

# Semantic Explanation in the Biological Sciences

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## **Abstract**

Some types of biological explanation are mostly considered respectable, like causal-mechanistic, constitutive, and evolutionary explanation. Other types raise philosophical concerns. Those are (i) functional explanation, which is regarded as teleology laden and was discussed continuously for half a century in philosophy of science (and by Kant anyway); and (ii) explanation in terms of transduced signals and of stored and transferred information. In the following, I call such information-theoretical models 'semantic explanations.'

This talk will concentrate on semantic explanation and consider functional explanation only in so far as semantic explanation relates to it. Semantic explanation was hardly ever discussed as a type of explanation. Instead, philosophers either looked at information transfer as a subject of mechanistic explanation, or attempted to explicate the concept of biological information in isolation. As a result, some contested that the term is of any use at all. However, the success of information-theoretical models in molecular biology suggests that they have some explanatory value, despite contested content and regardless the mechanistic explanation of information transfer processes.

Taking the semantic model of protein biosynthesis as an example, I focus on the model as a whole rather than on its isolated terms. This focus reflects the role of information talk in molecular biology, where on the one hand molecular processes are described by semantic models, but where on the other hand no piece of information was ever characterized or identified outside the context of a description by a semantic model. This leads to the view that 'information' enters the game as a theoretical term of the semantic model rather than as an observable that enters modeling. I discuss possible ontological commitments and argue in favor of the explanatory value of semantic models. They are not merely summing up what is to be explained by mechanistic models. They rather do themselves explain mechanistic models in functional terms. I finally draw parallels between semantic explanations in biology and certain types of explanation in other sciences.