

PURCC 2021
Undergraduate Research Day – April 24

Oral Presentations, Session 2 - April 24, 2:30 – 5:00

<https://pacific.zoom.us/j/97320073376?pwd=RCs1ZVVxSE9tTGhmb3Z2TkpCeVRSZz09>

Meeting ID: 973 2007 3376

Passcode: PURCC2021

2:30

[The Effects of Temperature and a Common Herbicide on Egg-Laying in the Variable Field Cricket, *Gryllus lineaticeps*](#)

Cindy Vo, *Biological Sciences*,

Faculty Mentor: Zachary Stahlschmidt, *Biological Sciences*

2020 Summer Undergraduate Research Fellowship Project

2:45

[Developmental effects of glyphosate in a warming world](#)

Jacob Whitlock, *Biological Sciences*,

Faculty Mentor: Zachary Stahlschmidt, *Biological Sciences*

3:00

[How do ecological light pollution and heat waves affect egg-laying?](#)

Sonia Sandhu, *Biological Sciences*

Faculty Mentor: Zachary Stahlschmidt, *Biological Sciences*

3:15

[Effects of glyphosate \(GLY\) and GLY-based herbicides \(GBH\) on animals: A meta-analytical approach](#)

Emmaleigh Barnhardt, *Biological Sciences*, **Phillip Evalen**, *Biological Sciences/Pre-Dentistry*

Faculty Mentor: Zachary Stahlschmidt, *Biological Sciences*

3:30

[Effects of thermal variation on embryonic development within and across generations](#)

Suheyla Yoksuloglu, *Biological Sciences*, **Justin Choi**, *Pre-Dentistry*, **Sonia Sandhu**, *Biological Sciences*,

Faculty Mentor: Zachary Stahlschmidt, *Biological Sciences*

3:45

Overcoming Obstacles in Pichia pastoris Protein Expression: The Article and the Movie

Zoe Ingram, *Biological Sciences*, **Daniel Oh**, *Pre-Dentistry*, **Abha Patkar**, *Pre-Dentistry*, **Kevin Zhang**, *Pre-Dentistry*

Faculty Mentors: Geoff Lin-Cereghino, *Biological Sciences*, Joan Lin-Cereghino, *Biological Sciences*, ,

4:00

Comparison of Cisplatin and Nitrogen Mustard Derivatives in Cancer Treatment

Jane Ung, *Biochemistry*, **Ethan Liu**, *Biochemistry*

Faculty Mentor: Qinliang Zhao, *Chemistry*

4:15

The Erasure of the Hispanic Male in Higher Education

Armando Borrego, *Philosophy*

Faculty Mentor: Jeffrey Hole, *English*

4:30

The Guise of African Independence

Benjamin Taylor, *History*

Faculty Mentor: Jeffrey Hole, *English*

4:45

Beyond Fiction: Animation, Society, and Theories of Reality

Michael Camacho, *Media-X*,

Faculty Mentor: Jeffrey Hole, *English*

Oral Presentations, Session 2 Abstracts

The Effects of Temperature and a Common Herbicide on Egg-Laying in the Variable Field Cricket, *Gryllus lineaticeps*

CindyVo

Faculty Mentor: Zachary Stahlschmidt

2020 Summer Undergraduate Research Fellowship Project

Glyphosate (GLY) is the active ingredient in the most commonly used herbicides in agriculture today. Although GLY-based herbicides (GBHs) target plants and other microorganisms, they may contaminate the surrounding environment and negatively affect non-target species (e.g., animals). In addition to GLY and GBH, animals are exposed to increasingly warm temperatures associated with climate change. However, the combined effects of GLY/GBH and temperature on terrestrial animals are unknown. Therefore, we investigated the effects of GLY and a GBH (Roundup® Weed & Grass Killer Super Concentrate; 5 mg acid equivalent GLY L-1) on the reproductive behavior (oviposition or egg-laying) of the variable field cricket, *Gryllus lineaticeps* under five different temperatures (20, 24, 28, 32, and 36°C). Females chose to lay more eggs in substrate containing GBH at 32°C, and they increased egg-laying when multiple oviposition sites were available. Oviposition specialization increased at temperature extremes, suggesting temperature may modulate the tradeoff between maternal and offspring fitness because clumping eggs into a small number of sites reduces females' predation risk while potentially reducing offspring fitness. There was a thermal mismatch between oviposition and offspring survival because the optimal temperature for oviposition was approximately 27-32°C, which is significantly warmer than the optimal temperature for egg survival (25°C). We are the first to examine interactions between temperature and GLY/GBH in a terrestrial animal and on oviposition in any animal. Our results suggest that temperature and the availability of oviposition sites may be more important than GLY or GBH when making egg-laying decisions.

Developmental effects of glyphosate in a warming world

Jacob Whitlock

Faculty Mentor: Zachary Stahlschmidt

Glyphosate (GLY) is the most commonly used herbicide in California and has been marketed as non-toxic to animals, but recent work indicates harmful effects of glyphosate-based herbicides (GBHs: GLY in addition to proprietary blends of surfactants that improve the absorption of GLY by plants) in some animals. My study examines the effects of GLY or GBH exposure during development, as well as how GLY/GBH effects are influenced by warming associated with climate change. To determine the effects of GLY/GBH and warming on development, I used the variable field cricket (*Gryllus lineaticeps*), which is native to California. Freshly hatched crickets were reared at either a 28±10°C daily cycle (control; current field conditions) cycle or a 32±10°C daily cycle (predicted warming conditions). Crickets were provided shelter and unlimited food (dry cat food), and they had access to one of three different water sources—control (tap water), GLY (5 mg of GLY per liter of tap water) or GBH (Roundup® diluted to 5 mg of GLY per liter of tap water). When the crickets molted into adults, I determined developmental success (survival to adulthood), duration of development, body mass, body size (femur length), and bilateral symmetry (similarity between right and left femur lengths), as well as investment into reproduction (ovary mass) and flight musculature. Warming sped up development, but it also reduced adult body mass and size, and investment into reproduction and flight musculature. In contrast, GLY had no significant effects, and GBH only affected development (GBH-exposed crickets reached adulthood faster than other crickets). My study is the first to examine the combined effects of temperature and GLY/GBH in a terrestrial animal, and it suggests that warming may be more important to developing insects than GLY or GBH exposure.

How do ecological light pollution and heat waves affect egg-laying?

Sonia Sandhu

Faculty Mentor: Zachary Stahlschmidt

Artificial Light at Night (ALAN) caused by urban light pollution disturbs the natural light patterns fundamental to all levels of biological organization. Recent studies have found strong effects of ALAN on physiology, reproduction, and behavior across animal taxa. In addition to ALAN, animals increasingly experience other environmental stressors associated with climate change, such as heatwaves. Yet, the combined effects of ALAN and heat waves on fitness-related processes are poorly understood. For example, egg-laying is the predominant parental behavior in animals, and it can influence the fitness of mothers (e.g., by increasing predation risk) and offspring (e.g., environmental conditions chosen during egg-laying influence embryonic survival). In my study, field crickets (*Gryllus lineaticeps*) spent early adulthood exposed to either control temperature or stimulated heat wave treatments, and in either control (dark nights) or ALAN treatments. Egg-laying over 24 hours was then observed to determine the total number of eggs laid (realized fitness) and oviposition specialization (i.e., the clumping of eggs into fewer egg-laying sites *sensu* putting all of one's eggs into one basket) in response to thermal and light conditions. My preliminary findings suggest egg-laying is strongly affected by temperature (but not light) conditions where stimulated heatwave conditions promoted egg-laying. Therefore, some features of human-induced environmental change may result in either no cost (e.g., ALAN) or even benefits (e.g., warming) to important traits in widespread animal taxa.

Effects of glyphosate (GLY) and GLY-based herbicides (GBH) on animals: A meta-analytical approach

Emmaleigh Barnhardt, Phillip Evalen

Faculty Mentor: Zachary Stahlschmidt

Glyphosate (GLY)-based herbicides (GBHs) are the most commonly applied pesticide worldwide, and non-target organisms (e.g., animals) are now regularly exposed to GLY and GBHs due to their accumulation in many environments. Although GLY/GBH was previously considered to be non-toxic, growing evidence indicates that GLY/GBH negatively affects some animal taxa. However, there has been no systematic analysis quantifying its effects in animals. Therefore, we used a meta-analytical approach to review previously published literature to address four questions: Do the effects of GLY/GBH vary due to (1) taxon (invertebrate vs. vertebrate), (2) habitat (aquatic vs. terrestrial), (3) type of exposure (ingestion vs. absorption through water in the environment), or (4) measured variable (behavior vs. physiology vs. survival). Our approach also allowed us to determine whether effects were caused by the GLY itself, or by other surfactants found in GBHs. The Scopus scientific database was used to analyze 833 observations across six types of dependent variables (survival; reproduction; growth, development, or morphology; physiology; behavior; and population level) from 85 articles. Hedge's *g* values were calculated to determine the effect size for each observation, and statistical analysis was performed using the JASP freeware program. Our meta-analysis will be the first to examine the effects of GLY/GBH on ecosystems by comprehensively quantifying its impacts on animals.

Effects of thermal variation on embryonic development within and across generations

Suheyla Yoksuloglu, Justin Choi, Sonia Sandhu

Faculty Mentor: Zachary Stahlschmidt

Variation in temperature associated with climate change may pose a greater risk to species and biodiversity than the gradual warming characterized by shifts in mean temperature. Embryos may be particularly vulnerable to thermal variation because they represent a critical stage of development and are trapped in their microclimates. However, the thermal variability experienced by mothers may influence the size or composition of their eggs thereby mitigating the effects of thermal variation on the development of their offspring. Our research aims to disentangle the effects of thermal variation experienced by adult females and by their embryos on embryonic development. We used a 2 x 2

factorial design to create four treatment groups of eggs from the variable field cricket (*Gryllus lineaticeps*): (1) eggs laid by females that spent adulthood in a constant 28°C and that incubate in constant 28°C, (2) eggs laid by females that spent adulthood in a constant 28°C and that incubate in fluctuating 28°C (daily oscillation between 18°C and 38°C) (3) eggs laid by females that spent adulthood in a fluctuating 28°C and that incubate in constant 28°C, (4) eggs laid by females that spent adulthood in a fluctuating 28°C and that incubate in fluctuating 28°C. All eggs were staged thrice weekly, egg survival was determined, and the length, width, and estimated volume of eggs were measured digitally using ImageJ. Our results will inform the potential effects of thermal variation in a widespread taxon (most animals are insects), as well as the transgenerational effects of thermal variation (e.g., the ability of mothers to adaptively provision their eggs in response to thermal variation).

Overcoming Obstacles in *Pichia pastoris* Protein Expression: The Article and the Movie

Zoe Ingram, Daniel Oh, Abha Patkar, Kevin Zhang

Faculty Mentors: Geoff Lin-Cereghino, Joan Lin-Cereghino,

The yeast *Pichia pastoris* (also known as *Komagataella pastoris*) has been used for about 30 years to produce thousands of recombinant proteins, such as insulin to treat diabetes and antibodies to prevent migraines. Despite its success, there are some stubborn problems encountered by research scientists when they try to use *Pichia pastoris* to produce their recombinant proteins. In order to provide those working in this field with strategies to overcome these common obstacles, we interviewed eight experts in *Pichia* protein expression to create a written review and video. The article and video contain a collection of short narratives describing how each featured scientist addressed a specific problem, focusing on his/her strategy, key achievements, and the long term effects of the work. The video will be previewed publicly for the first time during this PURCC presentation, and we will be available for any comments and questions. We expect that our work will be a tool to help empower scientists to successfully express challenging proteins in this popular yeast.

Comparison of Cisplatin and Nitrogen Mustard Derivatives in Cancer Treatment

Jane Ung, Ethan Liu

Faculty Mentor: Qinliang Zhao

Platinum-containing complexes and nitrogen mustard derivatives are two drug families for cancer treatment. The two core drugs of the families were Cisplatin, created in 1845, and Chlormethine (mustine), created in 1925. Cisplatin is used to treat cancers like ovarian, breast, lung, esophageal, and many more. Nitrogen mustards are used as palliative care in lung and breast cancers as well as treatment for Hodgkin's disease. The two families of drugs in treating cancer will be compared in terms of mechanism, side effects, and resistance factors. The report will also focus on the importance of the Pt metal in cancer treatment.

The Erasure of the Hispanic Male in Higher Education

Armando Borrego

Faculty Mentor: Jeffrey Hole

Witnessing and experiencing firsthand the, at times, dismissive societal attitude towards Hispanic communities and the commoditization of my Latin ethnicity into the role of field worker, I feel it is imperative and relevant to discuss and research this misstep in representation. We cannot underestimate the significance on research and scholarly writing on under-represented communities found in gender, sex, or ethnicity, etc. But, upon preliminary research I have found that most scholarly essays and journals published on the Hispanic/LatinX voice concern themselves primarily on Gender and career Roles for women, while relegating Hispanic males to their expected and stereotypical roles of blue collar professions. With the aid of articles discussing gendered differences in Urban Hispanic high school students, examining the gendered roles within the Mexican American culture, and utilizing the recounted experience of well-known Hispanic authors, Richard Rodriguez, Gloria Anzaldúa, and Julia Alvarez, the

purpose of this research will be to closely analyze the writings of distinct Hispanic voices regarding the cultural assimilation of the LatinX person in modern day America. In doing so I will provide a case that asserts that the societal erasure of the modern Hispanic male in higher education is equally portioned between systemic exclusion, and a self-imposed resistance to intellectual edification.

The Guise of African Independence

Benjamin Taylor

Faculty Mentor: Jeffrey Hole

The Western concept of independence implies that a sovereign nation is in control of its own economy and political decisions. When looking at newly “independent” Post-colonial African states in the mid 20th Century, however, these new nations did not fit under the aforementioned Western interpretation of freedom. This paper explores subsequent forms of continued US and British indirect rule of Africa by analyzing foreign and economic policy. The project comprises two parts. The first is a comparative study focusing on the differences between U.S. and U.K economic foreign policy. This project examines declassified government documents along with US and British newspapers that chronicled the postcolonial conditions of the mid 20th century. The second part of this project explores the African perspective of post-colonialism, by studying the poetry of authors such as p’Bitek Okot, who was well known for his critiques of 1970’s US and European hegemony. Ultimately, this project seeks to examine how the western world remained in control of African governments and economies, while maintaining the guise of African political independence.

Beyond Fiction: Animation, Society, and Theories of Reality

Michael Camacho

Faculty Mentor: Jeffrey Hole

“Beyond Fiction: Animation, Society, and Theories of Reality” seeks to study and analyze animation as a form that constitutes and mediates psychological and social realities. The project will look at how animation and the emergence of VR could lead to future questions of existence and the meaning of reality itself. The project draws from philosophical inquiries, such as the “Make-Move” theory from Jeff Malpas and Bruno Latour, as well as Actor-Network theory. Drawing from these theories and methodologies, this paper explores animation’s formal and technical components, analyzes the use of the medium in popular culture, and speculates into the future of the medium as it meshes with human society itself. I have divided my research presentation into three areas of inquiry: how animation has been constituted as a medium, how it has been utilized as a medium to affect society’s behavior (utilizing World War Two and the Coronavirus Pandemic as specific examples), and how modern advances in animation as a medium, such as virtual reality, lead to philosophical and ethical questions related to morality, immortality, and the meaning of life.