

Απειρον

απειρον

APRIL 16, 2021



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The Apeiron is an ancient term offered by Anaximander of Miletus in the 6th century B.C. that embraces the spirit of this forum. As with the Apeiron, which is infinite and boundless, all inclusive, eternal, and unaging, this forum is designed to be inclusive with respect to student research, scholarship, creative activities, and community engagement. It is dedicated to the proposition that students are capable of work that knows no limits and transcends all boundaries.

Each student participant in the Washburn University Apeiron has worked on his or her project under the supervision of a faculty mentor. The projects, which have been reviewed by the faculty, demonstrate creativity, originality, and a level of work superior to that normally expected of students. Today's presenters exemplify the spirit of the Apeiron.



www.washburn.edu/apieron

☞ The Greek Alphabet ☞

A α	Alpha	N ν	Nu
B β	Beta	Ξ ξ	Xi
Γ γ	Gamma	Ο ο	Omicron
Δ δ	Delta	Π π	Pi
E ε	Epsilon	Ρ ρ	Rho
Z ζ	Zeta	Σ σ	Sigma
H η	Eta	Τ τ	Tau
Θ θ	Theta	Υ υ	Upsilon
I ι	Iota	Φ φ	Phi
K κ	Kappa	X χ	Chi
Λ λ	Lambda	Ψ ψ	Psi
M μ	Mu	Ω ω	Omega

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April 16, 2021

Schedule of Events

10:00 a.m. – 10:10 a.m.

Welcome*

Courtney Sullivan, *Chair, Apeiron Committee*

Join: <https://live.remco.co/e/washburn-university-apeiron-2021>

Recognition of Student Designers*



Glorianna Noland and Christina Noland,
Designers of Apeiron Poster and Program Cover Art

10:10 a.m. – 10:40 a.m.

Fine Arts Performance

11:30 a.m. – 12:45 p.m.

Oral Presentations I

*Fine Arts/Communication Studies/
History/Anthropology/Physics/Spanish*

1:30 p.m. – 2:45 p.m.

Oral Presentations II

Computer Information Science/Nursing

3:30 p.m. – 5:00 p.m.

Poster Presentations

*A video recording of the Apeiron Welcome and Recognition of Student Designers can be viewed at:

<https://video.washburn.edu/Watch/Mn8p6Z5R>

Fine Arts Performance

10:10 a.m. – 10:40 a.m.

<https://live.remco.co/e/washburn-university-apeiron-2021>

Moderator: Madeline Eschenburg

► 10:10 a.m. – 10:40 a.m.

Antonin Dvořák's Scherzo (Quintet No. 2, op. 77, II. Scherzo)

**Mallory Lysaught, Suzanne O. Johnston, Isabelle Luckman, Caroline Shipley,
and David W. Lowry**

Mentor: Silas Huff, Music

Czech composer Antonín Dvořák (1841-1904) wrote his String Quintet No. 2 in G major, Op. 49 in 1876. A quintet is a form of chamber music for five players who must each lead their peers at different times. They communicate by breathing together, with eye contact, and through musical movements with their bodies. This musical presentation is a collaboration of five WU students known as the "Hughes Quintet": Mallory Lysaught (violin 1), Sue Johnston (violin 2), Isabelle Luckman (viola), Caroline Shipley (cello), and David Lowry (Bass), advised by Dr. Silas Huff, Director of Orchestras.

Oral Presentation Schedule-at-a-Glance

(All oral presentations take place via Zoom. To attend an oral presentation, click on the Zoom link for the presentation or copy and paste the Zoom link to a web browser.)

Oral Presentations I

Time	Presenter	Title
11:30 am – 11:50 am		
Zoom Link 1	Leslie Lopez	<i>Communication During the Pandemic</i>
Zoom Link 2	Kaitlyn Rohr	<i>El impacto de la clase social como es retratada por las telenovelas [The Impact of Social Class As Shown Through Telenovelas]</i>
Zoom Link 3	Taylor Nickel	<i>Recentering Forensic Anthropology in Anthropological Theory</i>
Zoom Link 4	Matthew Christman	<i>Design of Quantitative Phase Imaging Microscope and Use in Preliminary Investigation of Cellular Phase</i>
11:55 am – 12:15 pm		
Zoom Link 1	Cedric Lee	<i>Pandemic Communication</i>
Zoom Link 2	Eric Kullavanijaya	<i>Estrechando el brazo del Papado: El poder del Papado en la península Ibérica</i>
Zoom Link 3	Katherine LaFever	<i>Japanese Americans: Insiders' Perspectives</i>
Zoom Link 4	Alexander Yelland	<i>Effects of Supernovae Cosmic Rays on the Earth's Atmosphere</i>
12:20 pm – 12:40 pm		
Zoom Link 1	Taylor Molt and Isabella Martinez-Haskins	<i>Making a Musical: COVID-19 Edition</i>
Zoom Link 2	Teal Tobin	<i>Paraguay y COVID-19</i>
Zoom Link 3	Robert Geotz, Jr.	<i>Jesse Burgess Thomas and His Struggle to Save the Union</i>

Oral Presentations II

Time	Presenter	Title
1:30 pm – 1:50 pm		
Zoom Link 5	Trevor Beurman	<i>Pet Central: Humane Society CMS</i>
Zoom Link 6	Blaire Helgeson, Dawna Smith, and Jordan Brennan	<i>Treatment for Uncomplicated Urinary Tract Infections in Rural Primary Care Settings</i>
1:55 pm – 2:15 pm		
Zoom Link 5	Aaron Furman	<i>Rainbow Tables for NTLM Hashes: Theory and Viability</i>
Zoom Link 6	Keaton Meeks	<i>Understaffing, Burnout, and Nurse Retention</i>
2:20 pm – 2:40 pm		
Zoom Link 5	Dane Vanderbilt and Aaron Ediger	<i>Mapics: A Location-Based Image Sharing Social Media</i>

Zoom Link 1 = <https://washburn.zoom.us/j/92026846588?pwd=MkpDUUFhaHFUZkxhRFVtNDJEWGJXZz09>
 Zoom Link 2 = <https://washburn.zoom.us/j/97967274625?pwd=MWpVWWh0V0RYRldmc2o4OFozTFphQT09>
 Zoom Link 3 = <https://washburn.zoom.us/j/93783365055?pwd=TFNKUIRXNXIsU2hwQzVVL0wvTm1Rdz09>
 Zoom Link 4 = <https://washburn.zoom.us/j/99872801157?pwd=VjhjWE9leXR6VTEwekl4VExPVUp2UT09>
 Zoom Link 5 = <https://washburn.zoom.us/j/98243989454?pwd=MlFUZlVNOVFNU3ZtZ3ZYRVVzbG9sZz09>
 Zoom Link 6 = <https://washburn.zoom.us/j/93436798106?pwd=MDBGU1YxcE04TEhwOUZlZWY202S3ZYUT09>

Oral Presentations I

11:30 a.m. – 12:45 p.m.

WTE denotes Washburn Transformational Experience



Session α

Moderators: Kelly Erby and Julie Noonan

Join via Zoom: <https://washburn.zoom.us/j/92026846588?pwd=MkpDUUFhaHFUZkxhRFVtNDJEWGJXZz09>

► 11:30 a.m.

Communication During the Pandemic

Leslie Lopez

Mentor: Tracy Routsong, Communication Studies

WTE

In the past year and a half, higher education faculty and students have had to rethink education in general, but especially communication channels. Using Uncertainty Reduction Theory as a framework, this project used a mixed methods approach to understand the complexity of communicating during a pandemic, and the various channels used to continue the learning process. Students reported a lack of motivation, as well as decreased communication that they initiated. However, students indicated an increase in communication by professors. Email was perceived to be the most effective way to reach professors, while texting was named as the most used method to communicate with peers. 80% of respondents stated that they were reliant or extremely reliant on technology. Implications to this project include the continued need to assist students with technology and internet capabilities post-pandemic. Students also recognized that most professors attempted to increase their communication with students and worked to keep them informed. Future study could include discussing importance of technology and continued channel use post-pandemic.

► 11:55 a.m.

Pandemic Communication

Cedric L. Lee

Mentor: Tracy Routsong, Communication Studies

Communication channels provide a pathway for student-athletes to remain in contact with their classmates, coaches, and teachers. Amidst a pandemic, traditional means of communication prove more challenging as teams face quarantines, isolations, remote learning, and alternative training schedules. This project looks to understand the various modes of communication and the student-athletes' perception of the impact the disruption to the normal communication channels had on their year. Most students reported that they felt faculty and coaches reached out more during the pandemic, while they communicated and reached out less. Email was the most common response for channels of communication, with texting being the most common between

teammates. Few recognized social media as a strong communication channel between their peers or faculty/coaches. Outcomes of the study might have been impacted by the fact that the survey was conducted while still living through the pandemic.

► **12:20 p.m.**

Making a Musical: COVID-19 Edition

Taylor Molt and Isabella M. Martinez-Haskins

WTE

Mentor: Julie Noonan, Theatre

Have you ever wondered what goes into putting on a musical? What about putting on a musical during a global pandemic? This was something not even the best directors and actors could have prepared for. We will take you through all the steps we took to make our production of *The Last Five Years* come to life.



Session β

Moderators: Miguel Gonzalez-Abellas

Join via Zoom: <https://washburn.zoom.us/j/97967274625?pwd=MWpVWWWhoV0RYRldmc2o4OFozTFphQT09>

► **11:30 a.m.**

El impacto de la clase social como es retratada por las telenovelas [The Impact of Social Class as Shown Through Telenovelas]

Kaitlyn Rohr

WTE

Mentor: Miguel Gonzalez-Abellas, Modern Languages

Este estudio explora el impacto de la clase social y cultura en los valores sociales, religión y la dinámica de la familia a través de la lente de las telenovelas. Se usa información de las observaciones de varios capítulos de 7 telenovelas de países como los Estados Unidos, México, Colombia y Venezuela e investigaciones secundarias para formar un análisis de cultura para los lugares mencionados. Este análisis encontró que, a través de las telenovelas, la clase social tienen un impacto en la creación de valores sociales, el efecto de la religión en opiniones y la creación de leyes y las interacciones entre miembros familiares y sus expectativas de sus hijos. [This study explores the impact of social class and culture on social values, religion, and family dynamics through the lens of telenovelas. It uses information from the observations of various episodes of 7 telenovelas from countries such as the United States, Mexico, Colombia, and Venezuela and secondary research in order to form an analysis of culture in the mentioned areas of emphasis. This analysis found that through telenovelas, social class has an impact on the creation of social values, the effect of religion on opinions and the creation of laws and the interactions between family members and their expectations of their children.]

► **11:55 a.m.**

Estrechando el brazo del Papado: El poder del Papado en la península Ibérica

Eric Kullavanijaya

WTE

Mentor: Miguel Gonzalez-Abellas, Modern Languages

La institución del Papado influyó el entendimiento de la Reconquista como una cruzada. Con esta nueva formación del conflicto, acompañado por la influencia de las órdenes militares hispánicas y las reformas litúrgicas romanas, el Papado intentó obtenerse un control más firme en la península ibérica. [The institution of the Papacy influenced the understanding of the Reconquista as a Crusade. With this new formation of the conflict, along with the Papal influence of the Spanish military orders and Roman liturgical reforms, the papacy attempted to exercise greater control over the Iberian peninsula.]

► **12:20 p.m.**

Paraguay y COVID-19

Teal Brooke Tobin

Mentor: Miguel Gonzalez-Abellas, Modern Languages

En esta presentación, voy a hablar de mi tesis en español. COVID-19 ha afectado al mundo entero, pero golpeó Paraguay muy duro. La economía en Paraguay ya empezó a bajar rápidamente, pero solo va a bajar más en los siguientes meses. Debido al virus, la producción de todo se detuvo, y los negocios cerraron. Básicamente, el país cerró. COVID-19 va a continuar cambiando muchas cosas, especialmente en la cultura de Paraguay. La cultura en Paraguay es compartir todo, pero con eso encontramos un problema. ¿Cómo la gente de Paraguay va a compartir todo cuando hay una pandemia? ¿Qué van a hacer?



Session γ

Moderator: Rachel Goossen

Join via Zoom: <https://washburn.zoom.us/j/93783365055?pwd=TFNKUIRXNXIsU2hwQzVVL0wvTm1Rdz09>

► **11:30 a.m.**

Recentering Forensic Anthropology in Anthropological Theory

Taylor D. Nickel

WTE

Mentors: Laura Murphy and Alexandra Klaes, Sociology & Anthropology

Anthropology, as the holistic study of humans, has naturally fostered many subdisciplines, each requiring their own hybridized theoretical frameworks and methodologies. Forensic anthropology is one such subdiscipline that bridges anthropology, forensic science, and medico-legal practice, thus placing it within a spectrum of seemingly disparate frameworks. As a result, forensic anthropology has been criticized for its lack of a central theoretical framework rooted in

anthropology. Forensic anthropology has been perceived as atheoretical largely by belief that it is devoid of robust methodology, error analysis, assessment of cognitive bias, and related issues. Forensic anthropology is a case-driven forensic scientific discipline representative of applied science. The discipline is not atheoretical, but recognition and broader implementation of anthropological and scientific theory is needed to further define forensic anthropology as a scientific endeavor. This paper examines the use of theoretical frameworks in published forensic anthropology research and addresses such concerns that have led to forensic anthropology being perceived as atheoretical. Based on those results and through an examination of the historical and modern development of the subdiscipline, this paper offers ways to recenter forensic anthropology in anthropological theory.

► **11:55 a.m.**

Japanese Americans: Insiders' Perspectives

Katherine Claire LaFever

WTE

Mentor: Rachel Goossen, History

Primary documentation written by Japanese Americans who lived through the internment process make clear the effect internment did have on dynamics between generations, the opportunities of the young internees, and the redress movement. Secondary sources within this paper are used to enhance the histories surrounding those who lived through the injustices. In the 1940s, the Asian population was a perceived threat to the security of the nation but by 1988 opinions on the internment era quickly changed. Second generation Japanese Americans, or Niseis, found undisclosed documents in the national archives that revealed internment was never necessary for national security and that federal court officials covered it up. A team of Niseis, with support from the Japanese American Civil League (JACL) went to the courts and fought for the constitutional rights of internees and the future generation of Japanese Americans. The Supreme Court decided that the government illegally interned American citizens and a redress movement gained momentum. Redress was seen in the form of monetary support and a public apology. Controversy over monetary reparations existed within the community but for many, redress was the beginning of healing and understanding their own Japanese American culture. The redress movement allowed for Nisei, Sansei-third generation, and their descendants to share their histories that make clear the hardships and struggles that internment had caused.

► **12:20 p.m.**

Jesse Burgess Thomas and His Struggle to Save the Union

Robert E. Geotz, Jr.

WTE

Mentor: Kelly Erby, History

When Jesse Burgess Thomas wrote the Missouri Compromise in 1820, he struggled to find a way to save the Union while at the same time protect the state's rights. Slavery was a growing delicate political subject that interjected passions from the opposite political corners. The key for compromise to allow statehood for Missouri was to find moderates in both the United States Senate and the United States House of Representatives who would vote for approval in 1820.

The struggle allowed Jesse Burgess Thomas to shine through with his ability to use words on paper to create a fragile compromise on slavery to save the Union until the Civil War.



Session δ

Moderator: Vincent Rossi

Join via Zoom: <https://washburn.zoom.us/j/99872801157?pwd=VjhjWE9leXR6VTEwekl4VExPVUp2UT09>

► 11:30 a.m.

Design of Quantitative Phase Imaging Microscope and Use in Preliminary Investigation of Cellular Phase

Matthew E. Christman

Mentor: Vincent Rossi, Physics - Astronomy - Geology - Engineering

Over the past decade Quantitative Phase Imaging (QPI) has come forward as a useful technique for analysis of biological material. External forces can induce changes on cell depth and the internal arrangement of materials. These alterations impact light passing through the cell by imparting phase shifts on said light. QPI allows for observation of this change in phase, which provides data on cell depth and changes to localized index of refraction. Here we present specifications for designing a quantitative phase microscope, as well as preliminary examples of its use.

► 11:55 a.m.

Effects of Supernovae Cosmic Rays on the Earth's Atmosphere

Alexander M. Yelland

Mentor: Brian Thomas, Physics - Astronomy - Geology - Engineering

Geochemical evidence has established that at least one, if not more, supernova explosions occurred within 50-100 pc of Earth about 2.5 million years ago. Recent work has developed methods for estimating the cosmic ray flux arriving to Earth from supernovae events approximately 50 pc away and 100 pc away using various assumptions regarding particle transport. Here, I am reporting on the re-examination of some of those results using an updated computation of the cosmic ray proton flux under an empty-space diffusive transport approximation. We found that some cases reported in previous work present an overestimation of the proton flux. This has implications when modeling Earth's atmospheric chemistry changes during these time periods. As we continue our current work, we are updating these models and simulations while also extending our calculations to theorize the effects of closer supernova events.

Oral Presentations II

1:30 p.m. – 2:45 p.m.

WTE denotes Washburn Transformational Experience



Session E

Moderators: Bruce Mechtly and Nan Sun

Join via Zoom: <https://washburn.zoom.us/j/98243989454?pwd=MIFUZIVNOVFNU3ZtZ3ZYRVVzbG9sZz09>

► 1:30 p.m.

Pet Central: Humane Society CMS

Trevor Beurman

Mentor: Nan Sun, Computer Information Sciences

Pet Central is a humane society management system that enables the proper record keeping, adoption roster efficiency, and presentation of information for a 21st century humane society. With an easy to manage admin dashboard, attractive UI, and Calendly integration, Pet Central is a centralized environment for all the known and potential needs of a humane society. The web application is built on Angular, hosted on Firebase, and uses the noSQL Firebase Firestore datastore.

► 1:55 p.m.

Rainbow Tables for NTLM Hashes: Theory and Viability

Aaron Furman

Mentor: Bruce Mechtly, Computer Information Sciences

While rainbow tables are useful for reversing cryptographic hashes, they are imperfect. Though they achieve their goal of saving space versus a traditional one-to-one database of words and hashes, rainbow tables success rates fall below the ideal 100%. This study investigates how the theory of rainbow tables work, as well as measurements of success and limitations. To gather these results, a program was created which would generate rainbow tables with alterable character sets, password sizes, chain length, and the number of allowed duplicates using MD5 or NTLM hashing algorithms. For this study, a merged chain is defined as a chain with the same final hash as another chain. In addition to table generation, programs were created to determine exact statistics on the tables in order to fully understand how each variable impacted the quality of the table. The most important statistics that were made observable by these programs were the file size of the table, the success percentage of the table, and the time required to generate the table. The results and impact of the findings will be presented.

► 2:20 p.m.

Mapics: A Location-Based Image Sharing Social Media

Dane A. Vanderbilt and Aaron David Ediger

WTE

Mentor: Nan Sun, Computer Information Sciences

Mapics is a web-based application that allows users to post and view photos based on their location. The application has four main pages: home, direct messages, create a post, and your profile. The home page allows you to view photos that have been posted in a 10-mile radius of your current location or recent photos from people whom you follow. The direct messages page allows you to view your conversations with other users on the app, and the create a post page allows you to snap a picture and post it with a short caption. The profile page allows you to view your profile, edit your profile, and view a feed of your posts in three different ways. This project is implemented in HTML, CSS, and Typescript, along with the Angular and Bootstrap frameworks. The project also uses Google's Firebase APIs to store and retrieve data and images. The project is hosted on Netlify and can be accessed at <https://mapics.netlify.app>.



Session ζ

Moderators: Michele Reisinger

Join via Zoom: <https://washburn.zoom.us/j/93436798106?pwd=MDBGU1YxcE04TEhwOUZlWY202S3ZYUT09>

► 1:30 p.m.

Treatment for Uncomplicated Urinary Tract Infections in Rural Primary Care Settings

Blaire Elyse Helgeson, Dawna K. Smith, and Jordan K. Brennan

WTE

Mentor: Michele Reisinger, School of Nursing

The purpose of this project was to improve antibiotic stewardship within rural primary care outpatient clinics through the standardization of treatment for female patients aged 18 to 55 years diagnosed with uncomplicated UTIs. A QI project design was chosen utilizing three PDSA cycles. Data regarding the process of diagnosing and treating uncomplicated UTIs was collected at a rural healthcare clinic. A multifaceted intervention to standardize the process and treatment for uncomplicated UTI diagnoses was developed and implemented. The intervention addressed areas such as the process of delaying antibiotic prescriptions pending culture results, tools to educate patients regarding urinary symptomatic treatment, and consistency in documentation for UTI treatment. Results revealed some improvement in standardization of UTI diagnosis and treatment. Five cases in the pre-implementation phase included antibiotics prescribed prior to UA results, while the post-implementation period contained one case of antibiotic prescription prior to UA results (80% reduction). Twenty-one cases in the pre-implementation phase involved antibiotics prescribed for either no cultures, no growth on cultures, or inappropriate antibiotic selection that was insensitive to culture growth. This is compared to seven cases in the post-implementation phase, a 66% reduction. To further develop a quality improvement initiative,

barriers for sustainability in implementation strategies must be addressed. Barriers for this particular rural facility that were unable to be addressed in this project included collaborative communication, UTI diagnostic collection process, and documentation. Further research of a longitudinal nature would also build upon the findings of this project.

► 1:55 p.m.

Understaffing, Burnout, and Nurse Retention

Keaton M. Meeks

Mentor: Shirley Waugh, School of Nursing

WTE

This project was a literature review aimed to educate nursing managers, staff, and their facilities on the harmful effects of understaffing and how this can lead to nursing burnout and poor patient outcomes. A literature review found several interventions to solve this problem through active intervention, giving recognition, and using technical data.

Poster Presentations

3:30 p.m. – 5:00 p.m.

<https://live.remco.co/e/washburn-university-apeiron-2021-1>

WTE denotes Washburn Transformational Experience

Floor 1 – Table 1

*Preliminary Study Investigating the Efficacy of using Wild ID for Identifying Individual Ornate Box Turtles (*Terrapene Ornata Ornata*) Based on their Unique Shell Patterning*

Sally Neng Brownlee

Mentor: Benjamin Reed, Biology

Individual animals possess unique sets of characteristics including behaviors, physiology, and morphology. These characteristics directly influence the animal's performance within their environment but may also secondarily serve as a way for observers to consistently identify individuals across time and space. Morphological traits, such as patterning, are especially useful for identifying individuals; however, it is often difficult to detect the subtle differences in patterning across individuals. In these cases, it is helpful to use pattern recognition software to ID individuals as an alternative to more invasive PIT tagging, banding, collaring, ear-tagging, etc. methods. In this study, we are investigating the efficacy of using Wild-ID as a tool for identifying individual ornate box turtles both within and across different populations. In addition, we are also investigating whether shell patterning is based more on population association or whether there is no detectable difference in patterning across populations. Preliminary results indicate that Wild-ID can correctly identify turtles based on their plastron and carapace patterning, with plastron patterning thus far being more consistent and viable based on the program's matching ability. Future work will continue to investigate individual and inter-population differences in patterning characteristics.

Floor 1 – Table 2

A Comparison Study: Determination of THC Concentration of Seized Samples Using Two Different Homogenization Techniques

Megan Denis

WTE

Mentor: Holly O'Neill, Chemistry

The legal status of cannabis is constantly changing, with some states legalizing it while others have not. With the 2018 Farm Bill, some cannabis is now federally legal to grow; legal cannabis (hemp) is defined as having less than or equal to 0.3% THC concentration by dry weight while illegal cannabis is higher than 0.3% THC concentration by dry weight. Now law enforcement must discern between the two, utilizing published methods to utilize different processing methods to extract or homogenize the THC in the plant material. The purpose of this experiment was to test two different processing techniques, centrifugation and vortexing. Twenty-five

samples of cannabis were ground and prepared before being run through the high-performance liquid chromatogram (HPLC). Results showed that 4 out of 25 samples had significantly higher THC concentrations in the vortexed samples while none had significantly higher THC concentrations in the centrifuged samples. Six of the 25 samples that were centrifuged showed a lower %RSD between triplicates compared to vortexed triplicate samples, and 9 of the 25 samples that were vortexed showed a lower %RSD between triplicates compared to centrifuged triplicate samples.

Floor 1 – Table 3

Box Turtles as a Sustainable Bioindicator of Predator Density

Jacob J. Heit

WTE

Mentor: Benjamin Reed, Biology

In this study, we investigated whether a long-lived terrestrial ectotherm can be used as a sustainable bioindicator of predation risk within and across habitats. Certain species may be particularly useful for monitoring predation patterns within a habitat if the species can be attacked by a predator but not typically killed. Turtles have been around since dinosaurs walked the Earth, and due to their sturdy bony shell, they can withstand predation events with typically only minor shell damage as a record of these attacks. We specifically studied box turtles to identify predation threat level in a particular habitat. We used photographs of the turtles' shells to score their shell damage on a 0-4 scale. The shell was divided into four quadrants with each quadrant receiving a score. We then took an average of the four quadrants to give each turtle an overall shell damage score. We then compared the damage within each habitat and across two habitats. These scores enabled us to compare predation across two populations. Using previous data of turtle behavior, we also were able to compare risk-taking behavior with shell damage and identify if there is a correlation between the two. We found that shell damage differed among populations and among sex of the turtles.

Floor 1 – Table 4

Occupational Therapy and Youth COVID-19 Trauma

Larisse Williams

WTE

Mentor: Stephanie Sedlacek, Allied Health

The pandemic caused by COVID-19 has created problems felt throughout the world, including trauma in children. This trauma has been caused by many sources including the death of loved ones from COVID-19, increasing stress of parents leading to abuse, and direct lifesaving measures from COVID-19 effects. Occupational therapy's unique perspective can address this trauma in children that has resulted from the many impacts of COVID-19 and provide interventions for children to heal and thrive.

Floor 1 – Table 5

Mutation of Negatively Charged Amino Acid to a Positively Charged Amino Acid Changes V_{max} of the Lactate Dehydrogenase Enzyme

Isaiah L. Powell

Mentor: Allan Ayella, Chemistry

Lactate Dehydrogenase (LDH) is a protein that catalyzes the conversion of lactate to pyruvate during anaerobic pathways. LDH is a possible target for use in biotechnology therapeutics for cancer treatment. In this experiment, we aim to change glutamic acid (E), a negatively charged amino acid at position 55 to a lysine residue (K), a positively charged amino acid, and hence affect the formation of salt bridges within the enzyme secondary structure and hopefully will affect V_{max}. Methods in this experiment include transformation of a wild-type LDH plasmid through site-directed mutagenesis, and protein characterization. The isolated mutant E55K showed a drop in the optimal pH for the enzyme activity, as expected due to a change from an acidic to a basic amino acid. The residue changed is not in or around the active-site and the main function of the protein should be conserved, while its activity changes. This is important as effective mutations on LDH could result in possible treatment methods aimed at reducing the Warburg effect in cancer cells.

Floor 1 – Table 6

Sequencing the Genome of Bacteriophage Adastra using Nanopore Technology

Faith M. Butler

WTE

Mentor: Andrew Herbig, Biology

Bacteriophages are viruses which exclusively infect, and replicate within, bacterial cells. They consist of nucleic acid genetic information encapsulated in a protein shell with additional proteins that allow a bacteriophage to transmit its genetic information inside its host to direct all replication activities. Since bacteriophages specifically infect bacteria, there is hope for their therapeutic usage in treatment of bacterial infections that do not respond to antibiotics. Therefore, bacteriophages are very important in potential medical advancements. The bacteriophage Adastra was isolated from a soil sample by Washburn students in 2016 and shown to infect the Gram-positive, endospore-forming bacterium *Bacillus subtilis*. Experiments were recently conducted to determine the genome sequence of Adastra. These experiments included the isolation and purification of genomic DNA from the phage. We created a genomic DNA library and subjected it to sequencing using next-generation Oxford Nanopore MinION and Flongle flowcell technology. From our preliminary sequence analysis, the Adastra genome is similar to that of SPO1 and CampHawk, two bacteriophages which also infect *B. subtilis*. Work is ongoing to finish sequence alignment and annotation of the complete Adastra genome. Determination of the genetic sequence will allow phylogenetic comparisons to other bacteriophages and insights into its molecular biology.

Floor 1 – Table 7

Mutating Wild-type LDH Glutamic Acid at Position 55 to Alanine Causes Structural and Function Changes in New Mutant LDH

Dipesh Thapa

Mentor: Allan Ayella, Chemistry

Lactate dehydrogenase (LDH), an enzyme found in all living cells is expressed extensively in body tissues. To further investigate the importance of protein secondary structure in the function of LDH, we changed the amino acid outside the active site of wild type (WT) Barracuda LDH from glutamic acid(E) to alanine(A) with the hope of affecting its structure and hence function. To cause the change, we designed primers using site-directed mutagenesis. The E55A mutant LDH was confirmed through restriction enzyme digestion and sequencing. Both WT and mutant LDH DNA were then transformed into bacteria. Protein was then isolated using standard established biochemistry protocols. The function and structure of isolated WT and mutant LDH protein were studied through kinetics and circular dichroism. The E55A mutant had distinct structural morphology of the LDH protein due to their hydrophobic force interactions. There was also a rheostat effect on LDH function. These data support the result that structural changes that occur through site-directed mutagenesis affect LDH function, and hence helpful in targeting LDH for therapeutic intervention.

Floor 1 – Table 8

Ozone Depletion-Induced Climate Change Following Supernova Events

Cody Ratterman

WTE

Mentor: Brian Thomas, Physics - Astronomy - Geology - Engineering

Ozone in Earth's atmosphere is known to have a radiative forcing effect on climate. Motivated by "geochemical evidence" for one or more nearby supernovae about 2.6 million years ago, we have investigated the question of whether a supernova could cause a change in Earth's climate through its impact on atmospheric ozone concentrations. We used the "Planet Simulator" (PlaSim) intermediate complexity climate model with prescribed ozone profiles taken from existing atmospheric chemistry modeling. We found the effect on globally averaged surface temperature is small, but localized changes are larger and differences in atmospheric circulation and precipitation patterns could have regional impacts. Further work is being done to study longer time frames, previous geographic time periods, and multiple types of supernovae.

Floor 1 – Table 9

Analysis of Rainbow Tables for the MD5 and NTLM Hashes

Caleb Stadler

Mentor: Bruce Mechtly, Computer Information Sciences

Password cracking is an important part of digital forensics because to be able to find evidence of wrongdoing the digital forensic investigator needs to have access to the device, and people are not always willing to give up their information. Some of the methods of finding passwords are rainbow tables, brute force attacks, and dictionary attacks. In this project we analyzed rainbow tables for 6 character passwords using small character sets. This was done using programs that generate rainbow tables for two of the popular hashing algorithms MD5 and NTLM. Then programs were run with the rainbow tables that were generated to obtain statistics to see how efficient rainbow tables are. Some of the statistics include: the percentage of the possible unique keys were created, how many duplicate keys were created (wasting space), how many chains merged, and where on average the merges occurred. These results and the conclusions drawn from them will be presented.

Floor 1 – Table 10

London Symposium on Girlhood (Bande de filles), King's College London 2020

Balin Schneider and Mallory Elizabeth Hamilton

WTE

Mentor: Courtney Sullivan, Modern Languages

After taking Introduction to French Cinema, we had the opportunity to attend a King's College (London) symposium on Céline Sciamma's film, *Girlhood* (2014). During the day-long workshop, we discussed the work with prominent European critics of French film, we listened to a variety of presentations, and participated in dialogues about the film with a wide variety of participants. Through studying the film at Washburn, we were able to discuss the themes of the film, cinematic storytelling, and real-world applications/influence. One of our main discussions during the symposium revolved around the theme of race in the film. Some attendees were displeased with the idea of a Caucasian filmmaker creating a film about black teens. Confronting our pre-dispositions about the film, this topic, and the meaning of the film, we participated in this important dialogue. Also discussed at the Symposium was the motif of the color blue throughout the film. Using our prior knowledge of the film combined with the new outlook, our thoughts about the representation of race and class and the contrasting technical use of blue and orange changed. Our presentation will open a dialogue, as well as cover the different perspectives of these topics.

Floor 2 – Table 11

Oxamate Inhibitory Effects on E55G Mutated LDH

Quang T. Le

Mentor: Allan Ayella, Chemistry

Elevated and uncontrolled LDHA activity is heavily linked with tumor growth. Thus, effective inhibition of LDHA could be beneficial in reducing tumor growth. The hypothesis of this research is that disrupting salt bridges in LDH will be comparable to oxamate inhibition. To do this, a point-directed mutagenesis was done on LDHA, changing glutamic acid (E) to glycine (G) at position 55. The plasmids are then cloned and transformed into competent cells to grow and purify mutated and WT LDHA proteins. Oxamate inhibitory characterization on WT and E55G LDH proteins were done. Kinetics study on LDHA E55G mutant was performed and the results were compared to oxamate-inhibited WT LDHA. We found a weaker inhibition in the E55G compared to WT LDHA perhaps due to already reduced activity of the mutated LDHA. This research hopes to discover and understand potential inhibitory mechanisms that can be applied in future anti-cancer research.

Floor 2 – Table 12

How Different Types of Cognitive Breaks Affect Academic Achievement

Quincy Bocquin

WTE

Mentor: Michael McGuire, Psychology

There is no question that the current pandemic has caused problems for students of all ages in a variety of categories. As of April of 2020, 98% of colleges and universities moved a majority of in-person classes online due to COVID-19 (Bustamante, 2020). Students who had previously attended in person classes, now had to adjust to a new way of learning. Because of the shift from in person to online classes, it is important to study the use of different types of breaks to avoid burnout and maximize academic achievement. Currently, a large area of focus is on maximizing student learning outcomes. This review seeks to answer the question, does taking a break during class time benefit students and if so, what type of break is best? The goal for this review is to analyze the research on physically active breaks as well as breaks for cell phone use and determine which is more effective in maximizing academic achievement. Areas of interest include physical activity breaks and phone breaks and how each of these affect cognitive engagement and academic achievement.

Floor 2 – Table 13

COVID-19: Evaluating Generalized Anxiety and Functional Fear as Predictors of Compliance to COVID-19 Guidelines

Hannah G. Dykes

WTE

Mentor: Michael McGuire, Psychology

COVID-19 has integrated itself into everyday life, vastly affecting the American population and quickly becoming a national public health crisis. Additionally, the pandemic has taken a toll on everyday mental health for the average American. Researchers have found a significant relationship between functional fear and compliance to COVID-19 guidelines (Harper et al., 2020). The purpose of my study was to look at Generalized Anxiety Disorder and functional fear in relation to COVID-19 as predictors of levels of compliance to community guidelines.

Floor 2 – Table 14

Using Digital Holographic Microscopy and Optical Scatter Imaging to Observe Changes in Cellular Morphology

Bijaya Basnet

Mentor: Vincent Rossi, Physics - Astronomy - Geology - Engineering

Digital Holographic Microscope (DHM), when combined with Optical Scatter Imaging (OSI), can be used in measuring the angles of scattering by subcellular particles, which gives us the ability to observe and measure morphological changes in subcellular level via their scattered field. These include the structures like nuclei and mitochondria. We have built a Digital Fourier Holographic Microscope (DFHM) for these purposes. The images can also be used for 3D mapping of cells. Polystyrene microspheres of known diameter are used for calibration of the system before any cellular measurement is done. We are specifically interested in witnessing changes in mitochondrial morphologies of breast cancer cells at the onset of apoptosis as a response to Photodynamic Therapy.

Floor 2 – Table 15

Steganography

Allison Cross

Mentor: Bruce Mechtly, Computer Information Sciences

Steganography is a technique used to hide data inside of other files. This project is a program capable of retrieving this hidden data. For this project, a program was created that can extract hidden images from inside of .PNG and .JPG file types. This has digital forensics applications, because digital forensics is concerned with retrieving hidden artifacts. In order for this project to work, BitReader and BitWriter classes were created that can iterate through individual bits of a file, as well as several other classes that helped achieve the goal of this project. Multiple

techniques for retrieving data was used, such as parsing through the file to obtain data from the least significant bit, the two least significant bits, etc. as well as analyzing the alpha color components in .JPG files, along with other strategies.

Floor 2 – Table 16

Synthesis of Quantum Dots from Polycyclic Aromatic Hydrocarbon for Bioimaging

Avinash Dhimal

Mentor: Hoang Nguyen, Chemistry

Graphene quantum dots are nanoparticles of graphene whose spectral properties are directly related to their sizes. These quantum dots have attracted a lot of interest from the scientific community over the years because of their biocompatibility and low toxicity. In addition to their unique spectral properties, these quantum dots also have low cytotoxicity, stable fluorescence, and adjustable bandgap, making them excellent material for biological studies and applications. Graphene quantum dots are thus suitable for biosensing as well as for bioimaging. On the other hand, the small sizes of these quantum dots make it difficult to localize and track their activities inside a cell. In this project, we will discuss the synthesis of the graphene quantum dots from pyrene and applying an optical microcavity to determine the sizes of our synthesized product. We are working on optimizing our synthesis process to increase the uniformity of our products.

Floor 2 – Table 17

Developing an Optical System for Detecting and Characterizing Chemical Properties of Nanoscale Materials

Rajesh Kandel

Mentor: Hoang Nguyen, Chemistry

Optical microcavities play an important role in the study of quantum physics and related fields. There is the expanding applications of these optical devices into other fields, including chemistry and chemical biology, to study binding events of membrane proteins, as well as to investigate the physical and chemical properties of nanoscale materials. Biomolecules such as proteins are on the scales of angstroms and nanometers. They are too small to be observed directly in a regular optical microscope. To observe these nanoscale materials, we will amplify their signal using optical microresonators. The simplest form of optical microcavities is a Fabry-Perot cavity, a structure formed by two optically reflecting surface on opposite sides of a spacer layer. In this research, a micro Fabry-Perot cavity system is built with two high-reflectivity mirrors, situated micrometers apart, to concentrate the laser optical power to enhance the optical signal resulted from the interactions between light and our materials of interest. The distance between these two mirrors will be controlled by a homebuilt piezo stage to match the resonance condition of the circulating light to maximize the number of light-particle interactions. By combining our signal-enhanced microresonators with label-free chemically-specific Raman spectroscopy, we are working toward the detections and observations of the biomolecular activities of species inside a cell that are present in low concentrations.

Floor 2 – Table 18

Systems Literacy and Sustainability

Lucas Ryan, Jennifer Yi, Miguel Ramirez, and Dy-Esha Risby

Mentor: Lindsey Ibanez, Sociology & Anthropology

For our project we have compiled information on systems literacy and created a poster that contains a myths and facts section, with a QR code that links through to further resources that can be used to practically effect change within a system.

Floor 2 – Table 19

*Identification and Annotation of Genetic Sequences in *Drosophila ananassae*, contig17*

Frances Taylor Befort

WTE

Mentor: Takrima Sadikot, Biology

The genome of *Drosophila melanogaster* has been a highly studied genome in biology for the past twenty years. *D. melanogaster* is a model organism for studying the developmental and cellular processes common in other eukaryotes. Here, the *D. melanogaster* genome was used as a reference for identifying genes and genomic elements in contig 17, an approximately 18,000 bp region of the related *Drosophila ananassae* species. The analysis of the sequences and data collection was done using open source computational genomic tools for sequencing, gene-prediction, and genome browsing. The resources used during this project were obtained through the Genomic Education Partnership (GEP). GEP is a bioinformatics program sponsored by Washington University, in St. Louis. The analysis of contig17 of the *Drosophila ananassae* genome yielded the presence of four genes, homologous with genes Ddx1, Rich, CG11523, and JMJD7 of *D. melanogaster*. No incomplete genes or nonconsensus regions were found present within this contig.

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