

# HONORS THESIS SYMPOSIUM



15<sup>TH</sup> APRIL, 2022

1:30 - 4:00 P.M.

BULLER HALL



J.N. Andrews  
Honors Program  
Andrews University

# WELCOME

## To The Honors Spring Thesis Symposium

Dear Students, Parents, Faculty, and Friends:

Welcome to the Honors Spring Thesis Symposium. As Director of Honors, I feel so grateful that we have made it safely to this capstone moment in our academic calendar despite the many difficulties of the pandemic year. Heartfelt thanks go to each member of our learning community who followed all recommended guidelines for health and safety—you have made our in-person learning and researching possible. The Honors Council would also like to thank those faculty who have taken the time to serve as research mentors. Congratulations to the Honors Scholars who have persevered through the COVID crisis to complete their research projects as the capstone of their SAGES experience. And, finally, to those who are graduating, we wish all the best as new adventures begin! May God bless in all you do!



A handwritten signature in black ink, appearing to read 'L. Monique Pittman'.

L. Monique Pittman, PhD  
Director of Honors  
Professor of English

**Buller Hall 108**

**Chair: L. Monique Pittman**

**Honors Council Members: Vanessa Corredera and Karin Thompson**

1:30 p.m.

Moriah K. McDonald (Vanessa Corredera, English)

*Examining Katniss Everdeen's Gender Ambiguity in The Hunger Games: How Suzanne Collins Utilizes the YA Genre to Resist Feminine Stereotypes*

Having grown up as a teenager in the 21st century, I have noticed the unrealistic expectations imposed on women by the media—the binaries of wholly good or wholly bad. Such themes remain heavily featured in young adult (YA) literature, a genre specifically aimed at teenagers. Thus, in analyzing *The Hunger Games* trilogy by Suzanne Collins, I undertake a twofold analysis. I aim to not only illustrate how Collins's works tackle the specific issue of binary representation of women in the media, but also to validate the usefulness of the YA genre in commenting on current day issues facing teens.

2:00 p.m.

Taylor Uphus (L. Monique Pittman, English)

*A Man not a Monster: Reimagining Disability in Hollow Crown's Richard III*

Traditional portrayals of William Shakespeare's *Richard III* (1592) in film interpret Richard's physical disability as an outward reflection of his evil. In recent years, disabilities studies scholars have reconsidered the historic association of Richard's physical deformity with immorality. Unlike previous *Richard III* films, the BBC's *Hollow Crown: Richard III* (Dominic Cooke, 2016) highlights Richard's mental abuse and trauma. While the film does not shy away from Richard's villainy, its more empathic depiction of Richard contests the one-dimensional stage and film representation of him as a conniving monster. Ultimately, this film presents *Richard III* to critique society's treatment of disabled individuals.

2:30 p.m.

Elianna Srikureja (Vanessa Corredera, English)

*"A Woman's Lot is to Suffer": Recognizing the Intersectionality of Oppression and Resistance in Min Jin Lee's Pachinko*

Min Jin Lee's novel *Pachinko* (2017) portrays the lives of a displaced Korean family during Japan's colonization of Korea from 1905-1945. The novel's attention to the ways that colonial endeavors complicate Confucian family and national structures exemplifies the interrelation between gender and racial oppression facing Lee's Korean women in both the public and private domain. However, by centering female voices, Lee also depicts resistance modes that subvert such oppression. Using feminist and postcolonial theory, this project examines the complicatedness of intersectionality, ultimately arguing for the necessity of articulating local specificities instead of universalizing and homogenizing the experience of women worldwide.

3:00 p.m.

Elizabeth Atencio (Anneris Coria-Navia, Teaching, Learning, and Curriculum)

*Promoting Oral Proficiency Through Textbook Activities: A Comparative Analysis*

Learning a language in a scholastic environment should include intentional and significant oral communication opportunities. This project focused on analyzing and comparing elementary-level Spanish textbooks for their inclusion, or lack thereof, of oral communication activities. The project also included a literature review that addresses the importance of oral communication in the foreign language classroom. The results of the textbook analysis and literature review show the level at which textbooks support the development of oral communication skills in the early elementary Spanish classrooms in the strive for oral proficiency among Spanish language learners.

**Buller Hall 149**  
**Room Chair: Beverly Matiko**  
**Honors Council Members: Ryan Hayes and Alyssa Henriquez**

1:30 p.m. Joshua Pak (Ryan Hayes, Chemistry & Biochemistry)  
*The Chemical Challenges of Fixing Nitrogen*

Breaking the triple bond of dinitrogen is chemically challenging requiring high temperatures, high pressures, special iron catalysts, and carefully engineered systems to “fix” dinitrogen and make it usable as ammonia. Fixing dinitrogen is critical to the survival of all life on Earth. The enzyme nitrogenase, found in nitrogen-fixing organisms, can fix nitrogen at ambient temperatures and pressures. Can chemo-biological evolution adequately explain nitrogenase’s emergence or are there critical chemical barriers that suggest the intentional involvement of intelligence? Our methodology uses primary scientific research to understand nitrogenase’s cellular mechanism, chemical structure, and reaction mechanism alongside genetic ancestral phylogeny of diazotrophs.

2:00 p.m. Hannah Castillo (Ryan Hayes, Chemistry & Biochemistry)  
*Copper (II) Sequestration by PAMAM Dendrimers in Tap Water*

Dendrimers are nanomaterials that are widely studied for a variety of applications because of their distinctive properties. One such property of the generation 2-PAMAM Dendrimer is its specific affinity for copper (II) ions. This could be influential in selective heavy metal extraction, particularly in contaminated water. The research showed the selectivity of the G2-octyl PAMAM dendrimers for copper (II) in a chemical environment with interfering species using Inductively Coupled Plasma Optical Emission Spectroscopy. Such environments that were analyzed includes Andrews University tap water, where magnesium (II) and calcium (II) are present at significant quantities.

2:30 p.m. Seth Williams (Ryan Hayes, Chemistry & Biochemistry)  
*PAMAM Dendrimer Stability Analysis using Size-Exclusion Chromatography*

Enzymatic and thermal stability of dendritic nanoparticles is not well characterized in peer-reviewed literature. To establish methods and procedures to test nanoparticle stability, protocols were developed using bovine serum albumin (BSA) as a model for expensive PAMAM dendrimers since they share many of the same amide bond linkages. The amido structures was exposed to different environments such as pH, temperature, and proteases for various amounts of time and then evaluated using size exclusion chromatography (SEC). This research could prove beneficial to many disciplines that use dendrimer nanoparticles including medicinal uses involving oral delivery of pharmaceuticals.

3:00 p.m. Alyssa Henriquez (Ryan Hayes, Chemistry & Biochemistry)  
*Optimization of an Integrated Cartridge System for Efficient Loading and Characterization of DNA through Microfluidic Platforms*

Microfluidic platforms have critical implications for field-based clinical diagnostics. They can aid in accelerating the process of diagnosis, which is crucial for patients who are too ill to wait several days for results. The objective of this project was to create a cartridge system that improves the efficiency of loading and running biochemical assays in microfluidic platforms. This was accomplished by designing three separate cartridges made of polydimethylsiloxane (PDMS), laser-cut acrylic, and 3D-printed resin, and subsequently evaluating their ability to load a microfluidic chip once pressurized. Ultimately, 3D-printed cartridges were shown to be the most effective in loading microfluidic platforms.

3:30 p.m. Nels Wangsness (Ryan Hayes, Chemistry & Biochemistry)  
*Investigating the Fluorescent Properties of the Copper (II)-Dendrimer Complex*

Polyamidoamine (PAMAM) dendrimers are extremely versatile nanoscale molecules, with many variations of sizes in the nanometer dimension and surface groups that control solubility and reactivity. Specifically, PAMAM dendrimers with octyl- end chains have shown promising characteristics of fluorescence and specificity towards copper(II) ions. This research will present the basic excitation and emission properties of these dendrimers in dichloromethane. These “unloaded” dendrimers fluorescence properties were compared to copper(II) “loaded” dendrimers using a G2-octyl-PAMAM. Observed differences to previous PAMAM dendrimer fluorescence will be presented. This system could be incorporated into various industries as a copper sensor.

**Buller Hall 150**  
**Room Chair: Tiffany Summerscales**  
**Honors Council Members: Karl Bailey**

1:30 p.m. Tyler Braithwaite (Rodney Summerscales, Computing)  
*Art to Influence Creativity in Symbolic Music Completion*

Advances in Recurrent Neural Network (RNN) techniques have caused an explosion of problems posed that revolve around the mass analysis and generation of sequential data, including symbolic music. Building off the work of Nathaniel Patterson’s Musical Autocomplete: An LSTM Approach, we extend this problem of continuing a composition by examining the creative impact that injecting latent-space encoded image data, specifically fine art from the WikiArt Dataset (Saleh & Elgammal), has on the musical output of RNN architectures designed for autocomplete. For comparison purposes with Patterson, we will also be using a corpus of Erik Satie’s piano music for training, validation, and testing.

2:00 p.m. Joshua Dulcich (Rodney Summerscales, Computing)  
*Exploring the Efficiency of Neural Architecture Search (NAS) Modules*

Machine learning is obscure and expensive to develop. Neural architecture search (NAS) algorithms automate this process by learning to create premier ML networks, minimizing the bias and necessity of human experts. Recently, this emerging field has focused on optimizing a promisingly unique combination of NAS’s three segments. Despite regularly acquiring state of the art results, this practice sacrifices computing time and resources for slight increases in accuracy and obstructs performance comparison. In response, we use NASLib’s modular library to determine module efficiency across combinations. Each NAS algorithm produces an ML image recognition model—tested on the CIFAR-10 dataset—of which compute time and accuracy reveal efficiency.

2:30 p.m. Reise Campbell (Rodney Summerscales, Computing and Hyun Kwon, Engineering)  
*A Three-Dimensional Convolutional Neural Network for ECL Sensor Analysis*

Sensor technology has the potential to revolutionize fields ranging from biofuel manufacturing to Healthcare. One major innovation in the sensor field is Electrochemiluminescent (ECL) sensors, which have low background noise, allowing for ultra-sensitivity. ECL sensors are also cost-effective as they require less instrumentation for voltage delivery and provide measurements in a matter of seconds. Traditionally, calibration curves with a predetermined feature are used for some sensors to infer the concentration based on the reading. However, this method leads to variations between sensors that would require recalibration. This project seeks to use Machine Learning to interpret the sensor data, allowing generalization across sensor differences.



3:00 p.m.

Matthew Dulcich (Rodney Summerscales, Computing)

*Conditional Variational Auto Encoder (cVAE) for Augmentation of ECL Biosensor Data*

Machine Learning (ML) is vastly improving the world, from computer vision to fully self-driving cars, we are now able to accomplish objectives that were thought to only be dreams. In order to train ML models accurately, they require mountains of information to work with, but sometimes it becomes impossible to collect the data needed, so we turn to data augmentation. In this project we use a conditional variational auto encoder (cVAE) to supplement the original video electrochemiluminescence biosensor dataset, in order to increase the accuracy of a future classification model. In other words, using a cVAE we will create unique realistic videos to combine with the dataset.

3:30 p.m.

Eric Inae (Niki Pissinou, Florida International University; Rodney Summerscales, Computing)

*Improving Adversarial Attacks for Regression Problems in IoT*

A growing amount of research shows the tremendous vulnerability in deep learning models to nearly unnoticeable adversarial examples. Recent work suggests that the existence of adversarial examples may be an inherent weakness of machine learning models as a direct result of their sensitivity to well-generalizing features in high-dimensional data. While there have been great strides in the research area of adversarial machine learning, minimal works have examined time-dependent and continuous regression problems. Thus, with this work, we aim to put these findings to the test in the context of IoT-based regression problems.

### **Buller Hall 208**

**Room Chair: Benjamin Navia**

**Honors Council Members: Beatriz Martins**

1:30 p.m.

Lyle Goulbourne (Daniel Gonzalez-Socoloske, Biology)

*Interspecific and Ontogenic Differences in the Molar Occlusal Surfaces of Manatees (*Trichechus*)*

Manatees combat their abrasive herbaceous diet by continuously replacing their teeth along a horizontal axis, with new teeth added at the posterior end and older teeth falling out at the anterior end. To describe the teeth, we photographed and labeled features of manatee molars and premolars. We also measured molar occlusal area vs skull length to determine whether teeth increase in size as manatees age. The results determined that relative tooth size increases with age. This research will add to our understanding of manatee feeding ecology, which may allow us to better understand manatee diet and health and help provide improved habitats.

2:00 p.m.

Jewel Murray (Benjamin Navia, Biology)

*Reassessing the Parameters of Phonotaxis in Female Cricket *Acheta domestica**

When evaluating phonotaxis, two parameters have been used to determine a positive response; i) the distance travelled toward the source of a sound is twice that of the distance away and ii) the path of travel towards the sound is within a  $-60/+60^\circ$  angle. These parameters, established years ago, are widely accepted. The latter parameter, however, may not accurately describe the quality of phonotaxis of a given animal. This research assesses the angular orientation of phonotaxis in female crickets by further exploring the significance of the  $-60/+60^\circ$  parameter; looking at its variation and what it could elucidate in terms of the quality of tracking.

2:30 p.m.

Masy Domicillo (Peter Lyons, Biology)

*The Role of the Prodomain in the Folding of Carboxypeptidase A1*

Carboxypeptidase A1 (CPA1) is a digestive enzyme. This enzyme contains a prodomain region, which must be cleaved for enzymatic function. Previous studies have hypothesized that the prodomain is necessary for CPA1 structural stability. However, the discovery of a related enzyme, carboxypeptidase O (CPO), which does not have a prodomain, challenges this assertion. In order to investigate the need for a carboxypeptidase prodomain, or other stabilizing features, an antibody tag was added through polymerase chain reaction (PCR). The prodomain was then removed via PCR. Western Blots and enzyme assays confirmed formation of the protein with the antibody tag and will be performed to determine proper formation and function of CPA1 without the prodomain.

3:00 p.m. Jessica Rim (Benjamin Navia, Biology)  
*Phonotaxis Tuning in Male-Exposed Female Cricket *Acheta domesticus**

Phonotactic behavior of female cricket *Acheta domesticus* has been shown to vary among individuals. While some females are finely tuned to calls with syllable periods in the natural range of conspecific males, others respond phonotactically to a wider range of syllable periods and therefore lack the ability to discriminate between attractive and unattractive calls. When females are exposed to males but prevented from mating, their ability to discriminate attractive calls is reduced, suggesting that factors other than mating alter phonotactic behavior. This study evaluates the effect of male exposure on the females' tuning of phonotaxis and its underlying neural elements.

**Buller Hall 250**  
**Room Chair: Robert Zdor**  
**Honors Council Members:: Katherine Koudele, Andras Muranyi, and Maxine Umana**

1:30 p.m. Isabella Tessalee (Lisa Ahlberg, Chemistry & Biochemistry)  
*Synthesis of an Anticancer Molecule Containing an Isoxazoline ring and a Dibenzo[b,f]azepine*

The focus of this paper is the synthesis of an anticancer molecule, the biological mechanism targeted by this model compound, and the use of mass spectrometry in the analysis of the synthetic product. The synthesis of this model allows us to test the chemistry described in the literature and then apply it to the new compound. The predicted efficacy of the novel compound is supported by previous research of known agonist AC-5216 and antagonist PK11195 of the 18 kDa translocator protein (TSPO). The addition of an isoxazoline ring to the model structure is hypothesized to induce apoptosis of cancer cells.

2:00 p.m. Andras Muranyi (Denise Smith, Biology)  
*Analysis of Invasion Proteins in Glioblastoma U87MG Cells Treated with Novel Hybrid Anti-cancer Compound 3,4-dimethoxybenzaldehyde*

This research tested the effectiveness of novel compound 3,4-dimethoxybenzaldehyde, demonstrated to have anti-cancer properties. U87MG Glioblastoma cells were exposed to the compound at its LC50 concentration, then processed to collect proteins from the cells. Proteins were analyzed via Western blotting for specific protein levels of matrix metalloproteinase 2 and 9 (MMP) and disintegrin and metalloprotease 12 and 17 (ADAM). Previous research indicates these proteins are involved in the invasive properties of glioblastoma cells. Westerns were quantified with ImageJ and compared using One-way ANOVA. Results indicate the compound has minimal effect upon the expression of MMP2, MMP9, ADAM12, ADAM17 proteins.

2:30 p.m. HeeYun Oh (Robert Zdor, Biology)  
*The Effect of Clay on the Inhibitory Effect of Mustard Seed Meal on Velvetleaf Seedling Growth*

Mustard seed meal has been studied as a biofumigant in suppressing weed growth in farming systems lacking herbicide usage. MSM contains glucosinolates that hydrolyzes into volatile isothiocyanates which have herbicidal properties. Previous studies have shown that MSM in elevated sand content was highly effective in suppressing the germination of velvetleaf weed seeds, and that it decreased in an increased clay/silt content. Based on this, it was postulated that clay may inhibit MSM efficacy by preventing isothiocyanate action. Two different types of clay were tested at various concentrations to measure the reduced inhibition of seed germination by MSM. Low concentrations of both types of clay didn't inhibit the weed suppressive properties of MSM.

3:00 p.m. Jared Wallen (Katherine Koudele, Agriculture)  
*Monitoring the Immune Status of Calves at the Agriculture Education Center*

Each year at the Andrews University Agriculture Education Center calves are born to the resident cows and five to seven calves are purchased to be raised by the students in the agriculture program. In each of the previous two years that calves have been raised, morbidities have been observed. To try and prevent any calves from dying and reduce the morbidities, the research project was designed to monitor the calves' immune status. By doing weekly blood draws, the total serum protein levels can be determined and used as a standard for their health. Body temperature, food and water intake, and activity levels will also be used as health indicators.

**Buller Hall 251**  
**Room Chair: Sonia Badenas**  
**Honors Council Members: : Davide Sciarabba**

1:30 p.m. Jonathan Homan (Anthony Bosman, Mathematics)  
*Classifying Pretzel Links Obtained by Strong Fusion*

The strong fusion of a mathematical link joins two components of the link via a band and adds an unknotted circle about the band. We present a complete and original classification of those pretzel links which can be obtained by strong fusion. The primary tools we depend on are linking number and a dichromatic resolution of the link in which we conceive of the link as being colored with two colors and resolve crossings in such a way that respects those colors. Solving the classification problem in a number of subcases gives the general result.

2:00 p.m. Kurt Kuhlman (Stephanie Carpenter, History & Political Science)  
*Infamy, Lies, and Loss: The Downfall of the German-American Bund*

This project focuses on the German-American Bund, the largest Nazi organization in the United States, and those specific events that led to its collapse. First, a February 1939 Bund rally in Madison Square Garden made them more infamous across the country. Then *Bundesführer* Fritz Kuhn appeared before the Dies Committee in Congress to testify about Bund activities in the U.S. Finally, in December 1939 Kuhn was convicted on charges of larceny and forgery and sent to prison. Following his incarceration, the Bund was unable to hold together without his leadership, and dissolved within two years, immediately following Pearl Harbor.

2:30 p.m. Andrew Remmers (Carmelita Troy, Accounting, Economics and Finance)  
*The Impact of COVID-19 on Hospital's Financial Statements as it Relates to Elective Surgeries*

Coronavirus has negatively affected the financial health of hospitals. As hospitals reached in-patient capacities with Covid-19 patients, hospitals were not able to provide more profitable services, such as elective surgeries. Elective surgeries account for approximately 43% of hospitals' total revenue and profits. The impact of Covid-19 has put some hospitals into a precarious financial position. Variants of the coronavirus pandemic, such as Delta, have filled hospitals and critical care units with patients. With the increase in demand from these patients, hospitals have to adapt their strategies to remain financially viable during an unpredictable pandemic.

3:00 p.m. Steven J. Mann-Rojas (Davide Sciarabba, Religion & Biblical Languages; Rodney Summerscales, Computer Science)  
*Who Should Have the Final Say? An Investigation Into the Moral Implications of Decision Making Systems Within AI Piloted Vehicles*

The situation in which an Artificial Intelligence (AI) overrides the actions of a human driver constitutes a moral dilemma: should the AI or the human driver have the final decision on which action to take given one or more possibilities? I maintain that these actions should always be overridable by the driver because the AI is not capable of being held to account for its decisions and thus cannot be a moral agent. Furthermore, I argue that the human driver both can and should be held to account for their decisions.



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A Special Thanks to our Honors Council Members:

Dr. Sonia Badenas  
Dr. Karl Bailey  
Prof. Kylene Cave  
Dr. Vanessa Corredera  
Dr. Ryan Hayes  
Ms. Alyssa Henriquez  
Dr. Shandelle Henson  
Dr. Katherine Koudele  
Ms. Beatriz Martins  
Dr. Beverly Matiko  
Mr. Andras Muranyi  
Dr. Benjamin Navia  
Dr. L. Monique Pittman  
Prof. Davide Sciarabba  
Dr. Tiffany Summerscales  
Dr. Karin Thompson  
Dr. Robert Zdor

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