Communication, play, and collaboration
Ádám Miklósi

in Dog Behaviour, Evolution, and Cognition

This chapter examines communication, cooperation, and play behaviour in dogs. These activities share many aspects of behavioural coordination; in many situations they occur in parallel. Playing dogs are communicating, and also cooperating in broad sense and cooperation is also unlikely to occur without any communication. All three behavioural manifestations play an important role in dog training that brings in a specific aspect of applied research.

Perspective—Evolutionary Aspects of Motor Control and Coordination: The Central Pattern Generators in the Crustacean Stomatogastric and Swimmeret Systems

Wolfgang Stein, Carola Städele, and Carmen R. Smarandache-Wellmann

Central pattern generators (CPGs) are assemblies of neurons that autonomically produce rhythmic patterns of neural activity. Most, if not all, rhythmic behaviours in animals are driven by such CPGs, and examples are manifold across all taxa. CPGs have evolved independently many times and they show phylogenetic and functional diversity. They control a spectrum of very different behaviours in both vertebrates and invertebrates, including some that require the coordination of several body segments, or even the whole body, and others that move limited anatomical appendages. Some behaviours driven by CPGs are continuous and stereotypic while others are episodic and more flexible. Some are
impervious to sensory feedback, while others are strongly influenced by sensory feedback. This phylogenetic and functional diversity, although precluding a comparison of CPG circuitry in detail, allows us to distill the core features of CPG circuits and to learn general principles of neural function that underlie some of the most vital behaviours in animals. Here, the chapter reviews two systems that are at the forefront of studying central pattern generation and coordination of CPGs. The processing of food in the crustacean stomatogastric nervous system will be used as a generic model for addressing evolutionary aspects and highlighting general functional motifs of central pattern generation. The crayfish swimmeret system, on the other hand, will serve to demonstrate the known mechanisms of coordination of segmented CPGs.

Appendage Diversity and Modes of Locomotion
Jim Belanger

in Functional Morphology and Diversity

Crustaceans display a dazzling array of limb morphologies. In this review, I address this diversity from a functional perspective, by linking structure to behavioral demands. A general description of crustacean limb anatomy is provided, followed by a discussion of how the physical requirements of legged locomotion may have affected this. Factors considered include the dynamics of pedestrian locomotion, effects of animal size and speed, the differing demands of walking on land versus underwater, and the constraints of an exoskeleton. Patterns of limb coordination, along with the mechanisms producing these, are also briefly reviewed. Finally, the use of energy-conserving mechanisms such as tendon springs is considered.