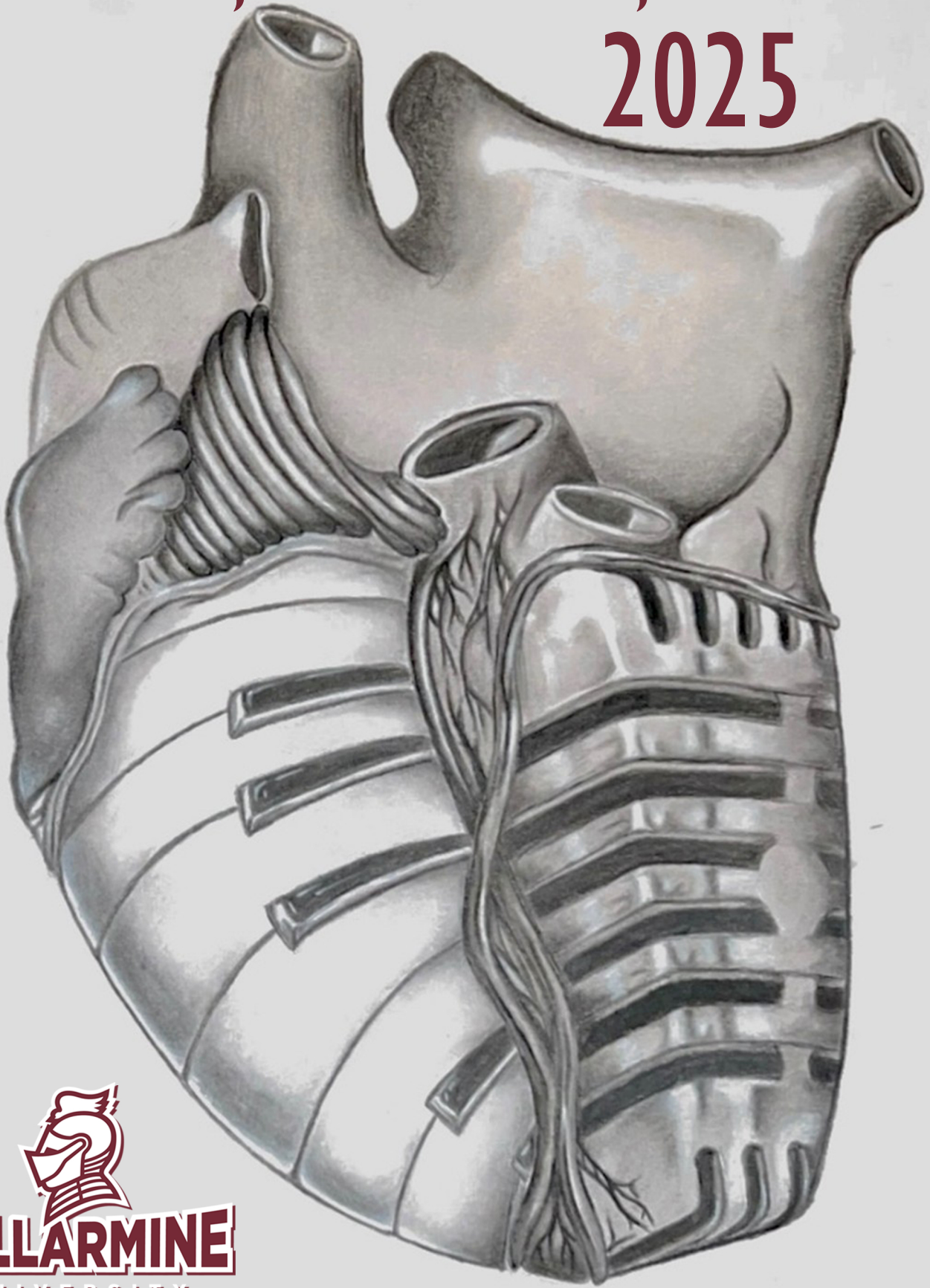


C E L E B R A T I O N of RESEARCH, SCHOLARSHIP, & CREATIVITY 2025



2025 CELEBRATION OF RESEARCH, SCHOLARSHIP, AND CREATIVITY

April 22

Student and Faculty Research & Scholarship Poster Session

5:00 p.m.

Frazier Hall

Student artwork in the McGrath Gallery

6:00 p.m.

Wyatt Center for the Arts foyer

Program

Student readings, music, and creative projects

6:30 p.m.

Black Box Theater

Band, Brass, and Percussion Ensembles Concert

7:30 p.m.

Cralle Theater

Theater Showcase

8:00 p.m.

Black Box Theater

April 27

Honors Student Thesis Presentations

12:30 p.m.

Centro Atrium

ABOUT THE BECVAR ARTISTS IN RESIDENCE PROGRAM

The Lansing School of Nursing and Health Sciences established the Artist-in-Residence program in the 2002-2003 academic year. This program examines the art and science of Nursing and Health Sciences through the eyes of an undergraduate student working in the fine and creative art mediums. Endowed by Mrs. Arthur N. BecVar in 2006 in honor of her husband, this program exemplifies the diverse and many creative and artistic talents of the BecVar family. Having earlier established an endowed nursing scholarship fund during Art's lifetime, with this endowment Jayne BecVar further connects her desire to support and provide to our community caring, ethical graduates. It is our mutual desire that the students' experiences in this program, as viewed through the arts, will give them new ways of thinking to inform their clinical practice, the health care profession, and patient contact and care.

The 2024-2025 Becvar Artists in Residence are Lauryann Smith, Clare Kramer, and Grace Schaefer.



Laurynn Smith

Laurynn Smith is a senior at Bellarmine University, pursuing a bachelor's degree in psychology and vocal performance, and she is starting her master's in business through the early-entry program. Her passion for both visual arts and music has led her to engage in both performance and artistic creation. Laurynn has performed with the Bellarmine Oratorio Society, Schola Cantorum, and local choirs, as well as collaborated with groups such as the Kentucky Symphony Orchestra. Beyond music, she has worked on commissioned art projects, including restoring the Our Lady of Guadalupe mural in Covington, KY. Laurynn also dedicates her time to volunteering by supporting youth music camps and Bellarmine's orientation groups.

Artist Statement: This artwork represents the powerful connection between music and emotion. I've always believed that music is a universal language—one that doesn't require shared words to evoke deep emotional reactions. These pieces highlight how music is rooted within all of us, reminding us of how it touches the deepest parts of us.

Cover by: Laurynn Smith



Clare Kramer

Clare Kramer is a junior Honors anthropology major and psychology and creative writing double-minor at Bellarmine University. She grew up on a farm in Southern Indiana and enjoys hearing and telling stories, making art and music, writing, and spending time in nature. She works on campus in the Student Success Center and is also a R.I.S.E tutor.

Artist Statement: As both a writer and a visual artist, I am interested in how different creative media can work together to express emotion and communicate ideas. My project aims to explore and increase understanding of some of the complex experiences of healthcare workers, especially the tension between joys and challenges of the work. For this project, I have created a series of three poems, each of which is paired with a mixed-media painting created in response to the corresponding poem. Bringing together two different media is symbolic of the often-dichotomous experiences of healthcare workers, who may find deep satisfaction in their work but may also face significant mental and emotional challenges in the healthcare field. These poems and paintings are inspired and informed by a number of interviews I conducted with students in the healthcare field, as well as by visits to a hospital and nursing home.

where are

the heroes

she said

the heroes

are gone

we have only our-

selves

our thinning hands

feet worn from treading out

the paces

of this day

when it's over

it has to stay over

she says

you have to leave it at the door

bruises on arms

mind thick from forgetting

to forget

it will drown you she says

so take care

we are our own heroes



Grace Schaefer

Bio: Grace Schaefer is a junior in the Honors Program, studying Health Humanities with a minor in Public Health. She works as a writer for four local magazines and is currently writing her thesis on the works of Tolkien and Lewis. Grace begins Bellarmine's Doctor of Physical Therapy program in May. She loves spending free time with her family and church family.

Author Statement: No two healthcare experiences are alike. Whether patient or practitioner, our experiences with health are inherently individual yet deeply unifying. In this project, I have sought to represent both the personal and relational aspects of health by telling the stories of an eclectic group of characters in a wide variety of experiences, whose stories all overlap in some way, representing the unifying nature of healthcare.

I lift my arm until my hand will surely come into view. It does not. I go further, and a strange bandaged mass comes up - a nub, a full stop, a period where before there was a comma.

Hand.

"Gone?"

"Gone."

There's nothing else to say. I look at the place where my hand once was. There is the sound of a heaving sob, something strangled and ragged and more raw than I've ever heard. It is only when your arms go about me that I realize it is me, that I am shaking, that I stare forward, stare blind and stare vacant, at that meaningful meaningless space.

"No, no, I -"

"Hush."

A whimper this time, and in response, your hands on my back. In a flash I realize I can't do the same, should you need it - can't rub a soothing circle with one hand while the other cups your head, strokes your hair - now, I would have to choose one and make do, and that is not how it ought to be. At last, you pull away, but only enough to let our eyes meet - your hands linger still. Your eyes too are red with crying.

"Remember," you say, "what you said before I told you. You said, 'I'll be alright. I'll get better again.' And that's true. You will."

I shake my head.

"Yes," you say. "I promise, you'll be okay."

"I want my hand back."

It was meant to come out as something angry, but it is a whimper, and the tears come back hot, and your arms, your hands, pull me close again.

"All will be well."

Celebration of Student Research & Creativity

April 22, 2025

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SPECIAL THANKS TO

Dr. Susan Donovan, President
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Ms. Annie Bladen, Senior Administrative Assistant, Academic Affairs

UNDERGRADUATE STUDENTS

ACTUARIAL SCIENCE

POSTER 1

Fractals in Nature

Lyn Detwiler / adetwiler@bellarmine.edu / Faculty Mentor: Anne Raymond

The study of fractal images is a modern mathematical area of study, which has a wide variety of focuses from measuring natural occurrences such as coastlines and mountains to man-made objects like computers and art. Accurately measuring such natural phenomena is a constant paradox with trivial use, but knowing more about the chaotic nature of fractals in turn increases the understanding of how the world operates. In this research, I present known ways to measure phenomena such as coastlines and mountains to attempt to get an accurate measurement, going from basic measurements that can be obtained with a ruler to highly specific methods to account for the miniscule separation of atoms. In addition, I attempt to create my own images by examining past creations, which are done in various ways such as repeating the same geometry to using computers to create fractals in which are not naturally occurring nor a Euclidean shape.

POSTER 2

An Analysis of the Multivariate Cryptosystem C and its Vulnerability to Rank-Based and Linearization Attacks

Radjamin Hukom / rhukom@bellarmine.edu / Faculty Mentor: Max Cartor

Public-key cryptography relies on mathematical problems that are difficult to solve efficiently. One such approach is multivariate cryptography, where security is based on solving systems of polynomial equations over finite fields. A prominent example is the C^* scheme, introduced by Matsumoto and Imai at EUROCRYPT 1988. C^* is based on hidden structure in finite fields, specifically leveraging field exponentiation to construct trapdoors. However, its security was challenged by rank-based and linearization attacks, which exploit algebraic weaknesses to recover the private key. Despite these attacks, no known quantum algorithm solves multivariate systems significantly faster than classical methods, making post-quantum multivariate cryptography a promising research direction. This research aims

to demystify C^* , explain its algebraic foundations, and illustrate why it remains a subject of study in post-quantum cryptography. I present key concepts from groups, rings, and fields in an intuitive manner to bridge the gap between abstract algebra and practical cryptographic applications.

POSTER 3

The Nature of Mathematical Paradox

Zachary Pilbean / zpilbean@bellarmine.edu / Faculty Mentor: Anne Raymond

This research examines the nature of paradoxes in mathematics. It analyzes their historical and philosophical foundations, precise definitions, and distinctions from non-paradoxes. A paradox presents an apparent contradiction or self-referential inconsistency, and many paradoxes have led to significant developments in mathematical theory. This study explores key examples, including Russell's paradox and the Banach-Tarski paradox, to illustrate different types of paradoxes and their implications. The findings demonstrate that paradoxes often expose foundational gaps in mathematical frameworks, which prompts the development of new axioms, formal systems, and problem-solving methods. By examining paradoxes' role in shaping set theory, measure theory, and logic, this study highlights their essential function in mathematical progress.

POSTER 4

A Many-Sided Look at the Distributions of Dice Rolls

Gavin Trumbull / gtrumbull@bellarmine.edu / Faculty Mentor: Michael Ackerman

This project analyzes how the distribution of dice rolls is impacted by using dice with different numbers of facings as well as different combinations of dice. Most games use dice to simulate the normal distribution, but less research details how dice are used for more skewed distributions or for distributions with greater or less variance than the normal distribution. Most current research also assumes that all of the dice rolled are identical, but if several different types of dice are rolled and their results combined, they would have a new distribution that may be useful in some games. The distributions created by these different dice combinations are compared to more commonly used distributions and show how changing the type of die used will affect the distribution. The distributions created are useful for determining which dice and what results involving those dice should be used for randomizing variables to create certain distributions.

BIOLOGY

POSTER 5

The Investigation of Dipeptidyl Peptidase-IV Inhibition and Glucose Uptake by Yeast Cells using a Lomatium dissectum plant extract for Anti-Diabetic Studies

Ty Been/ tbeen@bellarmine.edu / Faculty Mentor: Savita Chaurasia

Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disorder affecting millions globally, with a rising prevalence. Conventional treatments, such as insulin and other glucose-lowering agents, are often expensive, placing a significant financial burden on patients and the healthcare system. In response, this study explores cost-effective alternatives, such as plant-based therapies, for managing T2DM. Lomatium dissectum, a plant native to much of Western North America, has traditionally been used in herbal medicine for its anti-inflammatory and antioxidant properties. Given these known properties, this research investigates its potential anti-diabetic effects through glucose uptake assays using yeast cells and its role in inhibiting Dipeptidyl Peptidase-IV (DPP-IV). DPP-IV is an enzyme responsible for the degradation of incretin hormones, essential for regulating glucose metabolism. By inhibiting DPP-IV, Lomatium dissectum could enhance insulin secretion and lower blood glucose levels in diabetic patients.

Experimental results have shown that Lomatium dissectum enhances glucose uptake in yeast cells. Studies are in progress to compare its effectiveness with Metformin, a standard diabetes medication, while research on DPP-IV inhibition continues and is expected to yield promising results. This study aims to identify a cost-effective and accessible treatment for diabetes, especially in areas where pharmaceutical options are limited or costly. Further investigation will be necessary to validate these findings and determine the efficacy, safety, and potential mechanisms of Lomatium dissectum in diabetes management.

Recipient of the Student Government Association Research Grant Award

POSTER 6

Job Satisfaction Among Veterinarians

Savannah Dennison / sdennison@bellarmine.edu / Faculty Mentor: Caroline Doyle

Veterinarians are an essential aspect to animal wellness and care. Such doctors ensure proper health and appropriate treatment for all animals. However, such an important and necessary job can come with downsides. Veterinarians have extremely high suicide rates due to the stress and pressure that comes with the job. Burnout is another reoccurring issue in the veterinarian field as one endures daily work life struggles. Overall, there are a lot of unfortunate situations that veterinarians face that cause a low level of satisfaction in such a career. These facts are common knowledge when it comes to those wanting to pursue a veterinarian career, causing some to be deterred from the field. Thus, a research project was conducted involving job satisfaction/fulfillment in relation to different subtypes of veterinarians. To collect such information, I put together a survey that encapsulated important questions that relate to happiness in the veterinary field. The survey was sent out to veterinarians of different types where they provided feedback on their experiences in their career. In this, I have been able to provide any statistically significant results found in such information. With results, I can provide students with beneficial insights on which types of veterinarians feel the most satisfied in their career, and factors that may add to satisfaction, in order to lower the negative statistics surrounding the field.

POSTER 7

Life in Dance: Relationship to Self and Dance Environment

Emily Barz / ebarz@bellarmine.edu / Faculty Mentor: Madeline Tomlinson

Dance is an athletic art form in which the body is trained repetitively to perfect sequences of movement. The training regimen for dance requires a lot of time and dedication; this training can have an impact on self-esteem, especially when aspects of dance become detrimental to the dancer.

Maintaining high a level of self-esteem is important for dancers because self-esteem impacts a dancer's ability to grow in their artistry as well as life outcomes outside of dance.

Current research on dancer self-esteem highlights a very specific issue: body image. Dancers are expected to execute technique and fulfill high standards; often times, these high standards in relation to body movement lead to self-deprecation regarding a dancer's own

body. Constantly placing judgement on one's own appearance will impact self-esteem negatively.

There is rich literature providing insight into a niche of dancer self-esteem. However, this current study - Life in Dance: Relationship to Self and Dance Environment - places a focus on other aspects of dance that impact self-esteem. These aspects include motivational climate, perfectionistic tendency, and comparison. Despite varying body images among dancers, motivational climate, comparison, and perfectionism are universal exposures whilst learning dance. These universal exposures impact a dancer's self-esteem.

Through mixed-methods exploratory research design, this study aims to gain further insight into dancers' self-esteem outcomes based on the impact of three exposures: motivational climate, perfectionism, and use of comparison. This study will contribute to the current body of research regarding dance and self-esteem by exploring the impact of all three exposures, especially perfectionism - the primary exposure - and how it connects to a dancer's self-esteem. Through investigating what causes high or low levels in dancer self-esteem, pedagogical standards are better informed. Additionally, ideas on how to avoid the development of burnout and how to keep dancers involved in a healthy learning environment are informed too.

Further, considering self-esteem's role in major life outcomes, this study could contribute to meaningful intervention not only for a dancer's self-esteem in the context of a dance environment, but in life overall.

Presented at the Southern Regional Honors Council

Recipient of the Student Government Association Research Grant Award

CHEMISTRY

POSTER 8

From Lasers to Leaves: Integrating Photophysical Investigations and Spaceborne Observations of Terrestrial Ecology

Emily Rogers / erogers4@bellarmine.edu / Faculty Mentor: Patrick Holt

When molecules absorb energy from light, they often stabilize by reemitting light or undergoing chemical changes along pathways dependent on their structure. This research investigates the photophysical behavior of light-absorbing compounds using spectroscopic and time-resolved laser pump-probe experiments. By examining model chromophores and

their derivatives, we assess how variations in molecular structure influence decay pathways and lifetimes.

These insights are applied by the Terrestrial Ecology Group from the 2024 NASA SARP West campaign as part of an investigation of biogenic isoprene (2-methyl-1,3-butadiene) emission based on its main photochemical product, formaldehyde. A highly reactive compound, isoprene represents the most abundant non-methane biogenic VOC in the lower atmosphere. A common product of the Calvin Cycle, this thermoregulator and reactive oxygen species scavenger generates atmospheric pollutants including ozone and secondary organic aerosols. We use satellite data from regions dominated by plants of varying physiology to better understand the relationship between plant activity and isoprene emission. We compare seasonal trends in high-resolution solar-induced chlorophyll fluorescence (SIF) estimates from the OCO-2 satellite to formaldehyde vertical column measurements from the TEMPO satellite. Our findings provide insight into plant responses in changing environments which directly influence the atmosphere. We further explore this spaceborne approach to terrestrial ecology through photophysical investigations of plant pigments known as anthocyanins and their oxidation products. Results will provide a foundation for advancing our ability to study atmospherically relevant plant stress responses remotely.

Presented at the NASA SARP West 2024 Closeout on August 12, 2024; presentation and abstract was published by Milan Loiacono
Supported by NASA's Earth Science Division

POSTER 9

Synthesis and Characterization of Triaryl Bismuths: Analyzing Pnictogen Bonding Interactions

Julianna Haugh / jhaugh@bellarmine.edu / Faculty Mentor: Anna Christianson

Bismuth, the heaviest group 15 element, has been utilized as an inexpensive and less hazardous alternative to traditional bonding interactions. The interactions between bismuth and chloride are created by aromatic electron-withdrawing groups causing an electron deficit or “sigma-hole” on the bismuth atom which the chloride may donate electrons to. The synthesized compounds are easy to handle, stored free of solvents, and are stable to air or moisture, providing ease of subsequent applications. Some applications of pnictogen

bonding include supramolecular building for self-assembly, materials chemistry, organocatalysis, and molecular recognition. Preceding research synthesized the target triaryl bismuths through a two-step Grignard reaction, which had limitations of aromatic rings without sensitive functional groups. A more efficient transmetallation reaction scheme with BiCl₃ was studied and the scope of products was expanded to include more electron-withdrawing substituents. A new and cheaper solvent was discovered to be effective in NMR titrations. ¹H NMR titrations reveal that the strength of sigma-hole bonding interactions depend on the strength and number of electron-withdrawing groups on the triaryl bismuth. Further research could expand the scope of triaryl bismuth molecules by transmetallation synthesis and examine the strength of bonding interactions based on other electron-withdrawing groups.

COMPUTER SCIENCE

POSTER 10

GeoConsolidate

Brent Reynolds / breyolds4@bellarmine.edu / Faculty Mentor: Nathan Johnson

GeoConsolidate is an entity resolution web application capable of deduplicating geographical JSON datasets. Geographical datasets are often drawn from a variety of data sources causing duplicate locations to be present in the dataset. These data sources can come from government datasets or from companies such as Google, Apple, and Waze. For humans, it is easy to tell when two locations are duplicates of each other even if the location names are slightly different. However, this is a much more complicated task for a computer program because even the slightest variations in the spelling of a location's name, or slight variances in the longitude and latitude coordinates of these locations, can cause a computer program to identify these as being different. To overcome this challenge, GeoConsolidate makes use of vector embeddings to represent the location records. Each location record is transformed into a vector embedding using the all-MiniLm-L6-v2 Hugging Face sentence transformer model and stored in a Redis vector database. The all-MiniLm-L6-v2 Hugging Face sentence transformer model transforms these geographical locations into a 384-dimensional dense vector which allows a much more flexible representation of the geographical locations. These vector embeddings can then be clustered together by similarity using the DBSCAN (Density-Based Spatial Clustering of Applications with Noise) clustering algorithm to find

duplicate locations in the dataset which can then be removed before being returned to the user.

POSTER 11

Ratter Trials Pro: A Happy Ratter Extension

Jonathan Moreira Alsina / jmoreiraalsina@bellarmine.edu / Faculty Mentor: Nathan Johnson

Happy Ratters, a local, privately-owned business, provides a structured yet fun, competitive platform for handlers and their dogs, promoting teamwork, skill development, and responsible dog training. Happy Ratters Pro is specialized software designed for competitors, tournament organizers, and event staff to efficiently manage Ratter sport trials. When signing up your beloved animals to have some fun, it is important the management system works properly. American Kennel Club (AKC), and other organizations have implemented systems to allow users to sign up, keep track, and administer participation for many events, but doesn't implement a system for Ratters. Happy Ratters is an organization that conducts dog sport trials focused on scent work and hunting skills, where dogs search for hidden targets in a controlled environment. The trials test a dog's ability to detect specific scents, navigate obstacles, and showcase their natural hunting instincts. Ratter Trials Pro streamlines participant registration, class selection, scoring, and result tracking, ensuring accurate and organized trial management. The platform simplifies data entry, automates calculations, and provides real-time access to trial results, making event administration smoother and more efficient. Ratter Trials Pro was created using a combination of HTML, JavaScript and CSS, for the front-end, and MongoDB, a NoSQL database, for the back-end.

POSTER 12

ARTASA: Automated Robotic Text And Speech Assistant

Jerrin Redmon / jredmon3@bellarmine.edu / Faculty Mentor: Nathan Johnson

ARTASA, a handheld robotic vision system, is designed to assist individuals who have difficulty reading due to blindness, dyslexia, or other vision impairments. Many people with these conditions struggle to determine whether an object contains text. ARTASA addresses

these challenges by processing the environment, detecting and interpreting text, and then converting it into speech using text-to-speech software.

The system utilizes a dedicated Serial Peripheral Interface (SPI) camera module designed to capture images at an optimal resolution and color balance, ensuring efficient processing by the Optical Character Recognition (OCR) system. A Raspberry Pi is employed as a dedicated computer to manage the overall software, enhancing both the speed and accuracy of the process. The system operates through three primary stages: image acquisition, image and text processing, and audio output. For optimal performance, it identifies text with a confidence level of 75% or higher before reading it aloud.

The simple handheld device makes it easy to automatically scan objects, identify and verbalize text. This allows for a compact and adaptable design that can be deployed in various environments.

POSTER 13

Holo: Gestured Controlled Generative-AI Painting Application

Zachary Cowan / zcowan@bellarmine.edu / Faculty Mentor: Nathan Johnson

Project Holo is a multimodal artificial intelligence (AI) system that integrates multiple AI technologies into a dynamic, hand-gesture-controlled canvas painting and image generation application. With the increasing integration of AI in consumer applications, Holo provides users with an intuitive and interactive platform for AI-driven image creation. Holo is written in python but can be compiled down to C code for slightly increased performance. The graphical user interface (GUI) utilizes a library called “tkinter” with a custom theme wrapper called “custom tkinter.” Holo users can create a sketch using drawing tools such as a pen brush, fill tool, transform, and rectangle tool, and/or enter a text-based image generation prompt. Upon initiating the "Generate AI Image" function, Holo processes the provided inputs via an API call, using a variety of selectable AI models which convert the sketch and/or prompt into an image that appears in the designated output tab.

Holo supports standard interaction methods, including keyboard, mouse, and tablet pen input. Additionally, it enhances user engagement by incorporating a projector-interface and in-app hand tracking using MediaPipe – a Google solution suite enabling hand tracking and pose estimation in real time video feeds. The local hand position of a user in frame, derived from the MediaPipe hand solution, is mapped to screen space to control the on-screen cursor, while gesture-based controls — such as pinching the index finger and thumb to emulate a mouse press — enable a seamless, touch-free interaction experience. This

innovative approach makes Holo a versatile tool for AI-assisted digital art creation, expanding the possibilities of human-computer interaction in creative applications.

POSTER 14

WiggleVision: A Track-A-Worm video to images adapter

Chase Hall / chall9@bellarmine.edu / Faculty Mentor: Nathan Johnson

Many biologists rely on video recordings to study the movements of *C. Elegans* worms. Existing software often requires specialized hardware for image capture, limiting biologists who do not have access to specific cameras and microscopes. WiggleVision is an automated workflow that inputs multiple videos and outputs data on the movement and number of bends for each worm within each video. WiggleVision allows biologists to use a variety of hardware to access existing software such as Track-A-Worm, a free program provided by University of Connecticut Health, as well as automating video processing into a standard workflow. WiggleVision accepts a directory of video files as input, identifies and produces bounding boxes for multiple worms in each video, slices the videos into images and formats them for use by the Track-A-Worm software, which outputs metrics needed by researchers. WiggleVision identifies worms using convolutional neural networks (CNN) and the YOLOv8 model as well as the OpenCV Python library.

POSTER 15

GurneyGuide: Automated Path Planning for Hospital Navigation

Matthew Rice / mrice@bellarmine.edu / Faculty Mentor: Nathan Johnson

Efficient navigation in hospitals and other healthcare facilities is crucial for transporting patients and responding to emergencies. However, hospitals generally have complex layouts that can be difficult to navigate, especially for people who are unfamiliar with the layout. The GurneyGuide application is designed to process 2D floorplans, convert them into a computer-navigable environment, and, using the A* path-planning algorithm, determine optimal routes to a target room. The system first processes a DXF file, a file format commonly used in designing floorplans, by gathering the coordinates of the walls, the starting point, and the rooms. The coordinates are then added to a PostgreSQL database. The backend process converts the information into a grid format, allowing a user to select a room number. The system uses the A* algorithm to plan an optimal path to the selected room from the current location. The floorplan and path are then displayed as an image.

After preliminary testing, GurneyGuide can efficiently recognize walls, rooms, and entrances, generate the optimal paths from the entrance to any room, and display those paths. However, in order to be processed correctly, the DXF file must be formatted in a very specific way, which limits the functionality of the app. This limitation will be addressed in the future. GurneyGuide has the potential to enhance hospital navigation by providing automated navigational assistance to medical personnel so that they can transport patients more efficiently and respond more quickly to emergencies.

POSTER 16

GameSense: AI-Powered Sports Predictions

Matthew Parsley / mparsley@bellarmine.edu / Faculty Mentor: Nathan Johnson

The GameSense system allows football fans to select an NFL team and predicts outcomes of the following week's games. GameSense utilizes a linear regression model trained on data from three full NFL seasons. Data from the 2021-2023 NFL seasons is used to make predictions on each game for the given weekly session. While historical data is not completely accurate, the software can be useful when taking into account other factors such as weather and injuries. GameSense users make selections and view results through a web interface. In addition to predictions, the software displays actual results for the past week.

POSTER 17

Garden Helper

Truong Le / tle@bellarmine.edu / Faculty Mentor: Nathan Johnson

For avid gardeners, keeping track of all the plants and their needs can be a real chore. Garden Helper provides a desktop app where users can save a photo of their plants to a list. The software uses the `pl@ntNet` API to determine the name of the plant based on the photo. The software then uses the `Perenual` API to gather information on the plant's requirements such as water levels, temperature, nutrients. The user enters information about their watering schedule, light, and other factors, and the software suggests necessary improvements. Garden Helper was created using python and the `pyqt5` library to code the graphical user interface. It utilizes multiple APIs including `pl@ntNet`, which returns the plant name based on a photo, `Perenual`, which returns the growth requirements, and `ChatGPT` to suggest plant maintenance improvements.

POSTER 18

Fund Finder

Benjamin Powell / bpowell2@bellarmine.edu / Faculty Mentor: Nathan Johnson

FundFinder is a software system that gathers data about the U.S economy including the Consumer Price Index (CPI), Gross Domestic Product (GDP), unemployment rates, inflation rates, and prior federal funds rates and uses the data to predict the next federal funds rate. The Federal Reserve has a mandate to control inflation by setting the federal funds rate, which is the rate charged to banks for short term overnight borrowing.

FundFinder is a Python program that uses the BeautifulSoup Python library to scrape data from various credible websites and then builds a machine learning model which attempts to predict the future federal funds rate. The federal funds rate directly effects various economic factors including employment and inflation as well as the U.S stock markets. The Federal Open Market Committee (FOMC) has the opportunity to set the federal funds rate when they meet eight times a year.

POSTER 19

KnightsHarvest: Improved Data Collection and Storage for Knight's Pantry

Jared Rosenberger / jrosenberger2@bellarmine.edu / Faculty Mentor: Nathan Johnson

KnightsHarvest is a web app that automates data collection, storage, and visualization for the Bellarmine University Knight's Pantry. Knight's Pantry is a food pantry for students and faculty on Bellarmine's campus organized by the Center for Community Engagement (CCE) and sponsored by Dare to Care. The CCE is responsible for collecting and reporting data, including demographic and food data as well as other salient information. Data collection is currently done via pen and paper, and reporting requires the CCE to collate all data by hand. Typically, this is done by looking at all submitted forms once a month near the reporting window. KnightsHarvest will improve the efficiency of this process and reduce the number of man-hours required for collating and reporting pantry data. KnightsHarvest utilizes Microsoft services such as Forms and Power Automate, as well as the Microsoft Graph API to display collected data as well as minimal analysis needed for reporting.

POSTER 20

Louisville Book Tracker

Nicholas Newsom / nnewsom@bellarmine.edu / Faculty Mentor: Nathan Johnson

Louisville Book Tracker is a web application that allows users to search for books based on genre and author, track books they've read, and create reading lists. Book Tracker integrates with local library databases to determine whether a book is, or will, become available in a nearby library. The software also recommends new reading material based on previous user selections. The application was constructed with Django, a python web framework for the backend, React, a JavaScript library for the frontend, and PostgreSQL for database management. The application is written primarily with Python and TypeScript.

POSTER 21

nemaVisionAI: An AI-Powered System for Tracking and Analyzing *C. elegans* Locomotion

Jim Farese / jfarese@bellarmine.edu / Faculty Mentor: Nathan Johnson

nemaVisionAI is an open-source, AI-powered software system designed to precisely and efficiently track and analyze the movement of *Caenorhabditis elegans* (*C. elegans*) in videos taken from laboratory microscopes. nemaVisionAI uses YOLOv8, a convolutional neural network, to examine each frame of a video, identify the worm, and extract movement metrics such as total distance traveled and time in motion. Accurate tracking of *C. elegans* is essential for research in genetics, neurobiology, and pharmacology, yet many existing tools are costly and inaccessible to smaller laboratories or are difficult to use. By leveraging deep learning models trained on annotated datasets, nemaVisionAI offers an affordable and accessible alternative to expensive commercial tracking solutions. NemaVisionAI has a user-friendly graphical interface that allows researchers to upload videos, run detections, and visualize results with minimal technical expertise. The system outputs processed video files with bounding boxes and movement data, supporting both qualitative and quantitative analysis. By providing a free and efficient solution, nemaVisionAI enables a broader range of researchers to conduct high quality movement analysis, promoting innovation and discovery in the field of biology.

DATA SCIENCE

POSTER 22

League of Legends AI Coaching

Kadin McWilliams / kmcwilliams@bellarmine.edu / Faculty Mentor: Sayani Sarkar

This project aims to identify the most critical gameplay variables in League of Legends through quantitative analysis. Using data from 500 personal games and Riot Games' API, the project will explore over 100 gameplay variables, including objectives, damage, vision, gold income, and player behaviors. By analyzing this data set and applying machine learning models, the project seeks to predict game outcomes, validate predictions using random accounts and future games, and highlight key gameplay factors that influence success. The primary model for this analysis will be an artificial neural network, chosen for its ability to handle complex, non-linear data and its scalability for continuous updates. Additional models include gradient boosting machines for high prediction accuracy and random forest classifiers for robustness with large datasets. These models will help identify strengths and weaknesses in individual player performances, offering tailored coaching recommendations to increase the chances of winning. Python will be used for all coding involved in this project. The main libraries that will be used are pandas, numpy, and sklearn for data manipulation, data analysis and machine learning. Riot Games' developer tools will be used for the data collection. The project's ultimate goal is to provide players with a clear understanding of which gameplay variables matter most and provide personal recommendations so they can improve their competitive rank in League of Legends.

POSTER 23

Index NSA Predictive Model

Jonathan Penaloza Rumie / jpenaloza@bellarmine.edu / Faculty Mentor: Sayani Sarkar

Accurate house price prediction is vital for informed decision-making in the dynamic real estate market. This capstone project introduces a comprehensive House Pricing Pattern Analysis model, leveraging advanced data science and machine learning to address the complexities influencing property values. By utilizing a diverse dataset encompassing property features, location data, and economic indicators, the project employs a range of machine learning models, including Linear Regression, Random Forests, Gradient Boosting, and Support Vector Machines, to capture both linear and non-linear relationships. The

analysis focuses on identifying key price drivers, feature interactions, and model robustness against market fluctuations. This work extends beyond prediction, providing actionable insights into market trends and future directions, contributing to a more transparent, efficient, and stable housing sector, akin to how advanced systems secure digital environments.

POSTER 24

Global Car Buying Trends

Jardin Dantzler / jdantzler@bellarmine.edu / Faculty Mentor: Sayani Sarkar

Car purchasing patterns vary significantly across countries due to factors such as economic conditions, consumer preferences, and government policies. This project analyzes global car sales data to uncover key trends in vehicle purchasing behavior across different markets. Using statistical analysis and machine learning techniques, we explore factors influencing car ownership, such as income levels, fuel preferences, and brand popularity. The findings provide insights into regional automotive trends, helping businesses and policymakers understand market dynamics and consumer behavior.

POSTER 25

Beyond the Cure: Modeling the Risk of Breast Cancer Recurrence

Brandon Thomas / bthomas@bellarmine.edu / Faculty Mentor: Sayani Sarkar

Breast cancer recurrence remains a significant challenge in oncology, affecting approximately 20-30% of patients within five years post-treatment. Accurate prediction of recurrence risk is crucial for personalized treatment planning and improved patient outcomes. This project aims to develop a predictive model for breast cancer recurrence using machine learning techniques, leveraging clinical and demographic features such as tumor size, lymph node status, and patient age. Python serves as the core programming language, utilizing specialized libraries for data processing, model development, and visualization. Traditional models like logistic regression, decision trees, and support vector machines (SVMs) will be implemented alongside advanced ensemble methods such as XGBoost and Random Forest, while deep learning models using TensorFlow/Keras will be explored to capture complex non-linear patterns. Model interpretability is emphasized through SHAP, while Matplotlib, Seaborn, and Plotly/Dash facilitate data visualization. Existing clinical tools, such as the Nottingham Prognostic Index and Adjuvant! Online, offer

general recurrence risk estimates but often lack adaptability to high-dimensional data. Machine learning techniques provide a more robust alternative by integrating diverse data sources and capturing intricate interactions between features. While tree-based methods like Random Forest enhance generalization and interpretability, neural networks offer promise for modeling complex relationships but require careful tuning to mitigate overfitting and computational challenges. By leveraging a dataset from Kaggle, this project seeks to address the limitations of conventional predictive methods, combining traditional statistical models with advanced machine learning algorithms to improve prediction accuracy and interpretability. Through rigorous model evaluation and optimization, the goal is to provide clinicians with precise risk assessments, enabling better-informed treatment decisions and long-term patient monitoring. Ultimately, this project contributes to enhancing breast cancer survivorship and quality of care through data-driven innovation.

ENVIRONMENTAL SCIENCE

POSTER 26

The Culinary Potentials of Oak: A Historical and Scientific Exploration of Food and Beverage Uses

Rosemary Tieszen / rtieszen@bellarmine.edu / Faculty Mentor: Joseph Jareczek

With over 600 species distributed across the world, oak trees are a staple resource in many communities. Historically the tree's durable wood has been valued for shipbuilding, woodworking, and barrel-making. Additionally, oaks' nutrient-rich acorns, bark, and leaves have been used as food and beverages. Indigenous communities in North America and various European and Mediterranean populations created traditional dishes using ground acorns such as bread and acorn mush. More recently acorns have been utilized as a coffee alternative and oak leaves and bark are used to make teas and kombucha. The nutritional and functional value of oak parts is relatively unknown to the public and thus current utilization is limited. This study explores historical references and scientific research on oak tree usage to determine the future potential for food and beverage applications. Additional analysis of traditional preparation methods was used to create various educational resources, contributing to a broader understanding of oak-based sustenance and future potential in food systems.

EXERCISE SCIENCE

POSTER 27

Does Body Image Impact a Collegiate Athletes' Food Attitude After Being Injured?

Lydia Reichley / lreichley@bellarmine.edu / Faculty Mentor: Jean Lamont

Injury, or physiological disturbance causes an interruption in an athlete's life in their sport. Eating disturbance, a disrupted view and food attitude that will cause a disturbance in eating. Body shame has also been connected to eating disturbances. Body shame is a self-conscious emotion which is attributed to the failure to meet a cultural body ideal to an unchangeable aspect of the self. Therefore, injury may add to the negative effects of eating disturbances especially if body shame is involved. To test this, Bellarmine University female student athletes (n=57) filled out an online survey that tested injury, eating disturbances, and body shame. Injury status was not associated with any other variable of interest. However, anxiety about injury was associated with both poor body image and eating disturbances. Body image did not moderate the relationship between injury anxiety and eating disturbances. However, an exploratory analysis revealed that the relationship between poor body image and eating disturbances was mediated by injury anxiety. Specifically, poor body image predicted increased injury anxiety, which in turn predicted eating disturbance. These results may help inform interventions aimed at decreasing or preventing eating disturbances in women athletes.

Recipient of the Student Government Association Research Grant Award

POSTER 28

The Role of Aerobic Fitness in Golf Performance and Maintenance of Accuracy over 18 holes

Caitlin Perry / cperry4@bellarmine.edu / Faculty Mentor: Andrew Carnes

Golf is often viewed as a technical and mental sport, yet it requires substantial physical fitness. Existing research shows the key determinants of golf to be strength flexibility, coordination, and endurance. The major properties of a golf round include walking the

course, players often walk long distances (approximately 4-6 miles), increasing their heart rate and requiring sustained aerobic energy while carrying a 25-35lbs golf bag. Despite this, the cardiovascular demands of golf, particularly the role of aerobic fitness, has received little attention in the research. This study aims to investigate the correlation between VO₂max, a key indicator of aerobic fitness, and golf performance, specifically will greater aerobic fitness provide a resistance to fatigue that can better preserve swing mechanisms over an 18-hole round of golf. Swing mechanics play a major role, where factors such as clubhead velocity, ball speed, launch angle, spin rate, carry distance, total distance, club path, and face angle determine the accuracy of the swing. As demonstrated in the research, expert golfers show more consistent shoulder, wrist, and temporal movement patterns than novices—which contribute to the preciseness of the players clubhead velocity, ball speed, launch angle, etc. This consistency, especially under fatigue, is crucial for maintaining performance across a round. Following IRB approval, participants will be recruited from Bellarmine University's Men's and Women's golf teams, the study will employ a within-subject repeated-measures design. Participants will complete a VO₂max test using a treadmill-based graded exercise test with indirect calorimetry to measure aerobic fitness. They will then play an 18-hole round of golf. At the end of an 18-hole round, the player's score is compared to the total par for the course (e.g., 72). If the player completes the round in exactly 72 strokes, they are said to have "made par." A score below par (e.g., 70) is referred to as being "under par," while a score above par (e.g., 74) is called "over par." Before and after the golf round swing mechanics will be assessed using FlightScope's portable launch monitor. Using the launch monitor, you will measure clubhead velocity, ball speed, launch angle, spin rate, carry and total distance, and club path and face angle. These metrics will help evaluate both power and precision in a golfer's swing. The accuracy tasks will focus on tracking how well the golfer can hit targets consistently throughout the round, allowing for an assessment of how fatigue influences swing mechanics and accuracy. The accuracy task will involve evaluating the golfer's ability to maintain swing consistency and hit targets accurately over the course of an 18-hole round. As fatigue sets in, golfers may struggle to preserve their form, leading to variations in swing mechanics that can reduce accuracy. Target based accuracy will consist of golfers aiming at specific targets on the driving range—accuracy will be measured by how close the ball lands to the intended target, using launch monitor data to track deviations from the ideal path. Swing consistency will be measured by capturing swing mechanics before and after a round, using the launch monitor to assess the degradation of swing characters due to fatigue. The collected data will allow the researchers to determine how higher aerobic capacity may delay the onset of fatigue in collegiate golfers, thus maintaining

consistent and accurate swings which would lead to improved performance. This research could provide valuable insights for improving training regimens, potentially enhancing overall golf performance through targeted cardiovascular fitness interventions.

Accepted at the Southern Regional Honors Conference

Recipient of the Joe and Angela Schmidt Award and Student Government Association

Research Grant Award

MATHEMATICS

POSTER 29

Exploring Mathematical Concepts in Fiction

Jeremy Giffen / jgiffen@bellarmine.edu / Faculty Mentor: Anne Raymond

Mathematics plays a fundamental role in shaping the logic and believability of fictional worlds, particularly in science fiction. This research examines the mathematical foundations in fiction. While these works take creative liberties, their core concepts remain rooted in mathematical theory. The study begins with an analysis of time dilation in *Interstellar*, using Einstein's General Theory of Relativity. The Schwarzschild and Kerr metrics quantify extreme time differences near black holes, showing how the film's depiction aligns with real physics. Next, *Inception* is explored through topology and non-Euclidean geometry, focusing on paradoxical constructions and dream layers as higher-dimensional spaces. The study examines constructions that cannot exist, such as the Penrose stairs, illustrating impossible motion and how dream levels create a nested time structure with exponential scaling. Finally, *Dune* is analyzed through the Fibonacci sequence and exponential growth, particularly in its portrayal of desert ecology and genetic predictions. The golden ratio's influence on the film's cinematography is also considered. This research employs mathematical modeling, geometric analysis, and number theory to uncover the logical foundations of these films. By demonstrating how advanced mathematics influences storytelling, my study highlights the deep connections between mathematical concepts and fictional world-building.

POSTER 30

The Path to Metrization: An Exploration of the Proofs of Urysohn's Lemma and Metrization Theorem

Fanni Kertesz / fkertesz@bellarmine.edu / Faculty Mentor: Anne Raymond

Urysohn's Lemma and Metrization Theorem are foundational results in topology that reveal deep connections between the structure of topological spaces and the conditions under which they are metrizable. Urysohn's Lemma states that for any two disjoint closed subsets A and B of a normal space, there exists a continuous function f mapping the space to the interval $[0, 1]$ such that $f(0)=A$ and $f(1)=B$. The result of this lemma is then extended to Urysohn's Metrization Theorem which characterizes when a topological space can be equipped with a metric that induces its topology, meaning the space is metrizable if and only if it is regular and has a countable basis. This project explores the logical flow from Urysohn's Lemma to the Metrization Theorem, focusing on the details of the proofs. Additionally, to support the analysis of the proofs, the project first reviews important preliminary topics including countability axioms, separation axioms, and normal spaces. The project aims to offer a comprehensive and accessible examination of these significant results and their groundwork.

POSTER 31

Circles Are So Euclidean: Exploring Convex Bodies, Norms, Symmetries, and Isometries via the Minkowski Functional

Fanni Kertesz / fkertesz@bellarmine.edu / Faculty Mentor: Gregory Kelsey

In a real vector space, a symmetric convex body containing the origin and compact under the Euclidean norm uniquely defines a norm via the Minkowski functional, where the closed unit ball of this norm is the convex body. This establishes a one-to-one correspondence between convex bodies and norms. The norm derived from the convex body allows for the definition of a metric, enabling the study of isometries within the space. However, the symmetries of the convex body itself do not completely determine the isometries of the associated Minkowski space. Instead, the symmetries of the most symmetric shape a convex body can be linearly deformed into correspond to Euclidean and possibly newly defined non-Euclidean isometries of the space. This thesis will provide an accessible review of the connection between convex bodies and norms via the Minkowski functional and explore

how the symmetries of convex bodies help predict the Euclidean and non-Euclidean isometries of the associated Minkowski space.

Accepted at the 2025 Nebraska Conference for Undergraduate Women in Mathematics
Recipient of the Joe and Angela Schmidt Award

POSTER 32

Beyond Returns: A Comparative Study of Traditional and ESG-Focused Portfolio Performance

Lillianna Evans / levans2@bellarmine.edu / Faculty Mentor: Flannery Wells

In 2006, a UN-supported group of the world's largest institutional investors formed the Principles of Responsible Investment (PRI). These six principles encouraged investors to consider the impact of environmental, social, and governance (ESG) factors when investing. ESG data provides investors with information on how to invest money responsibly as it considers a firm's use of natural resources, disposal of waste and pollution, product liability, corporate behavior, and more. This study investigates the potential for positive portfolio performance by taking ESG factors into high consideration when investing. Herein, I compare two small portfolios: one traditional containing stock from the market's largest sectors and one ESG-focused containing the highest-rated ESG stock within those sectors. Using mathematical tools and graphical illustrations, I calculate expected returns, risk, asset correlation, and volatility to a market index. Finally, I use financial ratios to evaluate portfolio performance. This report confirms how responsible investment creates not only positive returns for the investor, but a trend towards more socially responsible firms.

POSTER 33

Using Geometry to Create Templates for Cinematography

Amos Bishop / abishop4@bellarmine.edu / Faculty Mentor: Anne Raymond

The motion picture is an artistic medium that relies heavily on position. Specifically, the position of the camera is a key factor in making the picture look perfect. The camera's angle, distance, and motion can strengthen or even change the impact of a shot. The state of the camera, its resolution and zoom, also plays a factor in the impact of a shot. Therefore, the position and state of the camera must be planned before recording a shot. This project looks at ways to plan the position and state of the camera using geometry. Using the 3-

dimensional plane and various geometric transformations, the position and state of the camera needed for the desired shot is determined before even picking up a camera. This strategy allows for templates to be made of specific shots that can be applied in different cinematographic situations. These geometric templates provide an unfamiliar perspective on how cameras are used in film making, demonstrating concepts that cinematographers already know in a different fashion.

POSTER 34

A Statistical Analysis on Weather in the NFL

Noah Clark / nclark5@bellarmine.edu / Faculty Mentor: Anne Raymond

The weather conditions of a National Football League game can notoriously impact the overall outcome and is heavily considered by coaches, players, sportsbooks, and the media. This research analyzes both historical game data of the 2020 NFL season, including total yards, total points, margin of victory, and turnovers, in tandem with recorded game temperature and wind speed to determine the weather's impact on game statistics. To analyze the possible correlation between these factors, different regression models are used to analyze both continuous and discrete cases. This research is done with the aim of providing insight on how NFL game outcomes can be reasonably influenced by the weather conditions. The results indicate that while certain weather effects may play an impact on a game-to-game basis, no direct correlation can be drawn between game statistics and weather conditions from the analyzed data.

MEDICAL LABORATORY SCIENCE

POSTER 35

Elizabethkingia meningoseptica: An Emerging Pneumonia

Karla Duarte / kduarte@bellarmine.edu / Faculty Mentor: Brenda Davis

Elizabethkingia meningoseptica is a multi-drug resistant gram negative bacillus found in the general environment (soil, plumbing, etc). E. meningoseptica is a non-fastidious, non-fermentative, non-motile, oxidase-positive, non-glucose fermenting, and aerobic organism. A rare and opportunistic nosocomial pathogen, E. meningoseptica is associated with high mortality in immunocompromised patients, particularly those in intensive care. This case study examines a 75-year-old male with multiple comorbidities, including hypertension,

COPD, and heart failure, who presented with acute illness, suffering a cardiac arrest en route to the hospital. Subsequent microbiological cultures obtained via sputum identified *Elizabethkingia meningoseptica* as the pathogen responsible for the pneumonia. The patient fell into a coma, and his hospital course was marked by several complications, including an acute kidney injury, a pneumothorax, and mild rhabdomyolysis - all likely exacerbated by his underlying conditions and resuscitation efforts. Laboratory results revealed thrombocytopenia, anemia, elevated CRP, and altered chemistry values, reflecting the systemic impact of the infection upon the body. This case highlights the significance of *E. meningoseptica* as an emerging pathogen, and the presence of *E. meningoseptica* in this patient's pneumonia may indicate a link between bacterial infections with this organism, the development of hematologic abnormalities, and cardiac events in patients infected with *E. meningoseptica*. Likewise, the patient's clinical progression underscores the pathogen's potential to cause severe complications, providing valuable insights into the pathogen's clinical management and its relationship with mortality in high-risk patients.

POSTER 36

A Case Study of *Listeria Monocytogenes*

Josie Gehret / jgehret@bellarmine.edu / Faculty Mentor: Brenda Davis

Listeria monocytogenes is a rare, food-borne pathogen. Symptoms vary depending on the immunocompetence of the patient, but the organism has a notable ability to cross the placenta. This case study describes a 23 year old woman, pregnant with her first child at 18 weeks, who presented to the emergency room with abdominal cramping, determined to be from intrauterine fetal demise. The patient also presented with transaminitis and jaundice in her scleras, as well as severe coagulopathy that required a unit of fresh frozen plasma before discharge. In addition, the patient had a chlamydia infection that was diagnosed at a prenatal appointment. This case is unique not only because of the rarity of *Listeria* infections in the United States, but also because multiple co-existing conditions complicated the diagnosis of the infection. A limited medical history further complicates the case and leaves many questions about the origin of the co-existing conditions and resulting symptoms.

POSTER 37

Timely Malaria Diagnosis

Ally Morris / amorris6@bellarmine.edu / Faculty Mentor: Brenda Davis

Malaria is a serious disease caused by Plasmodium parasites, typically transmitted through infected Anopheles mosquito bites. These parasites invade red blood cells, causing fever, chills, headache, muscle aches, and nausea. While endemic to Africa and South America, Malaria remains a global health concern. Prompt diagnosis is crucial to ensure effective treatment and prevent severe complications. In this case study, a 39-year-old woman arrived at the Emergency Department with fever, chills, headache, and body aches. She had recently traveled to Gambia, prompting suspicion of Monkeypox. However, without visible lesions to test, doctors performed a respiratory panel, diagnosed her with Human Rhinovirus, and discharged her. A week later, still unwell, she visited an urgent care center, where she again tested negative for COVID-19 and influenza. The original Rhinovirus diagnosis was maintained, and she was sent home. It wasn't until a third visit, ten days after her initial visit, when she visited her primary care physician (PCP), that a Malaria diagnosis was considered due to her persistent symptoms and travel history. A Malaria smear confirmed Plasmodium falciparum infection. This case highlights the serious implications of a delayed diagnosis and how that jeopardizes patient safety by prolonging suffering and increasing the risk of severe complications. It also places a significant financial and personal burden on the patient through repeated doctor visits, additional testing, missed work, and emotional distress. All of this could have been avoided with a timely and accurate diagnosis.

POSTER 38

Cholera: Diagnosis and Management

Deborah Sprigler / dsprigler@bellarmine.edu / Faculty Mentor: Brenda Davis

Cholera is an acute diarrheal disease caused by Vibrio cholerae, often acquired through the ingestion of contaminated food or water. This case study examines a 26-year-old female who arrived in a Louisville, KY emergency department due to persistent suffering from nausea, vomiting, and profuse watery diarrhea which occurred following a six-day trip to the Dominican Republic. Though her symptoms began three days into her visit, her three companions remained asymptomatic. Laboratory findings from a metabolic panel indicated dehydration with mild electrolyte imbalances, and a stool culture confirmed Vibrio cholerae which was resistant to ampicillin and trimethoprim. Diagnosis of cholera relies on clinical

presentation and laboratory confirmation via stool culture, with rapid diagnostic tests available for preliminary detection. Treatment focuses on aggressive rehydration with oral or intravenous fluids, electrolyte replacement, and antibiotic therapy when appropriate. In this case, resistance patterns necessitated the use of alternative antimicrobials such as doxycycline or azithromycin. Cholera remains rare in the United States but poses a risk to travelers returning from endemic regions. This case underscores the importance of travel history in diagnosing diarrheal illnesses and highlights the role of interdisciplinary laboratory collaboration, including microbiology for pathogen identification, clinical chemistry for electrolyte monitoring, and hematology for assessing dehydration status. Public health measures, including sanitation improvements and cholera vaccination, remain critical in endemic areas to reduce disease burden. Increased awareness among healthcare providers aids in prompt recognition and management, minimizing complications. This case contributes to the broader understanding of cholera diagnosis and treatment in returning travelers.

Keywords: Cholera, *Vibrio cholerae*, travel, Dominican Republic, dehydration, treatment

PHYSICS

POSTER 39

Search for Earth-Like Exoplanets Using Data Analytics

Samia Mahmood / smahmood@bellarmine.edu / Faculty Mentor: Akhtar Mahmood

We have studied NASA's exoplanet large datasets (Big Data) that contains over one million data parameters of over 5600 exoplanets that have been discovered to date by both ground and space-based telescopes using various exoplanet detection methods and techniques. Using data analytics, we have extracted and filtered NASA's exoplanet dataset with codes written in Python to search for Earth-like exoplanets, we have named as Earth 2.0. We have also written visualization code in Python to plot several exoplanet parameters - such as exoplanet radii, mass, orbital period, surface temperature, exoplanets' distance from their host star, stellar type, stellar mass, stellar radius, and distance of exo-stars from Earth. We have also classified all the exoplanets into seven categories, based on a combination of their radius and mass as - Earth like, Super-Earth like, Neptune like, Saturn like, Super-Saturn like, Jupiter like, and Super-Jupiter like. Using data analytics and data visualization, we have made a prediction to determine the number of potentially habitable Earth like and Super-Earth like exoplanets orbiting a Sun like (type-G) star in our Milky Way galaxy's habitable zone (HZ).

PSYCHOLOGY

POSTER 40

The Relationship Between Stress and Performance in College Athletes: Attenuation by Mindfulness

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Athletes are under lots of pressure such as school, financial issues, and competition. When these issues are on the forefront of their mind, it is hard for them to keep calm and composed when competing and practicing for their respective sport. Mindfulness is a way therefore for athletes to better keep their stress under control and focus on competing rather than the negative emotions that stress invokes. Athletes who are more stressed should perform poorer. However, mindfulness may attenuate this relationship such that athletes who test high in mindfulness will therefore perform better than their peers, even under stress. To test this, Bellarmine University athletes (N=100) participated in a survey that measured their behaviors and how stress effects their performance and other practices. As expected, stress was related to poorer performance, and mindfulness was related to better performance. However, contrary to the hypothesis, mindfulness did not influence the relationship between stress and performance, nor did self-compassion, a construct related to mindfulness. However, an exploratory analysis revealed that self-compassion predicted better athletic performance, and that stress mediated this link. Specifically, self-compassion predicted lower stress, which in turn predicted better athletic performance. The results of the current study may inform interventions that can aid athletes in reducing stress and improving performance.

POSTER 41

An Experiment on How Feelings of Belonging Affect Rates of Mimicry of Mental Illness Symptoms from Social Media Exposure

Kaitlyn Lunsford / klunsford@bellarmine.edu / Faculty Mentor: Jean Lamont

Often, social media influencers post content meant to aid in the self-diagnosis of mental illness, despite a lack of proper psychological/counseling training or presenting themselves

as someone who has a mental illness, whether that is true. These posts can influence contagion in which viewers may come to believe they have mental illness when that's not the case, but the reasons why are not well understood. However, low social belongingness--or feeling as though you don't fit in in a social setting--may promote the tendency to engage in social mimicry. Thus, the increased feeling of being ostracized may heighten the risk of contagion. US adults were recruited from the Prolific data collection community and randomly assigned to either a mild ostracization induction (experimental group) or a neutral task (control group). Both groups were then exposed to a social media post about symptoms of a mental illness, then completed measures of feelings of belongingness and rates of social mimicry—or whether they believed they had the fictitious disorder. It was hypothesized that individuals who have lower feelings of belongingness were more likely to mimic mental illness symptoms shown through social media compared to control. These results would offer an understanding of the phenomenon of social mimicry regarding mental illness online, potentially informing social media screening tools and awareness of this phenomenon and assisting psychology professionals in the treatment of their clients.

Recipient of the Student Government Association Research Grant Award

SECONDARY EDUCATION

POSTER 42

Cultivating Community: A Mixed-Methods Study Examining Community Literacy Practices in the Secondary ELA Classroom

Anna Heilers / aheilers@bellarmine.edu / Faculty Mentor: Jess Smith

Past research on the relationship between community literacy and schooling has emphasized how prior community-based knowledge can be used to teach the privileged literacies associated with academia. Some researchers have discussed the potential for university-community partnerships that are mutually beneficial, but few have explored possibilities for change in the high school setting. Utilizing 24 survey responses and 2 interviews, this study sought to answer the question of how high school classroom experiences supported or hindered students' community literacies, if at all. Data was analyzed using a combination of correlational analysis, axial coding, and narrative analysis. Though participants viewed their classroom experiences positively, few of these experiences directly supported their analysis

and use of language and texts in their communities. However, certain classroom experiences were protective factors, with participants suggesting that school was less likely to harm their out-of-school literacies when these factors were present. These findings support the assertion that high school classes have an impact on community literacy and that considering community literacies in the high school classroom can be worthwhile.

National Council for Teachers of English Annual Convention (November 20th-24th, 2024)
Recipient of the Joe and Angela Schmidt Award and Student Government Association
Research Grant Award

GRADUATE STUDENTS

EDUCATION AND SOCIAL CHANGE

POSTER 43

Empowering Diversity: Human Resource's Journey to True Cultural Competency

LaDaya Owens / lowens3@bellarmine.edu / Faculty Mentor: Courtney Keim

America is reaching a pivotal time in the nation's history where the population is becoming majority multicultural and multiracial, and by 2045, the White population will fall beneath the minority race population (Frey, 2018). As America's workforce becomes progressively diverse (Frey, 2018), human resource professionals have the responsibility and empowerment to promote inclusion in the workplace (Offermann & Basford, 2013). To support an expanding diverse workforce, human resource professionals must engage in cultural learning to have credibility when advocating for an inclusive workplace (Offermann & Basford, 2013), and, therefore, should become culturally competent to produce "positive actions and health outcomes" (Hayles, 2013, p. 58). Legislative governments across the United States are scrutinizing and shunning initiatives bringing awareness and training around cultural differences, such as diversity, equity, and inclusion programs (Salazar Montoya, 2024). Diversity, equity, and inclusion are used throughout organizational cultural and cross-cultural training (Society for Human Resources Management, 2024). Using the Cultural Competence conceptual framework (Balcazar, 2029), the current study will expand the literature by using human resource practitioners as study participants to learn about their lived experiences with diverse workplaces and their journey toward becoming culturally competent. There is limited research surrounding cultural competence development for human resources and their lived experiences.

Recipient of Provost Graduate Student Research Grant

PHYSICAL THERAPY

POSTER 44

Assessment of Student Physical Therapists' Knowledge and Attitudes of Opioid Overdose Following Naloxone Training

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Mentor: Hayleigh Raiff, Sonja Bareiss

Opioid overdose is a prevalent problem throughout Kentucky, especially in Jefferson County. According to the Kentucky Office of Drug Control Policy 2022 Overdose Fatality Report, Jefferson County had the highest number of drug overdoses involving fentanyl of any Kentucky county. Use of naloxone provides emergency treatment associated with an opioid overdose. Efforts have been made to train medical providers and the public alike to intervene in opioid overdose emergencies. The ability to intervene in these emergency situations requires individuals to assess for signs of opioid overdose and administer naloxone if appropriate. Physical therapists commonly work with patients utilizing opioid medications and, as both members of the medical community and the public, would likely benefit from training to recognize and respond to overdose emergencies. This project seeks to facilitate naloxone training for student physical therapists in Bellarmine's Doctorate of Physical Therapy Program in conjunction with the Kentucky Harm Reduction Coalition, an organization that provides naloxone training and other harm reduction strategies throughout the region. Student's knowledge and attitudes of opioid overdose will be assessed using questionnaires prior to and after participation in training. The aim of this work is to increase awareness of the prevalence of opioid overdose and provide student physical therapists with the tools to assess and intervene in these emergency situations. The aim is to report findings at regional and national professional meetings in an effort to advocate for similar trainings in physical therapy programs and other health professions programs.

Accepted and presented at American Physical Therapy Association Combined Section Meeting - Houston, Texas - February 2025 and American Physical Therapy Association-Kentucky Chapter Annual Conference - Lexington, Kentucky - September 2024

POSTER 45

Do pelvic anatomical videos enhance DPT students' knowledge and comfort with future of care?

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Mentor: Chantal Prewitt

Pelvic health is often overlooked, with only 32.5% of DPT students in the U.S being comfortable addressing sexual health concerns with patients. Supplemental videos have shown how to enhance student learning in various areas of education. Purpose: This study aims to assess the impact of supplemental anatomical videos on DPT students' knowledge of pelvic anatomy and their comfort with providing future pelvic health care. Participants: This study involves up to 180 DPT students including: first year DPT students who completed coursework in clinical anatomy and functional anatomy; second year DPT students who additionally completed gross anatomy coursework; and third year DPT students who are enrolled in a pelvic health elective course. Materials and Methods: In this quantitative study, participants are sent pre-test surveys via Microsoft Forms to assess baseline knowledge of pelvic anatomy. Afterward, students will have access to view supplemental educational videos on pelvic anatomy through Kaltura, followed by a post-test survey. Changes in knowledge are measured using a Likert scale evaluation. Results: To be determined. Conclusion: To be determined. Clinical Relevance: To be determined.

Recipient of Provost Graduate Student Research Grant

POSTER 46

An Eight-Week Protocol Improving Functional Mobility in Individuals with Lower Limb Loss: A Pilot Study

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Mentor: Elizabeth Levay, Dennis Lesch

Purpose/hypothesis: Lower limb loss is associated with numerous complications including the development of pain, muscle atrophy, and decreased activity, which significantly impact quality of life. Progressing resistance during open and closed kinetic chain exercises increases muscular strength, improves gait and mobility, and maintains cardiovascular

fitness. However, detailed exercise interventions in the literature are lacking. The purpose of this study was to investigate the effects of an eight-week exercise program on lower extremity amputees' muscular strength, endurance, gait mechanics, functional mobility, and balance confidence.

Accepted at American Physical Therapy Association-Kentucky Conference, Lexington Kentucky, September 26-27, 2024; presented at American Physical Therapy Association Combined Sections Meeting, Houston Texas, February 14-16, 2025

POSTER 47

Floor Recovery Biometric Analysis: What Does It Take to Get Off the Floor?

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/ Faculty Mentor: Beth Quinn

In the United States, falls are the leading cause of injury and death among older adults, thus is a major public health issue. Approximately 28-36% of older adults (aged 65 years or older) will experience falls each year. Among older adults who suffer from falls, one-half cannot get up and remain off the ground. Getting up from the ground in a timely manner is important for the long-term health of older adults. In previous studies, the Five Time Sit to Stand (5STS) has demonstrated concurrent and predictive validity properties in determining an individual's ability to independently rise from the floor.

Accepted at American Physical Therapy Association-Kentucky Conference, Lexington Kentucky, September 26-27, 2024; presented at American Physical Therapy Association Combined Sections Meeting, Houston Texas, February 14-16, 2025

POSTER 48

Perceptions and Attitudes of Performing Floor Transfers with Older Adults in Home Health

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Background: In the United States, falls are the leading cause of injury and death among older adults. Approximately 28-36% of older adults (aged 65 years or older), will experience falls each year. Among older adults who experience a fall, one-half cannot get up and remain off the ground. Getting up from the ground in a timely manner is important for the long-

term health of older adults. Those who stay lying on the floor for an hour after a fall are more likely to die within six months.

Purpose: Although the frequency and impact of falls among older adults is well established, little is known about the perceptions and attitudes of licensed rehabilitation therapists (physical therapists, physical therapist assistants, occupational therapists and occupational therapist assistants) in working with floor transfer training with older adults in the home health setting. The purpose of this study is to explore the perceptions and attitudes of performing floor transfers with older adults and better understand the practice patterns of home health therapists.

Methods: A 20-question electronic survey was developed and distributed online to physical therapists, physical therapist assistants, occupational therapists, and occupational therapist assistants working in the home health setting in a southeastern state.

Results: A total of 32 rehabilitation clinicians completed the survey (n=19 physical therapists, n=7 physical therapist assistants, n=6 occupational therapists, and n=0 occupational therapist assistants), with half of those surveyed had >20 years of clinical experience (n=16). 93.8% (n=30) of respondents felt it “very important” or “important” to assess the risk of falling with older adult patients, however only 71.9% (n=23) felt it “very important” or “important” to teach older adult patients how to transfer on and off the floor. Clinicians working in the home health setting identified a number of barriers preventing them from implementing floor transfer training with older adult patients, including safety (n=24), lack of a second person to assist (n=20), cleanliness of the home (n=12), and family request (n=10).

Accepted at World Physiotherapy Congress 2025

Recipient of Provost Graduate Student Research Grant

“Is the PROMIS Physical Function 4a (PROMIS-PhysF 4a) effective in measuring perceived physical function in cancer survivors going through an oncology exercise program.”

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Introduction: With advances in medical care, more cancer survivors are living longer, but they often face lasting effects from the disease and its treatments. These include physical challenges such as cancer-related fatigue and cachexia (muscle wasting), which reduce physical function, impact daily activities, and limit work capacity. Emotional difficulties like depression, anxiety, and fear further diminish their quality of life. To monitor recovery and guide treatment, clinicians use various outcome measures, including Clinician-Based Outcomes (CBO) and Patient-Reported Outcomes (PRO). This study employed tools such as the Bellarmine Norton Physical Assessment Tool (BNAT), Hand Grip Strength (HGS), and PROMIS Global® Physical Function 4a (PROMIS-PhysF 4a) to evaluate physical function in cancer survivors.

The BNAT, a comprehensive assessment, incorporates the 2-minute step test, 30-second sit-to-stand, timed arm curl, and timed up-and-go (TUG), alongside additional measures like the 10-meter walk test, InBody scan, and Fullerton balance test. The study included participants in active treatment and those who had completed treatment, revealing a wide range of physical function levels. The purpose of this study is to determine if there is a ceiling effect that could influence the results from the PROMIS-PhysF 4a.

Background: Cancer survivors frequently deal with persistent impairments due to the effects of cancer treatments. These physical impacts include fatigue, weakness and mobility issues. The PROMIS® Physical Function scale is a widely used tool for assessing an individual's ability to perform daily activities. This tool enables clinicians to better understand and quantify those challenges, enabling them to gauge the progress or lack thereof in cancer survivors.

Purpose: The purpose of this study is to examine how effective the Global PROMIS scores are at assessing the HRQOL of participants in a multi-week (10-12 weeks in the Fall of 2024 and 10-12 weeks in the Spring of 2025) multi-modal group exercise program on a population of cancer survivors.

Participant Selection: Participants will be recruited via an email flier through local cancer survivor groups and via social media fliers. They will also be recruited via word-of-mouth recommendations from local oncology clinics and therapy offices.

Inclusion Criteria: Adults over the age of 18 with a prior or current cancer diagnosis.

Exclusion Criteria: Persons were excluded from participation if they were not cleared for exercise by their physician, if they were not deemed safe to participate in exercise based on vital signs not meeting minimum requirements: resting blood pressure should be between 90/60 mm/Hg and 200/100 mm/Hg and heart rate between 60 and 100 bpm.

Methods: This study was a pre-test, post-test design to evaluate the effectiveness of the PROMIS Global® Physical Function 4a (PROMIS-PhysF 4a) in assessing perceived physical function in cancer survivors participating in a 10–12-week exercise oncology program.

Objective physical functions tests were assessed using the Hand Grip Strength Test, Bellarmine Norton Assessment Tool (BNAT), Fullerton Advanced Balance Scale (FAB), and the 10-Meter Walk Test (10MWT). The exercise program consisted of a structured, multi-modal exercise routine for all participants for two, one-hour sessions per week for 10-12 weeks in both the Fall and Spring semesters. Patient self-reported physical function was assessed using the PROMIS Global® Physical Function 4a (PROMIS-PhysF 4a).

POSTER 50

Do Physical Activity Barriers Shape the Health Related Quality of Life for Individuals with Limb Loss?

Taylor Eiting / teiting@bellarmine.edu / Faculty Mentor: Elizabeth Levay

Background: Individuals living with limb loss encounter a wide range of challenges that impact their daily activities and overall quality of life. These challenges include limited family support, financial constraints, fear of injury, persistent pain, reduced motivation, and restricted access to adaptive equipment or proper prosthetic fitting. These factors can significantly influence both the mental and physical well-being of those with limb loss.

Research indicates that individuals with limb loss are often less physically active and socially engaged compared to the general population. However, it is still unclear how barriers to physical activity impact health related quality of life in people with limb loss.

Purpose: The purpose of this study was to investigate associations between physical activity barriers and health related quality of life in individuals with limb loss.

Methods: An 18-question electronic survey was designed with a mixture of multiple choice and open response items, and was used to assess demographic values, type of amputation,

and barriers to completion of physical activity in people with limb loss. The 20-item short form survey (SF-20), a previously validated outcome measure in patients with chronic conditions, was also included in the survey to assess six aspects of health (physical function, role function, social function, mental health, health perceptions, and pain). This survey was distributed via methods of purposeful and convenient sampling, with an incentive to be entered into an optional lottery to win a one-hundred-dollar gift card.

Participants: $n = 130$

Results: Both descriptive and inferential statistics will be utilized to analyze data.

Discussion: Survey results will provide an understanding of barriers to physical activity in people with limb loss and will be used to determine relationships between physical activity barriers and health related quality of life. This information can help to guide a more focused and holistic physical therapy plan of care for amputees.

Recipient of Provost Graduate Student Research Grant

FACULTY

FACULTY DEVELOPMENT FELLOWSHIP RECIPIENTS (2024)

Midcentury Animation and Fuzzy Modernism

Dr. Jennifer Barker, Professor of English

Proposal abstract:

My fellowship work will examine midcentury animation during the Cold War in film archives in Estonia, Czechia, Poland, and Germany. This archival research is central to my project on “fuzzy modernism” in the 1950s and 1960s, which examines the work of stop-motion animators in countries bordering the Soviet Union and Europe. Their films compose a diverse yet coherent body of work that redefined animation while also subverting the dictates of a repressive occupying force. Their work remains deeply relevant and significant, though under-theorized by critics who equate animation with childishness. This research will allow me to complete my book manuscript.

Master of Arts in Teaching Program Students' Mathematical Knowledge for Teaching

Dr. Jung Colen, Associate Professor of Education

Proposal abstract:

This proposal seeks funding to conduct a study investigating the impact of Bellarmine University's Master of Arts in Teaching (MAT) program on students' Mathematical Knowledge for Teaching (MKT). While the MAT program benefits those without prior education backgrounds greatly, concerns exist regarding its short duration and potential inadequacies in knowledge acquisition. Through pre- and post-surveys using the Diagnostic Teacher Assessment in Mathematics and Science (DTAMS; Bush, n.d.), this study aims to assess the program's effect on MKT. The findings will inform strategies to enhance MAT students' mathematical preparation, ultimately benefiting the education field and the University's commitment to producing well-prepared teachers.

Beyond the Bloomer: Fashioning Change in Nineteenth Century Dress

Dr. Laura Ping, Assistant Professor of History

Proposal abstract:

Beyond Bloomers: Fashioning Change in Nineteenth-Century Dress is a research monograph that explores the social and political power of dress in shaping American culture. During the nineteenth-century, dress-reformers argued that the ornamentation of women's clothing physically restricted their mobility while metaphorically reiterating women's inferiority. This manuscript situates dress-reform within the histories of feminism and consumer-based political movements by analyzing reformers' efforts to empower women through modified clothing. It argues that dress-reform was most widely adopted when it was linked to function but that in striving to achieve equality through clothing, this movement excluded women for whom fashion was power.

INTERNATIONAL RESEARCH & TEACHING GRANT RECIPIENTS

Dr. Emily Bingham, Visiting Honors Faculty Fellow

Honors Rome

Dr. Tara Granada, Assistant Professor of Physical Therapy

EduGlobal Clinical Site Visit

Dr. Steven Wilt, Associate Professor of Biology

Marine Biology Belize

Dr. James Archibald, Professor of Graduate Education

Dr. Kristen Wallitsch, Dean of Student Success & International Programs

Comparative Education in the UK

Dr. Savita Chaurasia, Associate Professor of Chemistry

National Science Foundation – International Research Experience for Students Site Visit

Dr. Jessica Hume, Associate Professor of Health Services

Dr. Gabri Warren, Assistant Professor of Undergraduate Nursing

Healthcare Administration & Public Health in the UK Program Development

Dr. Fedja Buric, Associate Professor of History

BU Global Access: Northern Ireland

Dr. Michele Abee, Assistant Professor of Environmental Studies

Honors New Zealand

Dr. Frank Hutchins, Professor of Sociology
Food, Justice, and Sustainability in Italy - Site Visit and Course
Migrants Journey: US and Mexico Border

Dr. Leslie Leffler, Assistant Professor of Graduate Nursing
Dominican Republic Nursing Clinical

Rev. Dr. John Pozhathuparambil, OFM Conv., Director of Campus Ministry
India Program

Dr. Tim Glasscock, Associate Professor of Music
Oratorio Society: France

Dr. David Porta, Professor of Biology
Dr. Paul Kiser, Associate Professor of Biology
Dr. Carrie Doyle, Associate Professor of Biology
Marine Biology Bahamas

