

Undergraduate Research Symposium May 19, 2017 Mary Gates Hall

Online Proceedings

POSTER SESSION 1

Balcony, Easel 93

11:00 AM to 1:00 PM

Empathy: Where to Go, Where to Start?

*Michelle Wiuff, Senior, Psychology, Bemidji State University
McNair Scholar*

Mentor: Kate Larson, Psychology, Bemidji State University

Empathy can be a hard topic for discussion, especially when it comes to first examining it. Previous research on empathy has highlighted two basic types of empathy; cognitive and emotional empathy. Cognitive empathy refers to taking the perspective of another person and emotional empathy refers to emotional responses to another person that are like those responses the other is experiencing (parallel empathy) or a reaction to the emotional experiences of the other person (reactive empathy). The purpose of this project evolved from previous findings on college student empathy and local campus wide investigations. At the completion of this survey, we discovered current empathy levels on campus and the potential for increasing the perspective taking aspect of empathy. With this knowledge, we hope to explore potential interventions intended to increase perspective taking. The futuristic goal would be to build a more inclusive and diverse community environment that has the ability to embrace all students.

POSTER SESSION 2

Commons East, Easel 83

1:00 PM to 2:30 PM

Dynamics of Neuronal Birth and Addition in a Sensorimotor Circuit Responsible for Song Production during Transition into Breeding Conditions

Rachael Hu, Junior, Pre-Sciences

Mentor: Tracy Larson, Biology, University of Virginia

Contrary to common belief, all vertebrate brains are capable of adult neurogenesis, or the birth of new neurons in the adult brain. Few brains show as an extreme ability to generate and add new neurons as that of the songbird. Songbirds exhibit rapid changes in the rate of neurogenesis, survival of mature neurons, and as a result, total volume of brain regions that contribute to the development and production of song.

For example, the songbird Gambel's white-crowned sparrow (*Zonotrichia leucophrys gambelli*) is capable of adding more than 68,000 neurons to a region of the brain responsible for song production called HVC, all within four days of transition to breeding conditions. Along with this addition in new neurons, these sparrows also increase song production and song quality. To identify the dynamics between neurogenesis and the addition of new HVC neurons during rapid seasonal growth, we labeled dividing neural stem cells and their progeny, and quantified the incorporation of these progeny into HVC. Throughout the course of the experiment, we recorded individual bird's song and analyzed the spectral features and stereotypy of whole songs. Ultimately, we aim to correlate improvements in song quality and rate with the cellular changes occurring HVC and the neural stem cell niche during seasonal rapid growth. Such correlations will provide a model for tracking the behavioral progress of the plastic neural circuit as well as for identifying and testing molecular and physiological mechanisms underlying neuronal birth, maturation, and survival.

POSTER SESSION 2

Commons East, Easel 82

1:00 PM to 2:30 PM

The Dynamic Role of Microglia in Healthy and Natural Neurodegenerative States of a Sensorimotor Pathway Responsible for Song Production

Yekaterina (Kate) Tokareva, Junior, Pre-Sciences

Mentor: Tracy Larson, Biology, University of Virginia

Inflammation in the brain, called neuroinflammation, is typically considered a negative response following neuronal injury and damage. However, neuroinflammation can also play a beneficial role in the healthy adult brain. For example, one type of inflammatory cell, microglia, become polarized from the "inactive" surveying (or ramified) state following neuronal loss and promote the classic "negative" inflammatory response. Alternatively, in the healthy brain microglia elicit positive effects through neuronal and synapse pruning to maintain proper neuronal number and connections. To identify the dynamics of microglial responses between healthy and natural degenerative states, we employed the seasonal neuronal regression of avian motor pathways for song production in Gambel's white crowned sparrow (*Zonotrichia leucophrys gambellii*). Neuronal number in the song control

nucleus HVC (proper name) changes seasonally such that as male sparrows transition from nonbreeding to breeding conditions, HVC neuronal number increases by about 68,000 neurons. Useful for our study, an equal number of HVC neurons die through programmed cell death as sparrows transition from breeding to nonbreeding conditions. Using this unique model of natural and rapid neurodegeneration, we quantified the number of ramified and activated microglia in HVC of birds maintained in breeding and nonbreeding conditions using immunohistochemistry. To identify microglial promotion of local neuroinflammation within HVC, we examined the number of ramified and activated microglia in HVC of birds treated with pro- and anti-inflammatory agents. Additionally, we identified and quantified a putative downstream effect of this local inflammation: reactive neurogenesis, or the birth of new neurons following neuronal loss. Our results indicate that microglia promote reactive neurogenesis through local inflammation, and suggest that discrete microglial activity could have therapeutic consequences for various neurological diseases.

ical Observatory 1.83m Plaskett telescope using Sloan and Strömgren filters, respectively. We tested OCMAP on 8 of the 42 open clusters we have observed, and now present the resulting members-only Sloan [u-g] vs. [g-r] and Strömgren [m1] vs. [b-y] metallicity plots, as well as Sloan [g] vs. [g-r] and Strömgren [y] vs. [b-y] color-magnitude diagrams for each open cluster.

POSTER SESSION 3

Commons East, Easel 81

2:30 PM to 4:00 PM

OCMAP: Milky Way Open Cluster Stellar Membership Assignment in SDSS u, g, r, i, z and Strömgren v, b, y

Locke Patton, Senior, Physics: Comprehensive Physics, Astronomy

Mary Gates Scholar

Ellis Avallone, Senior, Astronomy, Physics: Comprehensive Physics

UW Honors Program

Mentor: Ana Larson, Astronomy

Open clusters are groups of gravitationally bound stars formed from the same molecular gas cloud. These clusters and their stellar metallicity enhance our knowledge of stellar evolution, stellar cluster characteristics, and the chemical evolution of the Milky Way (MW) Galactic disk. Stars that are actual members of the cluster must be identified within each cluster's observed field of view. We present OCMAP, an Open-source Customizable Membership Analysis Program developed in python for use within the astronomy data science community. Cluster membership is determined using simulated star fields and stellar photometry magnitudes across multiple filters. OCMAP matches stars across images, plots color-magnitude diagrams (CMDs), standardizes stellar magnitudes, and calculates the local and field star density on a CMD for each prospective member in order to determine a probability of membership for each star. OCMAP was developed to ultimately determine the membership and metallicity of 42 open clusters observed with the Apache Point Observatory 3.5m telescope and Dominion Astrophys-