

Dispositions and Causal Processes in Biology

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In this paper we analyze the relation between dispositions and causal processes relying on examples of dispositions from various biological disciplines (e.g. foldability of amino acid sequences, contractibility of muscle fibers, differentiability of cells, evolvability of populations). Our main thesis is that certain (implicit) assumptions that are traditionally made about the nature of dispositions need to be revised in the light of these biological examples.

First, the traditional picture of dispositions is inadequate with respect to biology since it obscures the great importance of the (causal) *process* of manifestation for biological dispositions. This process of manifestation of a disposition has to be distinguished from its *result* or *product* (though these processes can be characterized in terms of their results). So what we propose is that in biology the notion of a causal process helps to elucidate that of a disposition (rather than the other way round).

Second, taking into account the temporal extension of the manifestation process discloses a second respect in which the traditional picture of a disposition needs to be revised. The traditional view of the conditions under which a disposition becomes manifest does not account for the *diversity of roles* certain kinds of conditions play for the manifestation of biological dispositions. We propose the distinction of three different kinds of manifestation conditions, which captures the diversity of roles manifestations conditions play in current biological research practice:

- a) *stimulus conditions*: conditions that initiate the causal manifestation process, that is, for the manifestation to occur they need to be fulfilled right before the manifestation process starts
- b) *sustaining conditions*: conditions that need to be present or absent at different time intervals during the causal manifestation process; they ensure that the manifestation process takes its typical course and that the manifestation result obtains
- c) *background conditions*: conditions that are assumed to obtain and that are usually left unspecified in an explanation of the manifestation of a systems disposition (e.g. a certain pH-value, salt concentration and temperature)

Finally, we argue that our analysis requires not only a revised notion of a disposition but also revisions with respect to (related) notions such as ‘mechanism’ and ‘ceteris paribus law’, because it allows a more nuanced reconstruction of the various kind of conditions that play a role in mechanisms and ceteris paribus laws.