动物学报 52(Supplement): 489, 2006
Acta Zoologica Sinica

Symposium 27 Morphological integration and modularity

Introduction

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Organisms are complex systems built up in a biological hierarchy, from genes to expressed morphology, physiology and behavior, with networked correlations within and between the respective traits bound by a framework of heritability and phylogenetic constraint. The role of function as a key factor in avian morphology is deeply implicated. In an ongoing process of coevolution, form and function are blended in the body plan to constitute functional complexes. These may be explained as correlated morphological mechanisms that accomplish common biological roles such as locomotion or feeding. They are the main modules in the architecture of bird design. Bound by morphological integration they can only be modified together. How these modules are turned on and off has been poorly understood until now. During the last decade, the Hox genes, with their functions of constraint, have been discovered as the "master regulators" for the organization of body pattern and form. The morphological expression of developmental genes in vertebrates, especially in birds, is a very recent research field. Their ecological, behavioral and phylogenetic determinants are yet to be explored, as well as their portion of phylogenetic load as the counterpart of evolution.

This symposium reviewed several aspects of morphological integration, from basic trait evolution and its underlying molecular modules to its expression in flight and behavior and interaction with ecological factors. Hypotheses arising — how developmental morphological integration may affect the response of traits to selection pressures from the environment and behavior over time — have yet to be tested.