

# 2021 Shepherd University Exhibition of Undergraduate Research and Creative Endeavors Abstracts Collection

## INTRODUCTION:

Starting Wednesday, April 14, on the Strategic Research Initiatives webpage ([www.shepherd.edu/sri/](http://www.shepherd.edu/sri/)), Shepherd University will host an Exhibition of Undergraduate Research and Creative Endeavors. At this event, we will highlight student research presentations (in both oral and poster formats) from across campus. Students selected by their departments or programs have assembled these works and present them to the members of the Shepherd community.

Although we are unable to be together in person for this event, please join us for this dynamic online undergraduate research experience. It is our hope that the event will foster interplay between multiple specializations as visitors and presenters come to appreciate the interconnections between disciplines. We also wish to recognize and celebrate the continued commitment of our undergraduate scholars. Their perseverance and academic commitment during this challenging time is noteworthy and deserving of recognition.

In order to give visitors an understanding of these research and creative works, we present in this document a collection of abstracts provided by the student authors. They are organized alphabetically by the following topic areas:

Biology  
Computer Science, Mathematics, and Engineering  
English and Modern Languages

We hope that you will join this online event, where you can listen to and view the products of our student scholars.

With appreciation,

Dr. Jason Best  
Assistant Provost for Distance Education and Strategic Research Initiatives

## **BIOLOGY**

Title: Colorful Turtles Lack a Preference for Carotenoid-based Food that Maintains Stripe and Spot Color

Presenter: Logan Rothstein & Dominik Webster

Presentation Type: Poster

Abstract: For animals with carotenoid-based skin or feather color, plant matter can be an important food item because plants contain carotenoids which help maintain that color. Because skin or feather color impacts a species ability to advertise its identity and potentially act as a sexually-selected signal, animals should evolve preferences for eating plants. Adult painted turtles eat a wide variety of aquatic plants and animals, and here we examine whether adult turtles prefer some common native aquatic plants (arrowhead, cat-tails, water lilies, and waterweeds) over a common aquatic fish (juvenile bluegill sunfish). We presented juvenile and adult turtles 3.5 cm<sup>2</sup> pieces of the aquatic plants and bluegill, observed which items were bitten and eaten, and calculated selectivity and preference for each plant and bluegill fish. We found that juvenile and adult turtles show a strong selectivity and preference for bluegill sunfish. Bluegill may be selected for and preferred by painted turtles because fish is a high calory diet item, rich in proteins and fats, which facilitates the absorption and delivery of carotenoids to the skin.

Title: Shell Disease and Carotenoid-based Color Expression in Painted Turtles (*Chrysemys picta*)

Presenter: Dominik Webster & Logan Rothstein

Presentation Type: Poster

Abstract: Carotenoids are photo-accessory pigments found in plants that provide animals with integumentary color as well as a variety of immunological benefits. Carotenoids that are deposited in the feather or skin to advertise color must ultimately be obtained, ingested, absorbed and delivered to an integumentary site. However, carotenoids that serve immune functions cannot be used for integumentary display. As a result, carotenoid-based feather and skin color often indicates condition-dependent (i.e. immunological) phenotypic information because the pigments must be use for one or the other—but not both—roles. Support for the condition-dependent and sexually selective role of carotenoid-based turtle spots and stripes is equivocal. Here we show that carotenoid ingestion—and carotenoid-based color—is affected by *Emydomyces testavorans* fungal infection on the carapace, indicating that stripe and spot color could advertise immunological health altered by fungal infection and function as a condition-dependent indicator trait. This adds to other indirect evidence that painted turtle stripe and color may serve as sexually selective role.

## **COMPUTER SCIENCE, MATHEMATICS, AND ENGINEERING**

Title: RNA Sequence Classification with Deep Learning

Presenter: John Little & Keagen Thomson

Presentation Type: Oral with Slides

Abstract: Human cells produce two types of long RNA sequence: protein-coding (mRNA) and long non-coding RNA (LncRNA). One major difference is the presence or absence of an ORF i.e. a sequence of nucleotides that codes for a protein according to the standard translation table. The GenCode database

contains human RNA sequences that have been experimentally classified as either mRNA or LncRNA. Computer scientists have developed artificial neural networks that classify GenCode sequences as either mRNA or LncRNA with high accuracy. Some of these networks run on the RNA sequence with no other information. One, called mRNN, uses a recurrent neural network (RNN), which is commonly used for natural language processing. Another, called RNAsamba, uses a specialized convolutional neural network (CNN), which is commonly used for image processing. The CNN in RNAsamba was augmented with code that specifically tests for the presence of an ORF. We sought to determine whether a generic CNN could recognize ORFs without specialized code. We programmed a simulator that could generate any number of protein-coding and noncoding sequences. We programmed a generic CNN to learn from one set of simulated data and then make predictions on another set of simulated data. We determined empirically that a CNN can learn to recognize ORFs. We furthermore characterized the number of training samples required, with and without noise, that is required to train our CNN to high accuracy. These results should be useful for the development of artificial neural networks that classify RNA from species that are less well-characterized than human.

## **ENGLISH AND MODERN LANGUAGES**

Title: Fantastic Creatures and Where to Find Them: Animals in Emily Dickinson's Poetry

Presenter: Frank Santiago-Cabrera

Presentation Type: Oral

Abstract: In this critical essay, I discuss the possibilities behind the extensive use of animals in Emily Dickinson's poetry. For years, scholars have questioned why Dickinson bothers with focusing on creatures by personifying their actions. By breaking down some of Dickinson's poems, one can start to see how she shares a spotlight on creatures from her garden through a lens filled with anthropomorphism and godly qualities, in an attempt to not just make us understand them but also so we can see them as she does. Even at times, she provides anthropomorphism to animals that resist such qualities; a bird is no more than a bird, but Dickinson still invites us to see beyond, to admire these creatures for their ability to just exist among us humans. These ideas are shown in the poems "A narrow Fellow in the Grass," "A Bird, came down the Walk," "A Route of Evanescence," and "In the name of the Bee." In all of these pieces, the poet seems to reflect on the importance and roles of the fantastical creatures that live in our world.

Title: Philip Larkin: Selfish Man vs Selfless Nature

Presenter: Sarah Seibert

Presentation Type: Poster

Abstract: Poetry is a wonderful tool for catharsis, and as a result is abundant in sadness and grief. Philip Larkin especially enjoyed using his poems to express his disdain for society and the people comprising it, as well as his own personal misery. Therefore, his poems feature heavy themes of loneliness, death, anti-marriage, anti-religion, lost love, and disappointed sex, among other bitter topics. However, sprinkled throughout his collections are poems that don't sound like Larkin wrote them at all. In these seemingly bright, hopeful poems, he discusses the glory of the sun, innocent animals, and the beauty of nature. While these poems, at first glance, seem uncharacteristic of Larkin due to the bright themes, underlying each of them is the Larkin we know: the one disappointed in humanity. In this paper, I will

argue that Larkin uses his nature poems to express his association of human civilization with death, evil, and selfishness, and nature and animals with life, goodness, and selflessness. Additionally, these poems illustrate Larkin's abundant willingness and ability to empathize with animals, contrasting with his hesitation and inability to empathize with people.

Title: Stuck Behind Dublin's Window

Presenter: Madison Sites

Presentation Type: Oral

Abstract: In this essay, I explore the theme of paralysis and window symbolism during characters' epiphanic moments in James Joyce's *Dubliners*. The symbol of the window can be both a barrier and a lens, a division between the inner self and the outside world, which becomes the perfect framework for analyzing shifts in perspective throughout the stories in the collection. This collection ends the way that it begins—with characters on opposite ends of life looking through literal and metaphorical windows. Both characters and readers are urged to reflect upon life beneath the surface and upon what living life to the fullest truly means. The implication to look past the surface layer of each story in terms of breaking the routine cycle serves as a metaphorical window through which readers must look—and through which characters quite literally look—to indicate the importance of reflection upon what the novel as a whole provides.