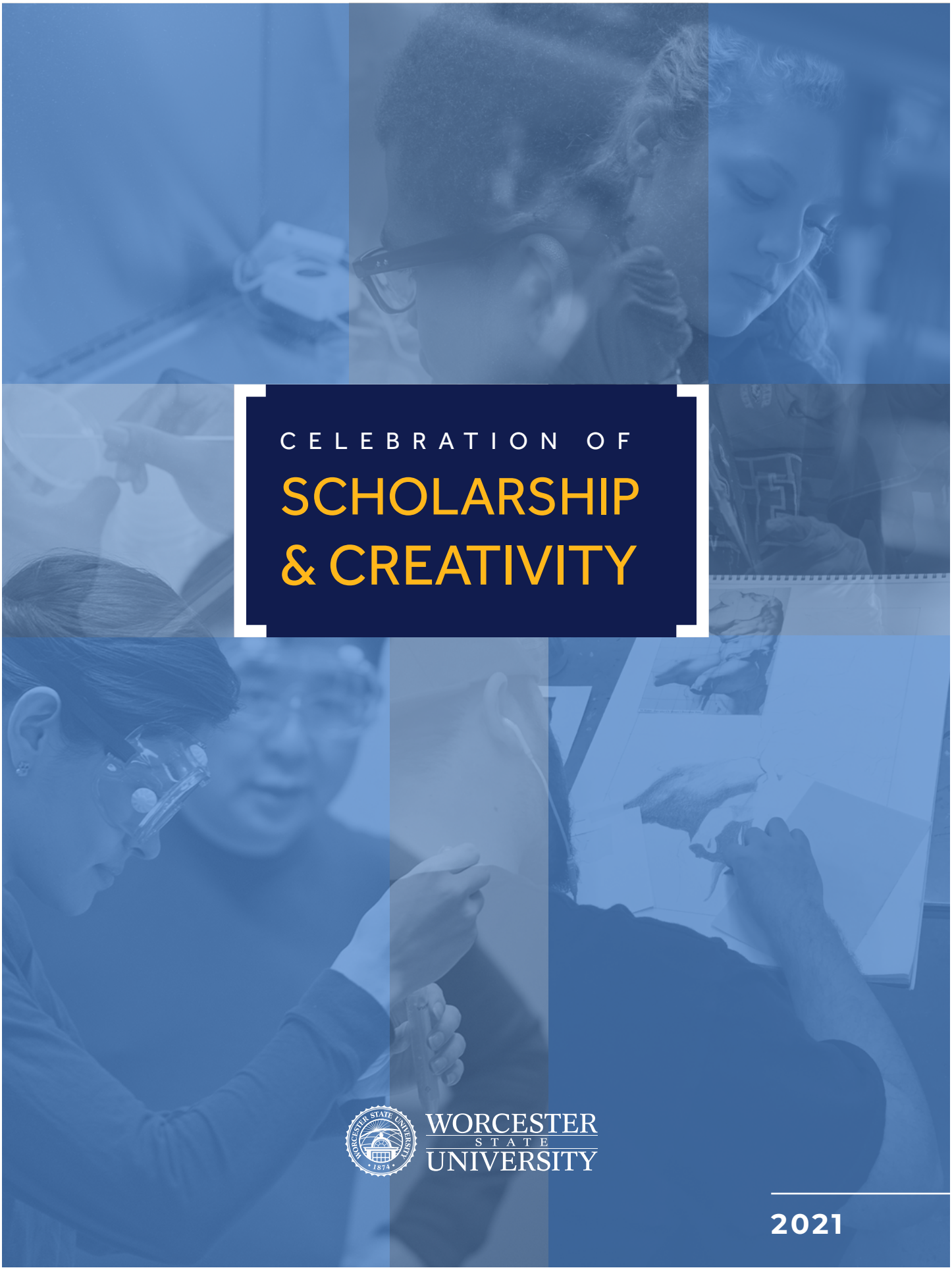


CELEBRATION OF

SCHOLARSHIP & CREATIVITY

WORCESTER STATE UNIVERSITY

2021

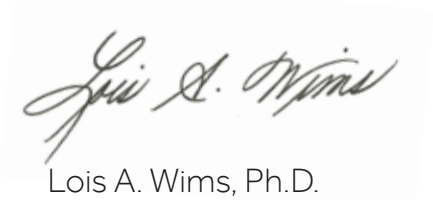
CELEBRATION OF

SCHOLARSHIP & CREATIVITY

Welcome to the 14th annual Worcester State University Celebration of Scholarship and Creativity. This is one of the highlights of the academic year at Worcester State University as we showcase the wonderful creative and scholarly work of our students.

We are enormously proud of the opportunities our undergraduate and graduate students have to embrace active learning locally, nationally, and internationally in concert with outstanding faculty mentors who are exceptional leaders in their fields. We are further elated that, despite the COVID- 19 crisis, Worcester State University has been able to hold the Celebration in an exciting virtual format. In addition to live interactive presentations, including a poster session, on April 28, oral presentation recordings and posters will be available on the conference webpage for the coming year. This event features impressive research and creative projects across the range of disciplines of study at Worcester State, from the natural sciences and social sciences to the arts and humanities.

Please immerse yourself in this culture of active learning and savor this tremendous student work as a window into what happens every day at Worcester State University.



Lois A. Wims, Ph.D.
Provost and Vice President for Academic Affairs

CELEBRATION OF
SCHOLARSHIP
& CREATIVITY

Welcome to the 2020 Worcester State University Celebration of Scholarship and Creativity.

Because of the stay at home protocols necessary to fight the COVID-19 pandemic, the Celebration moved from its usual format of oral presentations, exhibitions, performances, and poster presentations to a virtual format. Worcester State is tremendously excited to continue this tradition and recognize the great achievements of our students and their faculty advisors through virtual projects available at:

https://worcester.swivle.cloud

The password for entering the Celebration site is:

worcester20

The virtual conference runs from May 8 through June 6, 2020.

The conference website was created by ePosterBoards, LLC.

BIOLOGY

Biotic and Abiotic Factors' Impacts on Tree Growth

Martha Boiquaye, Matthew Abraham, and Malak Alkushtaree

Faculty Advisor: Aleel Grennan, Ph.D.

Poster Presentation

In this study we will look at the biotic and abiotic factors that impact tree growth: how they accelerate, decelerate, or completely stop tree growth from happening. These factors may include everything from environmental conditions to micro-organisms that cannot be seen with a naked eye. To address this issue, we will be doing a biodiversity assessment which includes a tree census, understory plants, and environmental analysis.

Tree Growth Analysis by the Holden Rail Trail

Briana Chang, Logan Laflamme, and Jenny Kha

Faculty Advisor: Aleel Grennan, Ph.D.

Poster Presentation

After the deconstruction of the Central Massachusetts railroad, the route of the trail was restored into a popular walking trail. Little is known about the plants growing within the region. The age and type of trees were identified through bark analysis, dendrochronology, and diameter breast height. Understory plants were identified as well as an analysis of the soil.

Evaluation of Mutualistic Interactions on Tree Growth in Holden, Massachusetts

Jillian Corliss, Rafael Fahmy, Adam McCluskey, and Ayman Nashawi

Faculty Advisor: Aleel Grennan, Ph.D.

Poster Presentation

Tree growth rate is a manifestation of the biotic/abiotic interactions in the environment in which the tree is existing. Therefore, growth rate can serve as a surrogate to analysis of the overall conditions of the environment, including the symbiotic relationships that arise between the flora and other living organisms in that same environment. In our research we aim to identify organisms involved in a mutualistic relationship with the trees in our study plot.

Examination of Factors Required for *Mitchella repens* Germination

Lucas P. Horan and Julia L. Fitzpatrick

Faculty Advisor: Aleel Grennan, Ph.D.

Funding Source: Aisiku Interdisciplinary STEM Research Team Initiative

Poster Presentation

The trailing plant *Mitchella repens* (partridgeberry) is a native, distylous perennial that is commonly found in New England forests. This study focuses on partridgeberry germination and what conditions were optimal for its success. This was achieved by exposing the berries to a variety of treatments simulating different abiotic and biotic factors. Our results suggest that a cold stratification and berry flesh removal were necessary for germination.

Predicting Ecological Succession of Reforestation

Caroline O. Moreira, Logan J. White, Shelby F. Brooks, and Joel N. Buabeng

Faculty Advisor: Aleel Grennan, Ph.D.

Poster Presentation

To predict the ecological succession of a forest where trees were removed, multiple sites must be compared. Assessing understory plants will allow us to determine the species richness of the area in an effort to predict the ecological succession of the forest. We will also be taking our climatological data into account to predict how varying precipitation and temperature will affect the future generations of vegetation growth.

Validating an Efficient Transformation Method to Identify Gene Function in Monocots

Hoang D. Vo

Faculty Advisor: Aleel Grennan, Ph.D.

Commonwealth Honors Project

Poster Presentation

Understanding gene function provides us with key data needed to understand how organisms thrive in their environment. Gene function can be studied using transformation, a multi-step process to introduce foreign genes into the host's genome. This project investigated methods to transform the C4 plants *Zea mays* and *Setaria viridis*. Two transformation techniques, electroporation and polyethylene glycol, were compared for ease of use and transformation efficiency.

BIOTECHNOLOGY

Growth Potential of Callus from Several Species of Plants on Two Different Media

Emma K. Greenberg

Faculty Advisor: Yan Hu, Ph.D.

Commonwealth Honors Project

Poster Presentation

In order for plants to grow in ideal conditions for them, it is necessary to test the effects that different additives to the media in which they are grown have on their growth. Two of the most common additives are α-naphthaleneacetic acid (NAA) and kinetin. To examine the effects of these components, different kinds of plants, including broccoli, carrot, and apple, were grown on media with and without these supplements. After four weeks of growth there was no significant observed difference between the plants grown on supplemented and unsupplemented media.

Imines: Microwave Synthesis for the Creation of Novel Antibiotics

Bradley Montanez and Stephanie M. Cofske

Faculty Advisor: Margaret E. Kerr, Ph.D.

Poster Presentation

Imines were synthesized in high yield from amines and aldehydes using microwave irradiation with water as the solvent. The imines have been coordinated to metals, forming mono-, bi-, and tri-dentate complexes. Imines have known antibacterial and antifungal properties and coordination of imines to metals is known to enhance these properties. These complexes have been evaluated against various bacteria to determine their antibacterial activity.

The Synthesis Study of *Thielavin T*

Phan Phan, Quynh Nguyen, and Nhu Le

Faculty Advisor: Weichu Xu, Ph.D.

Funding Source: Worcester State Foundation Student Research, Scholarship, and Creative Activity Grant

Poster Presentation

The development of new antibiotics is crucial in the fight against the emergence of antibiotic resistance. This research focuses on the synthesis study of *Thielavin T*, a natural compound that poses potential antibacterial activities against Gram-negative and positive bacteria. With the final building block successfully synthesized, the project is in its final stage. Access to *Thielavin T* will be gained after all building blocks are joined together.

Chlamydia Incidence Rates over a Period of 12 Years in the United States Between High School and College-Aged Individuals

Louisa Noelle Tannous

Faculty Advisor: Maura Pavao, Ph.D.

Oral Presentation

In this research project, the change in incidence rates of the sexually transmitted infection, Chlamydia, between 2002-2014 was observed. Data from the Centers for Disease Control was compared against census data using qGIS. There are some noticeable differences that were seen when comparing high school-aged individuals to college-aged individuals. There were increases in the incidence rates in more recent years in both age demographics.

Identification of Yeast Associated with the Fermentation of Apple Cider

Kaitlin E. Young

Faculty Advisor: Maura Pavao, Ph.D.

Funding Source: Worcester State Foundation Student Research, Scholarship, and Creative Activity Grant

Graduate Project

Poster Presentation

Fermentation of apple cider involves the yeast *Saccharomyces cerevisiae* that converts sugar to ethanol. However, wild yeast and bacteria may be present in low levels in the final product as a result of their presence on the apples at pressing. This project used next-generation sequencing to identify the key species present in home- brewed hard cider. In addition to fruit-associated microbes, a few opportunistic human pathogens were identified.

BUSINESS ADMINISTRATION

The Effects of the COVID-19 Pandemic on Small Businesses and Recommendations for the Small Business Resiliency Grant

Anni Cappi, Payton Collins, Avery Oldakowski, and Karen Shalev

Faculty Advisor: Elaine Vescio

Commonwealth Honors Project

Poster Presentation

This research, conducted by the Entrepreneurship Ambassador Program's Greater Worcester Ecosystem team, highlights businesses found to have been most negatively impacted by the COVID-19 pandemic. Research results are divided by sector, type of owner, and size of business. This research also identifies warning signs and provides effective recommendations for the Small Business Resiliency Grant.

A Study of Online Mental Health Services and Related Consumption Trends

Jonathan S. Vandersea

Faculty Advisor: Lagnajita Chatterjee, Ph.D.

Poster Presentation

The mental health care marketplace has shifted from in-person interaction and flourished online due to digital advancements. This project investigates the evolution of the online mental health care marketplace and its role in supplementing traditional services. Using systematic review of popular media and associated research articles, the project aims to understand associated consumption practices, societal trends, and consumer attitudes.

CHEMISTRY

Partridgeberry: VOC Emissions and Metals Within the Soil

Adam N. Bengtson

Faculty Advisor: Kathleen Murphy, Ph.D.

Funding Source: Aisiku Interdisciplinary STEM Research Team Initiative

Poster Presentation

Mitchella repens (partridgeberry) was investigated interdisciplinarily. The chemistry team characterized the volatile organic compounds (VOCs) at different stages of the flowering process using Solid Phase Micro Extraction (SPME) devices in unison with a GC/MS. Alpha-pinene was the most concentrated of the identified VOCs; its concentration decreased as the flowering process continued. The soil was analyzed via ICP-OES to compare 16 metals' concentration.

Reaction of HNO with GAPDH: Development of GAPDH Assay for Undergraduate Biochemistry Lab

Judy Le

Faculty Advisor: Susan M. Mitroka-Batsford, Ph.D.

Funding Source: Worcester State Foundation Student Research, Scholarship, and Creative Activity Grant

Commonwealth Honors Project

Poster Presentation

Nitroxyl (HNO) has been shown to have unique pharmacological chemistry as well as therapeutic advantages in comparison to other nitrogen oxide species. Research was conducted to determine the drug's effect on glyceraldehyde-3-phosphate dehydrogenase (GAPDH) activity in conditions of pH 7 and 10, with the goal of developing an assay that can be implemented into a biochemistry lab curriculum. Both direct oxidation and reversibility of this effect on GAPDH were examined.

COVID-19 and Chemistry

Vivian Parker

Faculty Advisor: Meghna Dilip, Ph.D.

Funding Source: Worcester State Foundation Student Research, Scholarship, and Creative Activity Grant

Poster Presentation

Chemistry has been crucial to understanding and fighting COVID-19. For example, chemists have helped define the structure of the virus and develop different diagnostic tests for COVID-19. The connection between chemistry and COVID-19 was researched and presented as an informative bulletin board for students and staff at Worcester State University. The bulletin board provided clarity to frequently asked questions and concerns the public/students may have.

How Green Is Your Nail Polish Remover?

Vivian Parker

Faculty Advisor: Meghna Dilip, Ph.D.

Poster Presentation

In this study a standard addition method using Nuclear Magnetic Resonance (NMR) was used to calculate the concentration of dimethyl adipate and dimethyl succinate in a nail polish remover marketed as acetone-free and non-toxic. The results were used to determine if the product was truly green as marketed.

Organic Video-Making

Han Phan, Quynh Nguyen, Nhu Le, and Emma Polak

Faculty Advisor: Weichu Xu, Ph.D.

Funding Source: Worcester State Foundation Experiential Learning Experience Grant

Oral Presentation

The COVID-19 pandemic has negatively impacted education systems worldwide. Here at the WSU Department of Chemistry, the pandemic has forced all laboratory courses to limit in-person class hours, which reduces the hands-on lab experience of the students. To assist students' learning during the pandemic, and to generate a library of graphic materials for students with special needs, a series of instructional videos on organic experiments has been created.

COVID-19 Drug Development

Rania R. Rezk

Faculty Advisor: Anne Falke, Ph.D.

Poster Presentation

COVID-19 is a disease that has spread rapidly since 2019, and it has affected nations worldwide. Many researchers tried to develop a drug to treat COVID-19, but none of these drugs have been approved by the FDA. Some studies have concluded that psychotropic drugs could have some actions against COVID-19. These studies need to go through clinical trials for FDA approval. The FDA has approved remdesivir with baricitinib to treat COVID-19.

Method Validation for Characterizing Volatile Organic Compounds from Flowers of *Mitchella repens*

Jay Turner

Faculty Advisor: Kathleen Murphy, Ph.D.

Funding Source: Aisiku Research Grant

Poster Presentation

An analytical method using SPME and GCMS was developed to characterize volatile organic compounds produced by flowers of the native plant *Mitchella repens*. COVID-19 restricted research during the plant's already brief flowering period, leaving no opportunity to determine the accuracy and precision of the method in the initial phase of research. The aim of the project was to determine sources of errant peaks and validate the method using a pure terpene standard.

COMMUNICATION SCIENCES AND DISORDERS

Tinnitus Treatment Study

Meagan M. Perro

Faculty Advisor: Keith Darrow, Ph.D.

Commonwealth Honors Project

Poster Presentation

Tinnitus, a phantom auditory sensation heard in the ears and/or head, plagues more than 50 million people in the United States with varying severity. This study involves 91 participants and analyzes the efficiency of hearing technology as a treatment for tinnitus during a 45-60 day window. Each participant was surveyed pre- and post-treatment to evaluate patient changes in perception of their tinnitus experience and its impact on daily life.

COMMUNICATION SCIENCES AND DISORDERS AND SOCIOLOGY

Multicultural Sensitivity Education in Hearing Health Care

Sabrina Dass

Faculty Advisor: Keith Darrow, Ph.D., and Alex Briesacher, Ph.D.

Funding Source: Worcester State Foundation Student Research, Scholarship, and Creative Activity Grant

Commonwealth Honors Project

Oral Presentation

Hearing health care professionals (HHPs) serve patients with diverse backgrounds, yet there is no formal multicultural training within the field. We interviewed 20 HHPs with various experiences with multiculturalism. While 95 percent of HHPs believe that multicultural education would improve outcomes, only 21 percent received formal training. A multicultural education program would help HHPs overcome bias, further their education, and build a bridge for better patient care.

COMPUTER SCIENCE

Evaluating Graduation Rates Between Private and Public Universities

Faraaz Baig, Haoru Song, and Mohammed Jaber

Faculty Advisor: Elena Braynova, Ph.D.

Poster Presentation

Using visualization and statistical methods, we explored variations in graduation rates between private and public universities. We used numerical prediction methods to answer questions such as “Can we predict graduation rates?” and “How does the graduation rate vary for each university?” We used different data mining models and algorithms to compare efficiency of the constructed numerical prediction models. We found that the graduation rate is higher for universities that have a higher enrollment rate.

Testing the Testers: A Comparison of Software Testing Tools

Michael H. Mendes, Kurt Maiser, and Delice K. Ndaie

Faculty Advisor: Shruti Nagpal, Ph.D.

Poster Presentation

Quality assurance testing is a large (and resource-intensive) part of software engineering as a whole. This research focuses on investigating and comparing software testing tools in order to reduce development time for software engineers and testers, as well as to ensure that all software is as reliable and safe as possible for the end-user. This study compares tools for software code coverage, defect detection, and mutation testing.

Worcester Election Results: Cleaning and Preprocessing

Migena Shkurti

Faculty Advisor: Elena Braynova, Ph.D.

Funding Source: Aisiku Summer Undergraduate Research Grant

Poster Presentation

The focus of this project was cleaning and preprocessing Worcester elections PDF data files containing scanned images. We converted these into accessible files, such as Excel files, and restructured data for further analysis. We analyzed the data sets for missing attribute values and detected and fixed errors that occurred under file conversion. We then analyzed attributes for dependency, outliers, and relationship by running machine learning algorithms such as K-Means, GMM, and Correlation.

COVID-19 Pandemic Trends: Cases and Death Rates

Lesly Wawa

Faculty Advisor: Elena Braynova, Ph.D.

Poster Presentation

We evaluated a global COVID-19 data set recording new cases, new deaths, total cases, and total deaths. We applied a visualization technique to draw comparisons between countries. The visualization techniques suggest the number of new/total deaths depends on the number of new/total cases when compared between countries. We constructed numerical prediction models for the number of deaths and compared them by countries.

EARTH, ENVIRONMENT, AND PHYSICS

The Study of New Successional Growth in Response to Climate Change

John J. Arsenault and Prince Gyau

Faculty Advisor Aleel Grennan, Ph.D.

Poster Presentation

Understanding climate change and local soil interactions will help us predict new successional growth in forested areas in Holden, Massachusetts. Soil processing and microbiome analysis will establish soil-ecological dynamics of the site resulting in historic and potential vegetation; forest cover will be analyzed using ArcGIS. Extrapolating dendrochronology data will support past and current climate conditions for comparison.

The Effect of Drought on Agriculture in Massachusetts

Kwaku Asare and Chloe Deviney-Dimarzio

Faculty Advisor: William Hansen, Ph.D.

Funding Source: Worcester State Foundation Student Research, Scholarship, and Creative Activity Grant

Oral Presentation

Drought is an environmental disaster. Agriculture, which is part and parcel of our existence as humans, is significantly affected by drought. In 2016, drought affected 54,027 hectares of Massachusetts farmland and resulted in an estimated loss of $18,172,759. We use GIS to show how Massachusetts' agriculture has been impacted by drought and suggest ways to prevent future occurrences.

Paleofire Research and Climate Change

Lauren Beckman

Faculty Advisor: Laura Reynolds, Ph.D.

Funding Source: Worcester State Foundation Grant

Poster Presentation

Paleofire research is important in planning for future climate change, because it helps us understand anthropogenic impacts on fire regimes and how ecosystems respond. Using macroscopic charcoal as a local fire proxy, we observe charcoal abundance in tidal marsh sediment cores. The data will be used to identify charcoal peaks to establish individual fire occurrences. We expect to observe changes in fire events synonymous with human alteration of fire regimes in the area.

Aquatic Invasive Species in Patch Reservoir

Katherine Burris and Kyle Splaine

Faculty Advisor: William Hansen, Ph.D.

Poster Presentation

This paper describes the relationship between temperatures and the influx of various impairments in Worcester's Patch Reservoir. We are focusing on aquatic invasive plant species and the different invasive plant treatments as well. Aquatic invasive plants out-compete native plants and threaten the existence of these plants. We will use color infrared imagery to examine the spatial and temporal extent of these species through Geographic Information Systems.

Mapping Worcester's Segregation

Lucas E. Ferreira

Faculty Advisor: Alexander Tarr, Ph.D.

Commonwealth Honors Project

Oral Presentation

This paper uses a geospatial analytical approach to study the degree of residential segregation in Worcester, Massachusetts, and several dimensions of its impact on marginalized communities. We use racial evenness-clustering and isolation-exposure to show how ongoing segregation at the local level of neighborhoods reproduces negative impacts on community well-being, education, and political participation across Worcester.

Examining Spatial Patterns of Food Environments Near Environmental-Justice Neighborhoods in Worcester, Massachusetts

Mahlet N. Kelecha

Faculty Advisor: William Hansen, Ph.D.

Poster Presentation

Food access is identified as one of the social determinants of health; food insecurity and food scarcity are risk factors for poor physical and mental health. The report explores a distribution of food environments in environmental-justice neighborhoods using spatial analysis. Convenience stores, farmer's markets, and grocery stores were geocoded, and the spatial analysis of the data examined the intersections with public transportation and pedestrian access.

Charcoal and Foraminiferal Record from a Coastal Marsh in New Jersey (Cheesequake Marsh)

Zoe G. Krouner

Faculty Advisor: Laura Reynolds, Ph.D.

Poster Presentation

Studying coastal marshes provides useful information to evaluate marsh evolution. Here we reconstruct fire history of the Cheesequake Marsh by sieving sediment samples from the wetland cores and counting the charcoal particles and foraminifera shells. We expect to see differences in fire history over time related to human influence and differences in foraminifera shells in relation to sea level change.

How Did the Postindustrial Change Affect Ground Contamination at a Former Steel Factory?

Michael Mathews and Ziliang Jin

Faculty Advisor: William Hansen, Ph.D.

Poster Presentation

The site at 25 Tobias Boland Way in Worcester used to be a steel factory, but was later converted to a shopping center. The factory operations caused significant ground contamination. Using MassGIS data on soil and water pollution, we examined how the environment changes through the postindustrial transformation.

The Effects of Micrometeorological Factors and Forest Type on the Presence of *Mitchella repens* (Partridgeberry)

Melanie R. Meadors and Briana Chang

Faculty Advisor: Douglas E. Kowalewski, Ph.D.

Funding Source: Aisiku Interdisciplinary STEM Research Team Initiative

Poster Presentation

How might abiotic environmental factors affect the success of *Mitchella repens*, a native New England plant? Micrometeorological data collected by sensors in and above ground showed minimal climate variability between locations with and without *Mitchella repens*. However, a vegetative index analysis performed via remote sensing suggests the presence of *Mitchella repens* is closely associated with forests containing a mixture of deciduous and coniferous trees.

ENGLISH

Combatting Addiction in the Latin American Community

Neill R. Toohey

Faculty Advisor: Christina Santana, Ph.D.

Poster Presentation

For many years, the Latin American community in Central Massachusetts and beyond has been underserved. The Hector Reyes House in Worcester does phenomenal work by assisting Latino men in recovery from substance abuse and addiction. This project reports on work done with the Hector Reyes House to improve the content of its website and produce informative literature. The result is a more vibrant, effective way to expand the impact of this vital organization.

The Benefits of Gaining Writing Experience with Community Organizations

Aspen Zheng

Faculty Advisor: Christina Santana, Ph.D.

Commonwealth Honors Project

Poster Presentation

College students provide a unique perspective while writing for organizations. This project reports on the outcomes from a team that produced community-based documents for the women's shelter organization, Abby's House, including increased community awareness, social well-being, and understanding of community organizations. The result demonstrates the importance for students of engaging with community organizations which benefit both individuals and communities.

ENVIRONMENTAL SCIENCE

How Soil Affects the Reproduction of *Mitchella repens* (Partridgeberry)

Briana Chang and Melanie Meadors

Faculty Advisor: Douglas E. Kowalewski, Ph.D.

Funding Source: Aisiku Interdisciplinary STEM Research Team Initiative

Poster Presentation

An interdisciplinary research team studied the biotic and abiotic growth factors of partridgeberry (PB), a native New England plant, to investigate the factors controlling its reproduction. Soil was collected from PB-containing and non-PB-containing sites, then analyzed for gravimetric water content, grain size distribution, and total organic carbon. Finer soil texture and increased TOC likely led to elevated water content, preferential growing conditions for PB.

Effects of COVID-19 Regulation on the Worcester Urban Heat Island

Alex Dalelio

Faculty Advisor: William Hansen, Ph.D.

Oral Presentation

This study quantifies how the Urban Heat Island (UHI) has been affected due to recent regulations and guidelines implemented in Worcester in response to the COVID-19 virus. We will be looking at Landsat-8 Thermal Infrared Sensor data, which will allow us to evaluate the ongoing temperature changes over Worcester County to see how much of a mitigated effect the laws have had on the UHI both before and during the pandemic.

Methods and Analysis of Microplastics in Soil Samples Taken Around an Urban Body of Water

Will C. Darling

Faculty Advisor: Laura Reynolds, Ph.D.

Funding Source: Worcester State Foundation Student Research, Scholarship, and Creative Activity Grant

Poster Presentation

We describe the results of methods developed to separate microplastics from sediment samples from environments near Patch Reservoir in Worcester, Massachusetts. Methods used in this research include density separation, mechanical sieving samples, and UV light to detect microplastics under the microscope. We hypothesize that a combination of these methods will improve the quantity of microplastics recovered from the samples.

HEALTH SCIENCES

Maintaining Mental and Physical Well-Being in Undergraduate Students During the First Phase of COVID-19 Social Isolation Sydney K. Howe

Faculty Advisor: Mariana C. Calle, Ph.D., and Jaime F. Vallejos, M.D., MPH

Funding Source: Worcester State University Foundation Grant

Poster Presentation

COVID-19 has caused widespread unrest among college students in the United States. An anonymous survey was distributed using social media and yielded responses from May to July 2020 regarding undergraduate students' (n=575) self-perceived stress levels and coping mechanisms. Preliminary data showed that 37 percent of the undergraduate students had high levels of anxiety during social distancing, and coping mechanisms were primarily cognitive activities over physical activity.

MATHEMATICS

Mathematics in Major Sports Compared to Field Hockey

Alexa M. Bobbin

Faculty Advisor: Jason Hardin, Ph.D.

Poster Presentation

The mathematics involved in sports around the world often goes unseen. Because field hockey is not a popular sport worldwide, many people also do not recognize how the mathematical aspects of sports can be connected to field hockey. Putting these two elements together forms the purpose of this paper, which is to identify the mathematics utilized in baseball, basketball, and golf, and relate them to the mathematics behind field hockey.

Investigations of Mathematical Logic

Pasquale Doucimo

Faculty Advisor: Jason Hardin, Ph.D.

Oral Presentation

First-order logic, intuitionistic logic, and constructivism are introduced, and their impact on mathematics is discussed via axiomatic set theory.

Modeling Basketball Free Throws

Emma Poplawski and Lacey Nguyen

Faculty Advisor: Maria Fung, Ph.D.

Poster Presentation

In basketball, a free throw can be considered an easy scoring opportunity because the ball is thrown from a fixed distance from the basket. In order to score, the ball cannot be thrown too high, too hard, or too low. The goal of this problem is to use the mathematical modeling process to determine and explain which ball path, out of all the paths, will score.

Optimizing Performance in a Triathlon

Shaylee J. Puleo

Faculty Advisor: Jason Hardin, Ph.D.

Poster Presentation

Training for a triathlon and other multidiscipline sports has proven to be quite the athletic feat. I aim to dissect each element of a triathlon to come up with some valuable advice for athletes training for their first race. I have grouped the information by the three different legs of the race consisting of swimming, biking, and running and in each section there are multiple mathematical analyses that aid in providing helpful training recommendations.

NONPROFIT MANAGEMENT

Worcester in Lockdown: Pictures from 2020-2021

Xheni Arapi

Faculty Advisor: Shiko Gathuo, Ph.D.

Graduate Project

Oral Presentation

The year 2020 was a year like no other. COVID-19 led to travel restrictions and a near-total shutdown. The lockdown made the world look very different in only a matter of days. In this project, I took pictures in various settings in Worcester. In my presentation of selected pictures, I zoom out and relate each picture to the larger socio-economic context in the United States.

NURSING

Prevention of Burnout in New Graduate Registered Nurses

Meaghan Campbell, Ashley Cotting, Quinn Ferreira, and Leah Fitzgerald

Faculty Advisor: Julia McNeil

Poster Presentation

A major problem in the field of nursing is the high turnover rate from the significant amount of stress nurses face, especially new nurses. The lack of experience, combined with the inability to cope with a high-stress and high-stakes job, leads to exhaustion and burnout. This poster explores the factors that lead to burnout, the underlying causes for nurses to leave the profession, and intervention strategies to prevent burnout.

Effects of Mindfulness Training on Nurses Experiencing Burnout

Bethany A. Irish, Hailey R. Baldwin, Hannah Crandall, and Lucia V. Revetria

Faculty Advisor: Melissa D. Duprey, Ed.D., MSN

Poster Presentation

Burnout is a state of emotional, physical, and mental exhaustion related to excessive stress. Due to the physical and mental demands of nursing, this makes nursing a career with a high rate of burnout, which can be seen in great detail under current circumstances due to COVID-19. An integrative review was conducted to determine if mindfulness training reduced the stress experienced by nurses. Ten studies were selected and cross-matched for relevancy. Initial findings support mindfulness training as an effective strategy in reducing burnout.

OCCUPATIONAL THERAPY

Walking as a Meaningful Leisure Occupation for Older Adults

Isabel Badeau and Laura McCarthy

Faculty Advisor: Joanne Gallagher-Worthley, Ed.D.

Graduate Project

Poster Presentation

Occupational therapists do not always consider leisure activities in their treatment. This study investigated walking as a meaningful leisure activity for adults over 50 and the benefits it has on life satisfaction, social health, and habits. The survey results showed that there are many common reasons for and barriers to leisurely walking, but the impact walking has on daily life for participants was not as closely related as the existing literature has concluded.

The Public Knowledge, Awareness, and Understanding of Occupational Therapy

Isabell Baldrate

Faculty Advisor: Joanne Gallagher-Worthley, Ed.D.

Graduate Project

Poster Presentation

Although the field of occupational therapy has engaged in strong advocacy efforts, the profession is still not well-known to the public. The study aimed to determine the nature of public knowledge about and perception of occupational therapy as compared to other professions in the health care field. An online survey was posted on Facebook to gather quantitative data from 50 participants. The results suggested that the majority of the public is not well-educated on occupational therapy.

The Psychological Impact of SARS-CoV-2 on Undergraduate Students

Emma V. Caneira

Faculty Advisor: Joanne Gallagher-Worthley, Ed.D.

Graduate Project

Poster Presentation

The purpose of this study was to determine the psychological state of undergraduate students during the Covid-19 pandemic. Results from this study showed that half of students had higher anxiety levels caused by disrupted routines, loneliness, perceptions of the virus, and changes in quality of education. Universities should provide effective services during crises to promote student success in their studies, occupations, and everyday life.

Occupational Therapy Practitioners' Attitudes Toward and Experiences with Telehealth

Julia C. Caristi and Emma A. Dyer

Faculty Advisor: Joanne Gallagher-Worthley, Ed.D.

Graduate Project

Poster Presentation

As the use of technology in health care continues to evolve, the incorporation of telehealth in all practice areas will expand. This study explored practitioners' perceptions and experiences using telehealth through an electronic survey, in an attempt to understand the application of telehealth to the occupational therapy field. While face-to-face was the preferred method of service delivery, telehealth was considered a viable alternative by the majority of practitioners.

Changes in Roles and Routines of Military Families During Reintegration

Stephanie R. Chapin

Faculty Advisor: Joanne Gallagher-Worthley, Ed.D.

Graduate Project

Poster Presentation

Military families have been found to experience challenges with changes in roles and routines during the reintegration phase of the deployment cycle. This study interviewed military spouses to better understand military families' experiences during reintegration. Results showed that changes in roles and routines may lead to decreased family participation in occupations and well-being in the reintegration phase.

Prevalence of Burnout in Pediatric Occupational Therapy Practitioners

Margaret Daley

Faculty Advisor: Joanne Gallagher-Worthley, Ed.D.

Graduate Project

Poster Presentation

Burnout is an issue that can affect many health care professionals — including occupational therapists — mentally, physically, and emotionally. This study examined the correlation between burnout levels and years of experience, job settings, and job title. It was found that although participants are affected by low to moderate burnout levels, there was no significant correlation between burnout and any of the aforementioned factors.

Impact of Service Dogs on Caregiver Burden for Parents of Children with Disabilities

Kacie DeSousa

Faculty Advisor: Joanne Gallagher-Worthley, Ed.D.

Graduate Project

Oral Presentation

While research has been conducted on the impact of service dogs on their handler's quality of life, little has been conducted on the impact of service dogs on their handler's caregiver's quality of life. This study investigated the impact of service dogs on the caregiver burden experienced by parents of children with disabilities. Results provided quantitative evidence that a service dog can have a positive impact on reducing caregiver burden.

The Impact of Chronic Pain on Occupational Performance in Individuals with Rheumatoid Arthritis

Lindsay G. D'Onofrio

Faculty Advisor: Joanne Gallagher-Worthley, Ed.D.

Graduate Project

Poster Presentation

Individuals with chronic pain from rheumatoid arthritis experience several limitations that contribute to overall functional disability. In this study, interviews of adults with rheumatoid arthritis were conducted and several themes emerged regarding the areas most affected in their daily lives. Themes of occupational withdrawal, role incompetence, and occupational dependency were identified.

Staff Perceptions of the Benefits of Activities on Nursing Home Residents

Allison L. Ekstrom

Faculty Advisor: Joanne Gallagher-Worthley, Ed.D.

Graduate Project

Poster Presentation

The purpose of this study was to determine staff members' perceptions of the benefits of activities for nursing home residents. Results showed staff believe activities, such as music, are essential to residents' well-being, as they create the opportunity for meaningful engagement and social interaction. Nursing home staff must be educated on the importance of activities to promote resident participation in meaningful activities that will support their quality of life.

The Effects of Chewing Gum on Memory

Megan E. Foley

Faculty Advisor: Joanne Gallagher-Worthley, Ed.D.

Graduate Project

Poster Presentation

This study gave a memory assessment and demographics questionnaire to a set of Worcester State University students to study the connection between chewing gum and memory. Results of the study showed chewing gum improved participants' scores on memory assessments. Gum is an effective, easily accessible, and inexpensive tool for occupational therapists to provide to patients with memory issues such as dementia.

Work-Life Balance in Police Officers

Patricia D. Gagnon

Faculty Advisor: Joanne Gallagher-Worthley, Ed.D.

Graduate Project

Poster Presentation

This project examined the effects of demographics and participation in activities on the work-life balance (WLB) in police officers. The study used two surveys to obtain information about WLB and time spent partaking in activities and work. The WLB was not influenced by any demographic factors, but positive effects were noted from involvement in leisure and sleep. Officers who reported working more overtime scored lower on the WLB scale.

Understanding the Challenges and Coping Strategies of Parents with Children with Autism Spectrum Disorder (ASD)

Haley M. Guyette

Faculty Advisor: Joanne Gallagher-Worthley, Ed.D.

Graduate Project

Poster Presentation

Parents of children diagnosed with ASD often experience higher levels of stress when compared to parents of typically developing children. Parenting a child with ASD can limit participation in all areas of life. Due to this, utilizing coping strategies is needed for improved well-being. This study examined the challenges of parents who have a child diagnosed with ASD, their coping skills, and their perceived quality of life.

Website Accessibility for Older Adults with Visual Impairments

Hannah E. Joyner and Monica K. Tran

Faculty Advisor: Joanne Gallagher-Worthley, Ed.D.

Commonwealth Honors Project

Poster Presentation

The purpose of this study was to evaluate how usable 10 websites were for older adults with visual impairments and assistive technology. The findings showed that websites need to become more cognizant of assistive technology for older adults with visual impairments.

Effects of Parentification on Typically Developing Siblings Who Have a Sibling with Autism

Lily A. Keating

Faculty Advisor: Joanne Gallagher-Worthley, Ed.D.

Graduate Project

Poster Presentation

The purpose of this study was to examine the impact of having a sibling with autism spectrum disorder and if typically developing siblings' roles and routines are hindered by parentification. A survey based on the Parentification Inventory (PI) by Lisa Hooper was given to 45 participants who were recruited online. Results of this study show typically developing siblings are not more exposed to parentification, and most are able to participate in their everyday roles and routines.

Accessibility and Impact of Everyday Technology Use on Occupational Performance in Adults

Meagan Kelley

Faculty Advisor: Joanne Gallagher-Worthley, Ed.D.

Graduate Project

Poster Presentation

The purpose of this study was to explore the everyday technologies that adults are utilizing and how these devices affect participation in meaningful activities. Due to lack of knowledge and confidence, adults faced barriers to modifying their devices. These barriers included decreased vision and comfort handling their everyday technology. Participants who received modifications to their everyday device were more confident in their ability to use it.

Impact of Military Retirement and Adjustment to Civilian Life on Occupational Behavior of Retirees

Corrina N. McKelvey

Faculty Advisor: Joanne Gallagher-Worthley, Ed.D.

Graduate Project

Poster Presentation

Military retirement and the transition to civilian employment is a significant change for veterans. This study examined the effect of military retirement and adjustment to civilian life on the occupational behavior of retirees. It was found that military retirement is a unique and dynamic transition involving occupational changes, role fulfillment, and workplace culture shifts. Social supports and retirement preparation influence this transition.

Transition to Remote Learning in College Students

Marissa L. Molinari and Paige O. Silveira

Faculty Advisor: Joanne Gallagher-Worthley, Ed.D.

Graduate Project

Poster Presentation

The COVID-19 pandemic caused college students to transition from face-to-face to remote learning environments in spring 2020. College students' interviews were transcribed, and themes emerged regarding the disruption in daily life. Themes that the study found related to the disruption were adapting learning styles to a heavier workload, decreased productivity and motivation, experiencing an unbalanced lifestyle, difficulty navigating technology, and peer isolation.

The Impact of Physical Activity Among Older Adults in Assisted Living Facilities

Olivia A. Morin

Faculty Advisor: Joanne Gallagher-Worthley, Ed.D.

Graduate Project

Poster Presentation

Physical activity is known to be beneficial for older adults in many ways, including increasing well-being and decreasing morbidity rates. This study was conducted in order to examine the impact of physical activity on six older adults residing in an assisted living facility. Findings revealed the barriers and motivations that hindered or aided older adults' engagement in physical activity and how it affected their overall well-being.

The Effects of Support Groups on Caregiver Burden

Olivia I. Petrucci

Faculty Advisor: Joanne Gallagher-Worthley, Ed.D.

Graduate Project

Oral Presentation

Participation in support groups has been shown to reduce levels of caregiver burden, which is the amount of stress experienced by a caregiver. There are many demographic factors that contribute to the level of burden experienced by a caregiver, including age, gender, employment status, and length of time spent in the role. The study examined these factors along with what types of support groups are most influential in impacting levels of caregiver burden.

Social Participation Among Older Adults in Assisted Living Facilities

Kelsey Snodgrass

Faculty Advisor: Joanne Gallagher-Worthley, Ed.D.

Graduate Project

Poster Presentation

This study explored how social participation (SP) affects older adults within assisted living facilities (ALFs) and if effects can indicate occupational therapy services. Three themes were identified: how social isolation affects well-being, barriers to social engagement, and whether SP increases happiness. Findings revealed an insufficient amount of SP has a substantial effect on older adults' overall well-being and that occupational therapy services are indicated.

PHILOSOPHY

The Ethics of Immigration

Gina Endres

Faculty Advisor: Frank Boardman, Ph.D.

Commonwealth Honors Project

Poster Presentation

My question regarding the ethics of immigration is rooted in my participation in the Student Clinic for Immigrant Justice, a pilot clinic at Worcester State University. After being trained extensively on immigration law and then working with an attorney on asylum cases, I became interested in the issues of who is allowed access into the United States and on what grounds. I argue that, when considering whom to naturalize, the courts should view "social membership" as part of this process.

PHILOSOPHY AND LAW

Transitional Justice Practices in Sexual Violence Cases

Jaymi-Lyn Souza

Faculty Advisor: Henry Theriault, Ph.D.

Commonwealth Honors Project

Oral Presentation

Transitional justice practices often promote reconciliation between the victim and the perpetrator of a crime. The hope for these practices is to be healing for both parties and to reintegrate both back into society in a productive manner. While transitional justice practices may yield productive results for minor infractions, this is not the case in instances of sexual violence, as sexual violence is a heinous crime with an inherent power imbalance.

POLITICAL SCIENCE

KPOP and the World

Kimberly-Ann V. Lang

Faculty Advisor: Catriona Standfield, Ph.D.

Oral Presentation

Korean pop music or KPOP has been taking the world by storm over the past few years. My research examines how, with the support of the South Korean government, KPOP singers have become ambassadors for South Korea and have dedicated their careers to spreading Korean culture and political influence. I find that KPOP has had both positive and negative effects on South Korea's diplomatic relations.

PSYCHOLOGY

The Role of Individual Differences in Inhibition in Face Memory Specificity

Haley Brann

Faculty Advisor: Brittany M. Jeye, Ph.D.

Poster Presentation

This study will evaluate the specificity of memory for faces. Participants will be asked to remember a series of faces. They will then be shown old faces, related faces, and new faces and will indicate whether the second and third sets of faces are exactly the same as the originals. Participants will also take the Cambridge Face Memory Test to assess individual differences. Analyses will investigate memory specificity and whether this depends on inhibition and individual differences.

East-West and Healthy-Unhealthy: Patterns of Perfectionism in Vietnamese and White American Undergraduate Women

Ethan Guertin

Faculty Sponsor: Champika K. Soysa, Ph.D.

Poster Presentation

Among Vietnamese international students (n=44) and White American (n=40) students, striving for personal standards was significantly higher than evaluative concerns and parent-driven perfectionism in healthy perfectionists, but not in unhealthy perfectionists. From a social cognitive perspective, healthy perfectionists may have internalized early parental influences. These findings added to the literature on patterns of healthy and unhealthy perfectionism.

The Role of Inhibition in Long-Term Color Memory Specificity

Isabella M. Quattrucci

Faculty Advisor: Brittany M. Jeye, Ph.D.

Poster Presentation

The current study evaluates the specificity of long-term color memories. Participants are asked to remember a series of colored shapes. Participants are then shown old colored shapes, similar colored shapes, and new colored shapes and then indicate whether the second two sets of items were exactly the same as the original ones and their confidence in their answer. Analyses will investigate whether memory for color is very specific and if color memory specificity depends on inhibition.

SOCIOLOGY

Atomwaffen Division: How is it Viewed Across Media Platforms?

Hannah L. Gianfriddo

Faculty Advisor: Alex Briesacher, Ph.D.

Poster Presentation

Atomwaffen's extremist behaviors and violent tendencies came to be recognized quickly by the public. This research focuses on how popular media and news sources have depicted this hate group. Hate groups often feed off of the media attention they receive; because we are living in a highly technological era, the portrayal of the Atomwaffen group across media platforms may help us better understand why the group's name has come to be known in less than five years' time.

Serial Killer Identities Through Symbolic Interactionism and Social Structure and Personality

Hannah L. Gianfriddo

Faculty Advisor: Alex Briesacher, Ph.D.

Poster Presentation

Infamous male serial killers are usually depicted as outgoing, kind, caring family men throughout media statements when they are caught by law enforcement. This research analyzes media depictions of serial killers through the social psychological faces of symbolic interactionism and social structure and psychology through Mead's theory of "I" and "Me" as well as Goffman's front stage and back stage behaviorism theory.

The Provost's Office thanks the many faculty who advised students in preparation for their Celebration of Scholarship and Creativity presentations and the staff whose work supports this signature event in a variety of ways. The work of faculty and staff members was crucial to converting the program to its virtual format because of the restrictions caused by COVID-19.

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