills for English as a Second Language (ESL) children. This study analyzed whether the GrapeSEED program would significantly improve participants’ development when compared to their pre-tests. Empirical observational data was additionally collected at Mars Elementary during the 2018-2019 academic year. Statistical analysis indicates significant advancement in listening and literacy with increased improvement for younger participants in the GrapeSEED program.

2019 Undergraduate Research Mentor Awards

Each year Andrews University recognizes faculty mentors for their excellence in mentoring undergraduate research students. This award was started in 2015 by the Dean of the College of Arts and Sciences. Below are excerpts from the student nominations.

STEM: Benjamin Navia (Biology)

“I am so glad I got to work with Dr. Navia in doing this research. Through collecting and analyzing my data, I learned to think in more three-dimensional ways that required honest self-evaluation and much thinking outside the box. I learned how to communicate my research content to an interdisciplinary audience in a way that will speak relevance and ‘light-bulb moments’ to them. I got to have many fun learning experiences by attending conferences where I presented my research. Through these conferences, I was able to experience the bigger ocean of academics that reminded me once again that there is a lot more to see, learn, and challenge myself with. I am thankful for all the work Dr. Navia is doing that helped me to get to where I am today! Thank you very much, Dr. Navia!”

Social Sciences: Melissa Ponce-Rodas (Behavioral Sciences)

“Dr. Melissa Ponce-Rodas... What can I say? No student’s research experience is complete until given the chance to cross paths with a professional of her caliber. She embodies the whole person concept as described by God’s Servant in her inspired work Acts of the Apostles, p. 318: ‘No matter how high the profession, he whose heart is not filled with love for God and his fellow men is not a true disciple of Christ.’ During my time with Dr. Ponce-Rodas, I have seen first-hand her devotion for her mentees—myself included—as well as her profession. On the relational aspect of working with her, I am touched to see how we were—as I am positive her current mentees still are—her most important asset, our well-being her number-one concern. While mentored by Dr. Ponce-Rodas, there was never a time when she assigned me a task in which she did not take the time to also assess my current life situation, and, if needed, lend a helping hand or a much needed and appreciated word of advice, whether career or non-career related. Having Dr. Ponce-Rodas as my research mentor was nothing short of a blessing as sharing our values enhanced our work and our connection. Workwise, she offered us a safe environment and set the ideal tone for any mentee, new or seasoned, to grow professionally and spiritually, especially while handling such a sensitive and taboo subject as it is the existence of domestic abuse in the SDA Church.”

Health Professions: Darah Regal (Speech-Language Pathology & Audiology)

“Dr. Regal has been very influential in shaping my career goals and encouraging me to pursue the areas in which find most interest. She is open and approachable, and has a heart for students. From the day that I approached her about doing some kind of research with her, to presenting it at a national conference, she was with me every step of the way encouraging me to do my very best and to share with others what I was interested in. She showed me the importance of asking questions, questioning my own findings, and seeking out answers and methods on my own. I can easily say that my time spent with Dr. Regal and research at Andrews University was by far some of my most well spent time. Without her guidance, I very well may not be on the career path I am today or have found my own passion for investigation and research. Not only has she been an excellent mentor, but she has been a good friend.”

To learn more, visit https://www.andrews.edu/services/research/faculty_research/mentor/index.html.

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