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HONORS THESES

AND CREATIVE PROJECTS

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Medium And High Aggression Intensities Direct Early Hierarchy Resolution During Protandrous Sex Change in *Lythrypnus dalli*

Species that live in linear social hierarchies use a combination of visual and contact aggressive behaviors to gain and emphasize status within a group. In the sexually plastic fish, the bluebanded goby, *Lythrypnus dalli*, three levels of aggression intensity are displayed during early hierarchy resolution leading to protandrous (male to female) sex change. Low and medium aggression intensities include the display of sexually dimorphic traits such as dorsal fins and size to emphasize dominance, whereas high aggression intensity includes physical contact interactions. We investigated the impact of medium and high aggression intensities in groups of two initially dominant males and one female on days 1, 3, and 5 of the Dominance Phase during early hierarchy resolution. We used both live and video recorded behaviors to describe and manually measure aggression. Males who remained dominant displayed higher levels of medium and high aggression intensities on all days compared to transitioning males and females. Consistent with previous studies, agonistic efficiency is a good predictor for social status. Even within hours of group formation in this social context, we developed an assay that combines medium and high aggression intensity behaviors to predict the focal individual that will undergo protandrous sex change. This finding is foundational for future work investigating temporal dynamics of molecular mechanisms regulating the onset and maintenance of traits associated with protandrous sex change.

Keywords: aggressive behaviors, aggression intensities, sex change, social status

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Gender, Sexuality, and the Nuclear Family in Early Cold War America

The Cold War (1947-1991), in its early years, marked a period of heightened uncertainty among the American people due to widespread fears of the spreading of communism and the possibility of nuclear war. This widespread fear and uncertainty resulted in Americans turning inwards, toward sources of familiarity and traditional values, including the nuclear family structure, strict binary gender expectations, and an escalation on the policing of homosexuality. Although there is a significant amount of existing scholarship on the topics of gender, sexuality, and family structures in the Cold War, this research uses the unifying factors of fear and uncertainty to examine how the political and social climate of the early Cold War impacted widespread perceptions on gender and sexuality. The impacts range from an exclusion of homosexuals from government and military positions, the emergence of early gay rights organizations, an uptick in stereotypes regarding gender and sexuality within popular media, and women's perceived domesticity playing key roles in the defense of American values.

Keywords: Cold War, homosexuality, gender roles, McCarthyism, nuclear family

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Unearthing the Dead: An Investigation of Mesoamerican Chultun Burials at Archaeological Sites in Belize

Chultuns are often a subject of debate within the Mesoamerican archaeological community. These bottle-shaped subterranean structures are man-made chambered pits often found near residential complexes. Their primary function has not been able to be defined by researchers due to several issues. An interesting use found for these structures is as burial sites. This study focuses on a sampling of 62 individuals from various Maya chultun burials in Belize. The chultun burials span across 10 maximal site locations including Cahal Pech, Xual-Canil, Nohoch Ek, La Milpa, Cerro Maya, Minanha, Chaa Creek, Blue Creek, Caracol, and Ka'Kabish. Through the creation of a chultun burial database using archaeological field reports and a spatial analysis this research established potential connections and points of comparison between the chultun burials. In doing so, this study provides a starting point for future research into chultun burials and their relevance to Maya mortuary archaeology.

Keywords: Maya bioarchaeology, chultun, funerary practices, subterranean features, Belize

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Increased Excitability but Decreased Bursting in Brainstem Respiratory Networks During Acute Developmental Hypothermia

Temperature is important in physiological function, especially during early development. In birds, embryonic temperature drops during parental absences, but the consequences of cooling and rewarming remain unclear. While hypothermia typically suppresses neural activity, data suggests that respiratory-related brainstem circuits may develop resistance to acute cold exposure. We used in vitro brainstem-spinal cord preparations from Zebra Finch embryos to investigate cold's exposure on developing brainstem motor rhythms essential for breathing behaviors. We examined whether 1) embryonic maturation enhances neural resistance to cold and 2) whether metabotropic (M-type) K⁺ channels contribute to this adaptation. We hypothesize that older embryos develop countermeasures to cold's depressive effects by potentiating neural activity via closing voltage gated non-inactivating K⁺ channels in the Kv7 family. Results show low temperature suppresses rhythmogenesis but also evokes excitatory effects on developing motor circuits. Specifically, cold-induced blockage of M-type voltage-gated K⁺ channels heightens excitability, potentially sustaining respiratory function.

Keywords: hypothermia, Zebra Finch, respiratory neural circuit, potassium channels

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Factors Associated with Clinical Psychologists' Assessment of Suicidality in Autistic Adolescents

In spite of an elevated incidence of suicidal thoughts and behaviors in autistic individuals, many clinicians report lower likelihood, competence, and confidence in administering suicide assessments to this population. Thus, the present study examines how clinician competency and confidence impact clinician likelihood to assess for suicidality in at-risk autistic adolescents. The study was administered to 99 psychologists practicing in the United States via an online survey. Contrary to our hypothesis, preliminary results indicate clinicians are more likely to assess for suicidality in autistic adolescents. Additionally, there was not a significant correlation between clinician likelihood to assess and clinician competency nor likelihood to assess and clinician confidence. While previous discrepancies in perception of suicide risk were largely uncorroborated, generalizability of these results is limited by the narrow scope of clinicians (i.e, psychologists) surveyed. Nonetheless, it is clear improved training concerning the administration of suicide assessments for autistic individuals is needed.

Keywords: autism, adolescents, suicidal ideation, clinicians

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A Comparative Analysis of Low-Cost Honeypots

This paper compares low-cost honeypots using Raspberry Pi and virtual machine (VM) platforms for cybersecurity research. Raspberry Pi devices were configured with DShield and Cowrie honeypot software, while a VM hosted Cowrie on a low-cost Toshiba laptop. The main purpose of this paper was to compare and assess ease of installation, ease of use, quality of results, and cost between the three honeypots. The study found that the Raspberry Pi, with its affordability and versatility, was effective for deploying low- to medium-interaction honeypots, particularly with Cowrie for medium-interaction honeypot functions. The VM setup faced performance limitations, which hindered installation and performance. While DShield had the simplest installation, issues with data export and communication with its third-party manager rendered the honeypot ineffective in practical use. The results show that Cowrie honeypots on a Raspberry Pi offer a more efficient, cost-effective solution than VMs, though further research is needed to enhance VM configurations.

Keywords: Raspberry Pi, virtual machine, Cowrie, DShield, cybersecurity, honeypot, interaction

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***Caregiver Emotional Response to an Autism Diagnosis: Examining the Effects of
Caregiver and Child Factors***

Caregivers experience a wide range of emotions when undergoing the autism diagnostic process for their child. Understanding caregiver emotions and the factors influencing those emotions is thus crucial to aiding clinicians in their effort to best support caregivers and their children. There are mixed findings within the extant literature on what caregiver characteristics- income, education level, and age at diagnosis- and child characteristics- age of symptom onset, count of symptoms, and regression in skills- influence caregiver emotions when receiving the diagnosis during the feedback session. In total, this study included survey responses from 517 caregivers of children diagnosed with autism. A hierarchical regression determined caregiver characteristics accounted for 3.5% of the variance in distress. Adding the second block- child characteristics - explained an additional 1.4% of the variance of distress. Caregiver education level and child skill regression were significantly correlated with distress when receiving the diagnosis during feedback. Further, for comfort when receiving a diagnosis, 2.3% of the variance could be explained by the first block of caregiver characteristics, and adding the second block of child characteristics added 0.8%. Caregiver income level was significantly correlated with comfort when receiving the diagnosis.

Keywords: caregiver experiences, autism, diagnostic process, feedback

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“Your Path Doesn’t Have to Look Like Someone Else’s”: A Photovoice Exploration of Belonging at an Honors Program in the Intermountain West

Over the past decade, there has been increased emphasis on diversity, equity and inclusion in honors education. Many factors in higher education, like academic culture and othering, create barriers for students, particularly those from historically underrepresented backgrounds. These barriers, including financial challenges and cultural alienation, hinder students’ sense of belonging. This study examines the experiences of 11 honors students at a medium-sized public university in the Intermountain West from underrepresented backgrounds using photovoice—a participatory action research method. Data was collected using an audio recording device and transcribed and coded using qualitative inductive coding. With this approach to coding, themes emerge on their own as patterns and phrases are repeated. Four key themes emerged: imposter phenomenon, repayment, boundaries, and acknowledgement. Ultimately, this study offers valuable insights into the challenges honors students from a variety of backgrounds face and can guide universities in enhancing support for underrepresented students to improve their success.

Keywords: photovoice, belonging, higher education, honors education, diversity, equity, and inclusion

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The Process In Which LGBTQ+ People Leave Religion

There are teachings in some high-cost and/or conservative religions (HCCRs) that do not provide positive or welcoming environments for Lesbian, Gay, Bisexual, Transgender, Queer, and other sexual and gender minority (LGBTQ+) members (Beagan & Hattie, 2014; Wood & Coonley, 2014). HCCR teachings and HCCR communities can be overt or subtle in denouncing LGBTQ+ identities (e.g. Beagan & Hattie, 2014; Lassiter, 2015; Sorrell et al., 2022; Wood & Coonley, 2014). LGBTQ+ members' religious experience can result in negative, long-term psychological impacts from staying in these unwelcoming environments.. (Beagan & Hattie, 2014; Lassiter, 2015; Wood & Coonley, 2014). There remains a lot to be understood about how LGBTQ+ people leave HCC religions, and what impacts this may have on people. This research will use narrative stories from LGBTQ+ individuals who have left their HCCRs to identify recurring themes in their experiences separating from the church they were raised in.

Keywords: LGBTQ+ populations, high-cost religion, conservative religion, identity conflict

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Quantitative Classification Model for Terrestrial and Planetary Basalt Morphologies at Various Resolutions

Existing descriptions of basalt flows depend on field observations and can vary depending on the scale of observation and the observer's experience. Previous research has shown promising results using remotely sensed measures of surface roughness, specifically Area Ratio (AR) and Root-Mean-Square (RMS) height. This study expands upon this quantitative classification by including additional surface roughness measurements, slope and Root-Mean-Square (RMS) slope. Our results are generally consistent with previous findings in which the model can best differentiate between end-member morphologies. Differentiating between the intermediate morphologies is significantly more difficult, but including slope and RMS slope improves the model's ability to differentiate between the intermediate morphologies. We discuss how multiple measures of surface roughness at various resolutions can be leveraged to improve the model's ability to recognize a greater number of separate morphology types. These same methods can be applied to planetary remote sensing studies to better understand and map lava flow textures on Mars and the Moon.

Keywords: basalt, lava flow, terrain, planetary remote sensing, k-means clustering

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Injury Reporting and Care Satisfaction of Collegiate Dancers in the West

Collegiate dancers frequently experience injuries, yet many go unreported. Understanding the factors that influence injury reporting and patient satisfaction may support improvements in overall dancer healthcare. This study aimed to characterize injury reporting behaviors and assess medical care satisfaction among dancers from different types of providers. A Qualtrics survey was distributed to 75 dancers across 28 universities which included items that assessed injury history, reporting behaviors, type of provider seen, satisfaction with medical care, and baseline demographic information. Data findings show varied satisfaction levels among professionals, with physical therapists being the highest-ranked professionals. Reports also indicate that many injuries go unreported. Injury reporting among collegiate dancers is inconsistent, and satisfaction with medical care is influenced by perceived quality of treatment with physical therapists being regarded more highly than physicians or other healthcare providers. Future efforts should focus on education for both dancers and healthcare providers to improve reporting and care. Policy changes to encourage reporting may improve dancer health outcomes.

Keywords: dance-related injury, collegiate dancer, healthcare providers, injury reporting

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Utilizing Physics-Informed Synthetic Data to Predict Reactor Operations

The ability to predict how a reactor will operate, understand when anomalous conditions arise, and ensure a reactor is being operated as expected is crucial for deploying new nuclear facilities. Digital twins serve as a unique solution to recognizing reactor behavior; however, they require data to be useful. For next-generation reactors, this data may not currently be available. To explore how synthetic physics-informed reactor data can be used to predict reactor operations, a recurrent neural network was implemented for the Idaho State University AGN-201 digital twin. The RNN model was validated using both synthetic data and real operational data, where the R^2 , mean absolute error, and mean average percent error were between 0.984–0.986, 0.078–0.095, and 4.1–4.4%. The goal of this work is to determine how synthetic data can be used to train a recurrent neural network model for predicting the reactor power of the AGN-201. This approach will help bridge the gap between the virtual and physical sides of a digital twin, where reactor physics models based on as-built data can be corrected for actual operating parameters to ensure the virtual model mirrors reality.

Keywords: nuclear safeguards, long short-term memory, reactor kinetics, synthetic data

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Evaluation of Geoscience Outreach Materials through Conjecture Mapping

In the K-12 educational space there are a vast variety of freely available geosciences outreach materials. However, there is a divide between the ability of the exercise designers to assess if the activities are engaging and effective for students. Conjecture mapping allows for activity components to be evaluated based on student engagement and available learning standards. The study aims to look at three separate hands-on activities for Geosciences and conduct conjecture maps to evaluate activity effectiveness against the Next Generation Learning Standards. By designing activities that are engaging at the appropriate grade level the study aims to engage students in Geoscience as a profession.

Keywords: conjecture mapping, geosciences outreach, next generation learning standards, diversity