

# Bayesian Development for Empiricists

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In recent years, theoreticians have demonstrated that information about the environment can come from many different sources (e.g. genes, inherited epigenetic factors, parental effects, personal experiences), and that Bayesian models of development can be used to predict how information from different sources and different times should be combined within lifetimes and lineages to affect the development of phenotypic traits. Bayesian models of development provide general explanations for several widely-observed empirical phenomena, e.g. why sensitive periods often occur early in life. More important, they make specific predictions about individual or genotypic differences in developmental trajectories. For instance, Bayesian models predict that if different genotypes express a wide range of scores when naive, their scores will converge on a similar score following exposure to the same informative cue. This prediction of GxE is supported by results from a recent study of the responses of wild-derived genotypes of *Drosophila melanogaster* larvae to aversive olfactory conditioning. The same models show why indices often used to measure individual differences in learning ability will produce erroneous results if the subjects began with different initial scores. Bayesian models also make predictions about relationships across genotypes between within-individual and trans-generational plasticity, some of which are supported by data on responses of *Daphnia* clones to exposure to cues from predators in the parental and offspring generation. These and other recent studies suggest that Bayesian models of development have much to offer empiricists in search of testable predictions about individual and genotypic differences in within- and trans-generational developmental plasticity.