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Genes as cues: integration of genetic and epigenetic information from a Darwinian perspective

Abstract

The development of multicellular organisms involves a delicate interplay between genetic and environmental influences. It is often useful to think of developmental systems as integrating available sources of information about current conditions to produce organisms. Genes and inherited physiology provide cues, as does the state of the environment during development. The integration systems themselves are under genetic control, and subject to Darwinian selection, so we expect them to evolve to produce organisms that fit well with current ecological (including social) conditions. I argue for the scientific value of this explicitly informational perspective by providing detailed examples of how it can elucidate taxonomically diverse phenomena. I also present a general framework for linking genetic and phenotypic variation from an informational perspective. This application of Darwinian logic at the organismal level can elucidate genetic influences on phenotypic variation in novel and counterintuitive ways.