

9:45 – 10:45

## EXTENDING EVOLUTION: THE STRUCTURE, ASSUMPTIONS, AND OBJECTIVES OF THE EXTENDED EVOLUTIONARY SYNTHESIS (EES)

Armin Moczek, Ph.D.

*Professor, Department of Biology, Indiana University*

Scientific activities take place within the structured sets of ideas and assumptions that define a field and its practices. The conceptual framework of evolutionary biology emerged with the Modern Synthesis in the early 20th century by integrating the concepts of natural selection and Mendelian inheritance into the then emerging framework of population genetics. In the decades that followed, evolutionary biology has continued to expand, incorporated new theoretical and empirical findings and matured into a highly sophisticated framework. However, evidence has accumulated from several literatures to a degree that has begun to question the completeness of key axioms on which modern evolutionary theory is founded. These include fundamental insights derived from *evolutionary developmental biology*, *developmental plasticity*, *inclusive inheritance*, and *niche construction theory*. Here I review some of these insights, focusing on findings whose implications for evolution can be interpreted in two ways— one that preserves the internal structure of contemporary evolutionary theory and one that points towards an alternative conceptual framework. The latter, labeled the *extended evolutionary synthesis* (EES), retains the fundamentals of evolutionary theory, but differs in its emphasis on the role of constructive processes in development and evolution, and reciprocal portrayals of causation. In the EES, developmental processes and niche construction share with natural selection responsibility for the direction and rate of evolution and the fit between organisms and their environments. Similarly, while we traditionally view genes as the only evolutionarily relevant inheritance system, the EES extends inheritance beyond genes to encompass epigenetic, ecological, social, and cultural inheritance. Perhaps most importantly, traditional perspectives commonly define evolution as changes in gene frequencies brought about through natural selection, drift, mutation, and/or gene flow. In contrast, the EES advocates an organism-centered perspective, whereby the developmental properties of organisms themselves facilitate adaptive variation and modify selective environments. Consequently, evolution is redefined as a transgenerational change in the distribution of heritable traits of a population. In this presentation I outline the structure, core assumptions and novel predictions of the EES, and show how it can be deployed to stimulate and advance research in those fields that study or use evolutionary biology.

11:00 – 11:15 **EXPANDING THE 'CENTRAL' DOGMA: PERIPHERAL MECHANISMS OF SEASONAL AGGRESSION**

Nikki Rendon

*Doctoral Candidate, Department of Biology, Indiana University*

Sex steroids are key regulators of behavior thorough their actions on the central nervous system (CNS). To date, studies on aggression have overwhelmingly focused on the role of the gonadal hormone testosterone acting through androgen receptors in the CNS. This 'central' dogma has resulted in an oversimplified framework of the neuroendocrine mechanisms underlying aggression. Evidence across taxa and sexes demonstrates the lack of a relationship between sex steroids and aggression. These exceptions to the rule suggest that there are alternative, non-gonadal mechanisms regulating aggression. We present an extra-gonadal mechanism used by female Siberian hamsters. These hamsters breed seasonally and display concomitant changes in aggression. Short-day females display increased aggression despite non-functional gonads and low levels of gonadal steroids (estradiol) compared with long-day females that display low aggression despite functional gonads and elevated estradiol. We present data demonstrating peripheral actions of the adrenal gland and the adrenal androgen, dehydroepiandrosterone (DHEA), underlying changes in aggression. Specifically, we show that photoperiod induces morphological changes in the adrenal, the pineal hormone melatonin has *direct* action on adrenal DHEA release, and elevations in DHEA increases aggression. This alternative mechanism is of broad relevance to a wide range of animals, as both birds and humans show DHEA-dependent mechanisms, therefore DHEA likely serves a critical, but underappreciated role in the regulation of behavior. Collectively, these findings demonstrate that DHEA is a key peripheral regulator of aggression and that melatonin coordinates a 'seasonal switch' from gonadal to adrenal regulation of aggression by direct action on the adrenal glands.

11:15 – 11:30 **MEAN ON THE SCREEN: SOCIAL AGGRESSION ON TELEVISION AND ITS IMPACT ON YOUTH**

Nicole Martins, Ph.D.

*Assistant Professor, Department of Communication Science, Indiana University*

Media violence has been a topic of both public and scientific concern for over 60 years. There is now a large literature that documents that repeated exposure to television violence contributes to increases in physical aggression in youth. Much of this research suggests that boys are influenced more by media violence than girls are. However, one possible reason for this gender difference is that prior research has focused almost exclusively on physical forms of aggression, which are more common among males. We know that girls act aggressively too, but more often in covert or social ways—that which has been called social aggression. This talk will discuss Dr. Martins' research that has examined the role of the media in children's use of socially aggressive behaviors.

11:30 – 11:45 **FEMALE AGGRESSION: WHAT'S T GOT TO DO WITH IT?**

Kim Rosvall, Ph.D.

*Assistant Professor, Department of Biology, Indiana University*

About 10 years ago, there was a surge in interest in the evolution of exaggerated traits in females – traits that, if observed in males, would be described as sexually selected traits ipso facto. Bright colors, elaborate displays, weaponry, vocalizations, intense aggression and more. At the same time, I was developing a dissertation on the evolution of same-sex aggression in female tree swallows (*Tachycineta bicolor*). Tree swallows are obligate secondary cavity nesting birds that experience intense competition for nesting sites, much as males of many species experience intense competition for territories or mates. In this talk, I will briefly summarize my research on the evolutionary and hormonal mechanisms of female aggression, touching upon the following questions: Is female-female aggression sexually selected, and does it matter if we call it sexual selection or something else? Is female aggression mediated by testosterone, and how might female life history shape how neuroendocrine mechanisms of behavior evolve? I will also share the frank and sometimes hostile comments I have received from reviewers, which have ranged from comments that my research on female competition “ignores the normal life-style” of the birds that I study, to suggestions that my proposals are “too narrowly drawn” if they do not also test how male behavior influences or compensates for female behavior, to even stronger statements that “any ecological interpretation [about testosterone-mediated trade-offs in females] is too far-fetched.”

1:30 – 2:30 **THE PORN ADDICTION MYTH AND POPPERIAN FALSIFICATION IN THE MEDIA**

Nicole Prause, Ph.D.

*Associate Scientist, Department of Psychiatry, University of California, Los Angeles*

*Founder, Liberos LLC*

Sexual arousal strongly resembles other rewards in the brain, including sweet foods, cocaine, or watching puppies play. Recent research showing that adult films stimulate these areas in men and women who especially enjoy adult films is consistent with this research. However, it is often interpreted in the media as evidence of sex or porn addiction. The studies disconfirming many aspects of the addiction model are reviewed. Alternative models still supported by published data are compared, including sexual compulsivity, high sex drive, and social guilt models. Examples of the difficulties communicating the falsification approach in science in the media are reviewed. Finally, new data examining brain responses to sex films over time and during orgasm in “problem” sex films users are previewed.

2:45 – 3:45

**EXEMPLAR TALK:**

**YOU MAKE ME SICK: USIG SICKNESS BEHAVIOR TO RE-THINK WHAT WE THINK ABOUT ANIMAL BEHAVIOR**

Greg Demas, Ph.D.

*Professor, Department of Biology, Indiana University*

For the last several decades research within the biological and behavioral sciences has been dominated by a translational approach. Within this paradigm our basic understanding of how and why animals behave normally has been largely supplanted by studies of how and why mind and body fail. Moreover, the idea that the routine day-to-day responses of our bodies to environmental challenges reflect healthy, adaptive responses that only occasionally go awry, has given way to a biology of disease. An unfortunate outcome of this emphasis on translation has been a diminished appreciation for the importance of basic research within biological and behavioral sciences. Using sickness behaviors as a conceptual framework, I will articulate how the study of the basic biology of sickness can serve as an “integrating agent” to connect basic research in behavioral biology with more applied disease approaches. Only by understanding the basic biology of naturally occurring fluctuations in sickness responses in relatively healthy animals (under laboratory or field conditions) do we have the potential to make real and substantial contributions to our understanding of sickness and disease. By doing so, we will also be able to better appreciate fluctuations in sickness behaviors as adaptive functional responses that promote survival rather than deleterious byproducts or symptoms (although not denying the potential for disease). This basic approach to studying sickness has traditionally been, and will continue to be, an extremely important and productive strategy with which to complement more applied, biomedical approaches. Further, applying this approach to other areas of behavioral research will allow us to re-think what we think about normal and abnormal behavior, as well as health and disease.

4:00 – 5:30

**PANEL II: EVEN MONKEYS FALL FROM TREES: SENIOR SCIENTISTS TALK ON CHANING THEIR MINDS**

Despite being critical to scientific advancement, the willingness to (publically) change one’s mind is rarely recognized, let alone praised, within the culture of science. When there is pressure to confirm influential theories (or get results that meet funding priorities), paradigms can persist long past their usefulness and scientists are tempted to abandon fruitful, if unexpected, findings. This panel fights back by celebrating the scientific ideal of following the data, wherever it leads us. Four successful senior scientists from four different disciplines – Ellen Ketterson (Biology), Cara Wellman (Neuroscience), Julia Heiman (Clinical Psychology), and Virginia Vitzthum (Anthropology) – will speak on their experiences of completely changing their minds about a topic within their field. After each panel discussant describes a real-life example of their personal paradigm shift, conference attendees will be invited to share their own experiences, and participate in a discussion on how to keep an open mind.

**INVITED PANEL MEMBERS:**

Ellen Ketterson, Ph.D.

*Distinguished Professor, Department of Biology, Indiana University*

Cara Wellman, Ph.D.

*Professor, Department of Psychological and Brain Sciences, Indiana University  
Director, Center for the Integrative Study of Animal Behavior*

Julia Heiman, Ph.D.

*Professor, Department of Psychological and Brain Sciences, Indiana University  
Senior Research Fellow Director, The Kinsey Institute*

Virginia Vitzthum, Ph.D.

*Professor, Department of Anthropology, Indiana University  
Senior Research Scientist, The Kinsey Institute*