




**Bernd Rosslenbroich, *Properties of life. Toward a theory of organismic biology*. Vienna series in theoretical biology, 2023, The MIT Press, 326 Pages, ISBN 9780262546201 (Paperback)**

Christoph J. Hueck<sup>1</sup> 

Accepted: 1 July 2024

© Springer Nature Switzerland AG 2024

“What, then, is life?” This question, addressed in the new book by Bernd Rosslenbroich, could be seen as a variation of Augustine’s question about the nature of time, to which the church father replied: “If no one asks me, I know what time is, but if someone asks me, I do not know”. We naturally and intuitively recognize living beings, but biology has been struggling to find a satisfactory definition and explanation of them for over 2000 years.

Rosslenbroich’s original approach to the question is phenomenological: “What characteristics do living organisms typically exhibit when they are studied by physiology, embryology, molecular biology, and so on?” (p. 64). Unlike other authors, he does not attempt to define the living organism, but rather to describe those of its characteristics which cannot be reduced to physicochemical principles. These range from the organism’s integrative system functions to its autonomy and agency, from its ability to process molecules and information to the generation of shape, from the maintenance of autonomous time processes to growth, development and evolvability, from sensibility to consciousness, and some more. As Rosslenbroich compiles these characteristics based on extensively researched current literature, the book is a treasure trove for anyone looking for the current state of affairs on the respective topic.

The author argues in two directions. Firstly, he emphasizes that the reductionist machine metaphor of the organism, which still dominates mainstream biology, is inadequate to explain the properties of living things. Instead of mechanistic reductionism, biology must recognize the living organism as such and place it at the center of its investigations. “Life must be understood as life and not as something else” (p. 75). Rosslenbroich’s particular concern is not only to fully integrate the organismic approaches in the literature, but also to consider the results of experimental research:

---

✉ Christoph J. Hueck  
hueck@akanthos-akademie.de

<sup>1</sup> Akanthos Academy, Zur Uhlandshöhe 10, D-70188 Stuttgart, Germany

“The working hypothesis is that empirical research is developed far enough today to reveal by itself the material and prerequisites to allow us to understand more of the specific organismic properties of the living” (p. 63).

Second, Rosslénbroich demands that the organismic paradigm requires a unifying, comprehensive concept, albeit one that does not focus solely on a single property. Other approaches often only emphasize singular aspects of the organism such as its processuality, or its agency and autonomy, or the ability to proliferate and evolve. As an example, he discusses a perspective advocated by Daniel Nicholson and John Dupré, who have argued for a general processual view of life. Rosslénbroich claims that this view can be reformulated “somewhat more biologically” (p. 266) by adding other characteristics, e.g. that the process is a continuous agential activity which is organized within a spatial and developing shape and a specifically regulated time structure generated by the organism itself. Furthermore, the organism exhibits a certain autonomy toward its surroundings, in which it actively maintains itself in a status of disequilibrium. Rosslénbroich therefore attempts to “bring the [various] aspects together to try to develop a coherent concept of the phenomenon of life” (p. 263), a concept that he regards as “living” and flexible and open to correction and expansion. “The vision is to think [these properties] in toto” (p. 272) (my addition).

The introductory two chapters describe the development of concepts of life from antiquity to the present, with perspectives evolving from the vitalistic to the mechanistic. Rosslénbroich outlines the transition from the view of the cosmos as a harmoniously ordered whole, in which natural philosophy strove for knowledge of divine wisdom and a life in harmony with nature, to Galileo, Descartes and Newton, who conceived of nature as a calculable mechanism made up of particles of dead matter. The contrast between holistic (vitalistic) and reductionist views runs through the text, and Rosslénbroich repeatedly describes the tenor of the dispute: “While the vitalists asked essential questions about the nature of the living, but were unable to answer them, the physicalists were able to give many answers, which, however, did not touch on the essential properties of the living” (p. 23).

Organismic thinking attempts to find a way out of this dilemma. Rosslénbroich describes its history in the 20th century in detail. In the first half, there was a wave of organismic biology influenced by Alfred North Whitehead’s process ontology, supported by researchers such as Spemann, Goldschmidt and Haldane and by theorists such as von Bertalanffy, Waddington and Weiss. Rosslénbroich also refers to the views of the Austrian philosopher Rudolf Steiner, who is not normally mentioned in these contexts. Steiner expressed the idea—later advocated by Hans Jonas—that humanity had lost sight of the realm of the living through an increasing separation of self-consciousness from the object world (p. 28).

During the second half of the 20th century, organismic thinking was pushed into the background by the reductionist view of molecular biology and the evolutionary synthesis. Since the turn of the millennium, however, there have again been many voices criticizing the genocentrism and the “nothing-buttery” of the physical reductionists, who consider organisms to be nothing but gene-controlled survival machines (p. 40). According to the author, the repeated rise and fall of the reductionist and organismic views shows that the central problem has not been solved: “We need a

realistic conception of the organism and not defective metaphors that lead to a misguided handling of nature” (p. 60).

According to his “working hypothesis” (put forward in Chap. 3) that essential features of the organism can be derived from empirical research, Rosslenbroich describes a total of 15 such properties of living things in great detail and with extensive literature references in Chap. 4. Some of these features, such as the reciprocal interdependence of organic functions, autonomous self-generation, organismal agency, and evolvability are frequently found in discussions over definitions of life. Others, like time autonomy, or the ability to generate shapes, are rarely mentioned by others.

Finally, Rosslenbroich integrates these features in Chap. 5 by describing some additional and overarching principles of the living. He stresses the processual nature of life which, at the same time, enables the organism’s stable identity (p. 71) and emphasizes the principle of *concurrency* of partially contradictory properties (e.g., the skin is both a closing boundary and a permeable membrane; organisms are both autonomous and environmentally dependent; processes generate specific substances, which in turn determine the processes; etc.). Thus, living beings show an “indissoluble” interdependence of processes, substances, energy and information (p. 74), which enables a multitude of regulatory effects and fosters the resilience of the organismal system against external disturbances.

A central feature of the organism is its autonomous agency. Rosslenbroich emphasizes that the concept of agency brings a creative element into nature, which has been forbidden ever since the Newtonian revolution (p. 200). This banishment has led to the conception of a particulate, material world which is essentially passive. At this point at the latest, it becomes clear that the statement of organismal agency, even if it is only meant to be empirical and descriptive, inevitably touches on an ontological question. This question becomes urgent precisely against the background of the comprehensive compilation of the properties of the living: How can agential beings have emerged and exist in a purely material world? Rosslenbroich avoids this problem, stating that “questions on the origin of life are not addressed here” (p. 64) and claims that “certainly, no attempt shall be made to design an alternative world-view” (p. 212). However, a philosophy of life would ultimately have to consider our understanding of the whole of nature, the cosmos and its becoming. In this regard, Rosslenbroich’s repeated rejection of any form of vitalism (pp. 4; 65; 265) possibly leads to a theoretical self-restriction that makes further perspectives difficult. If organisms cannot be reduced to mechanistic laws and causality, how can the holistic properties of organic matter be explained if no forces other than physical or chemical ones are accepted? This question is hardly ever asked in the literature on organisms, but Rosslenbroich’s book makes it almost obvious. The appreciation of the organism’s living properties may be a bridge to seriously asking such deeper questions.

In summary, Bernd Rosslenbroich’s book is clearly structured, well thought out, highly informative, balanced, contains the latest research and discussion (500 references) and should be basic reading for any student of life sciences.

**Publisher’s Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.