# Systems biology and the quest for organizing principles

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**Abstract**

Session: Philosophical perspectives on and from systems biology (Sara Green; **Robert C. Richardson & Fred Boogerd;** Olaf Wolkenhauer and Rogier De Langhe)
With the emergence of systems biology the notion of organizing principles has been (re)introduced in the life sciences. I highlight the motivation behind the intensified search for organizing principles and reflect on their epistemic role in scientific practice.

Organizing principles are abstractions that reflect general system properties; possibly signifying what counts for *any* cell, *any* organism or *any* control system. I suggest that organizing principles can be understood as templates for relational and dynamic properties in a double sense; i) as coarse-grained sketches for developing more detailed models of biological phenomena, and ii) as higher order abstractions for understanding general dynamic properties for classes of typified systems. They are investigated within an abstract mathematical framework that facilitates transfer of methods and concepts across systems, levels and even disciplines. Thus, organizing principles are not only templates for arriving at de-idealized mechanisms but also provide an investigative framework for the ongoing search for general features that underpin the organization of biological systems at a higher level of abstraction than much of biological research.

Their role as de-contextualized abstractions at first sight seems to be at odds with the widely accepted view that explanations in biology are descriptions of biologically specific and context-dependent mechanisms. However, the goal of organizing principles is different from mechanistic explanations; it is to signify how a class of systems works "in principle", abstracting from the detailed dynamic features of biological systems. I therefore argue that this approach is complementary to, rather than conflicting with, finer-grained mechanistic explanations.

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