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Developmental and Selectionist Approaches in 21st-Century Evolution

The theories that Lamarck and Darwin originally formulated 200 and 150 years ago were radically transformed during the 19th and 20th centuries. Nevertheless, Darwinism and Lamarckism have been, and still can be legitimately seen as approaches that emphasize different aspects of the evolutionary processes. The focus of Lamarckians was traditionally on variation – on its environmental induction, developmental construction, and inheritance. They therefore emphasized organizational-developmental principles that channel and constrain variation. The main (though not the exclusive) focus of early Darwinians was on selection, which was seen as the major direction-giving process in evolution. In the mid-20th century, the Modern Synthesis, which was based on *neo*-Darwinism, expelled developmental responses to environmental changes from the study of heritable variation, and identified heredity with genetics, with hereditary variation being seen in terms of combinations of randomly generated gene mutations. This view has dominated evolutionary theorizing for the last sixty years. However, since the 1990s, data coming from developmental biology (particularly the molecular aspects), from ecology (in particular ideas about niche construction and studies of horizontal gene transfer and symbiosis), from behavior (where the transmission of information through social learning is a major focus), and from cultural studies (where the relation between cultural evolution and genetic evolution is under scrutiny) are challenging the assumptions of the Modern Synthesis. In parallel with this, there has been an expansion of the Darwinian notion of natural selection: selection is now seen as a general principle that is not confined to replication and multiplication of entities such as genes and individuals, but rather encompasses processes of selective stabilization of different types and at different levels of biological organization. In this lecture I present some of the data and ideas that suggest how developmental (epigenetic) variations can be inherited and affect evolution, and then discuss approaches that integrate the broad notion of selectionism with development, thus creating bridges between the traditional approaches.