
Mechanisms in Systems Biology: do they explain enough?

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Abstract

Models play a prominent explanatory role in top-down and bottom-up systems biology. As demonstrated in the present study, these models generally meet the most recently stipulated theoretical constraints that define what counts as mechanism. In light of these observations, I argue that a purely mechanism-based framework that complies with the constraints of the new mechanistic philosophy can be regarded as explanatorily adequate to the extent that it allows for the reliable manipulation and control of biological processes in the context of systems approaches. Nevertheless, such framework remains limited in its capacity to carry out the comprehensive explanatory integration demanded for the holistic understanding of complex biological systems, whose attainment constitutes systems biology's most ambitious objective. In addition, in their current formulation the models endorsed by the new mechanists are not sufficient for capturing the rich explanatory pluralism that characterizes the practice of systems biology. The contention that this pluralistic character of systems biology is only revealed through a pragmatic view of its practice suggests that moving beyond theoretical considerations is required for gaining a better insight into the nature of explanation. I propose, however, that philosophers do not need to make a choice between adopting a theoretical or pragmatic attitude: the dilemma is spurious because both perspectives contribute in a mutually complementary way to constructive thinking about explanation in biology.

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