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Evolution, Ecology, and Modularity of the Lagomorph Skull

The lagomorph (rabbits, hares, and pikas) skull exhibits a unique set of characteristics that distinguish it from most other mammals. Hares and rabbits hop, and some species show a level of cursoriality that is unmatched for animals of their size. Previous workers have suggested that hare skull morphology is related to locomotion, but this hypothesis has not been thoroughly tested. We explored the relationship between skull shape and ecology using an 2D morphometric data set that included 144 skulls from 17 living leporids (rabbits and hares). Our analyses showed strong correlation of skull shape and burrowing behavior. We also found that the tilt of the facial skeleton relative to the basicranium correlated with locomotion, with generalized scampering taxa having flatter skulls and hoppers having more facial tilt. This led us to investigate possible modularity within leporid skulls. Our 2D data showed that diastema length was more strongly correlated with overall skull length than was basioccipital length. To explore this further we utilized the RV coefficient to analyze a subset of skulls using 3D geometric morphometric data taken from surface renders from CT scans. These analyses suggest a distinct pattern of modularity between the facial and basioccipital regions in the lagomorph skull. The most recent ancestors of lagomorphs, the mimotonids (ca 55Ma), exhibit a facial region that is remarkably similar to that of living lagomorphs, but a relatively primitive basicranium.. It wasn't until tens of millions of years later that the basicranium of fossil lagomorphs showed features that were consistent with those of the highly tilted skulls of living lagomorphs.

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Effects of APKQYVRFamide and FMRFamide on the Earthworm Body Wall

Recently our laboratory identified APKQYVRFamide, the first earthworm FMRFamide related peptide. Since FMRFamide modulates the contractions of the isolated body wall of *Lumbricus terrestris* we decided to determine the effects of APKQYVRFamide. A 10 segment section of dorsal body wall anterior to the clitellum was removed, attached to a Grass force transducer, and suspended in a tissue bath. Mechanical contractions of the longitudinal muscles were recorded on a computer using Iworx Labscribe 2. The body wall was challenged with increasing concentrations of peptide and the resulting changes in contraction amplitude and rate were used to construct log-concentration response curves. APKQYVRFamide caused a large increase in frequency at 10^{-9} M. Between 10^{-8} and 10^{-6} M it caused a decrease in rate and at 10^{-5} M it caused an increase. For all concentrations of APKQYVRFamide the changes in amplitude remained in the negative range. At 10^{-8} M the peptide caused an increase in amplitude. FMRFamide caused a complex response with a large increase in frequency between 10^{-9} and 10^{-8} M. Between 10^{-7} and 10^{-5} M it caused a decrease in rate. FMRFamide caused a slight inhibition of amplitude between 10^{-9} and 10^{-7} M. Between 10^{-7} and 10^{-6} M there was a substantial increase in amplitude followed by an equally large decrease between10^{-6} and 10^{-5} M. Thus it appears that APKQYVRFamide, which is more potent than FMRFamide, may be involved in controlling body wall movements of the earthworm.

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Successful Sage-grouse Show Greater Laterality in Social Behaviors

Lateral biases in behaviors are common across animals. Greater lateralization may be beneficial (e.g., if it allows for more efficient neural processing), yet few studies have considered the possible importance of inter-individual variation in lateral biases in wild animals, particularly for social behaviors. We examined lateral biases in lekking male greater sage-grouse (*Centrocercus urophasianus*), a species with obviously lateral orientations during aggressive and courtship interactions and in which male mating success can readily be measured. In both agonistic "facing-past events" and courtship "strut" displays, successful males showed greater bias. The greater resolution of angular orientation in our courtship data revealed that bias depended on the region of the visual field being used; struts were left biased in the frontal hemifield and right-biased in the lateral hemifield. Our results suggest that more successful males were more lateralized, although variation in social context and portion of the visual field being used are also important to consider.

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Patterns, mechanisms, consequences of gender-biased parasitism in small mammals

We will review patterns, causes and consequences of gender-biased infestation of small mammalian hosts by macroparasites. We start with a description of gender biases in parasite infestation and discuss variation in these patterns among host and parasite taxa. We will also look at temporal and spatial variations in gender-biased parasitism and demonstrate that they can vary seasonally and be mediated by environmental conditions. Then, we will present main hypotheses that examine mechanisms of gender-biased parasitism. One group of these hypotheses focuses on differences between male and female hosts in their probability to be attacked by parasites, while another group links gender-biased parasitism with differences in parasite performance in male versus female hosts. Finally, we discuss possible consequences of male-biased parasitism for individual parasites, their populations and communities.