

Summary

Vis essentialis and entelechy. Caspar F. Wolff's and Hans A.E. Driesch's parametric dimension of the organic world

The books deals with central categories – *vis essentialis* and *entelechy* – developed by C.F. Wolff and H. Driesch in the context of biological quantitative and qualitative changes. The author shows that they used both concepts within a similar methodology to explain epigenesis and understand it on the basis of research on different animal organisms. In this regard, he proves that Wolff's research on organogenesis and Driesch's research on regeneration (regulation) were aimed at elaborating permanent causal factors explaining the biological phenomena taking place in organisms.

Both scholars understood the scope of the fundamental concepts analogously to the categories used in physics and chemistry, which involve measurable quantities such as force, mass or energy, which are predictable under certain conditions. However, it was eventually proved that both categories – *vis essentialis* and *entelechy* – remain problematic from the viewpoint of modern scientific methodology and its method towards understanding the basis of organic development. The research presented as a whole shows an attempt to create a parametric vision of morphogenesis developed by both Wolff and Driesch.

Chapter I. Caspar Friedrich Wolff's and Hans Driesch's initial assumptions aimed at exploring the epigenetic specificities of development

The first chapter deals with C.F. Wolff's and H. Driesch's initial research assumptions aimed at exploring the specificities of development. The author presents a research strategy based on specific methodological assumptions and empirical data concerning embryological

phenomena. The philosophical historical foundation that had a lesser or greater influence on the stance of both researchers is also indicated in this chapter.

During the discussion of methodology, the general mechanistic context that runs through subsequent analyses is highlighted. This was a significant aspect of Wolff's and Driesch's studies, which they often criticised and contrasted during attempts to specify universal reasons explaining the development of epigenetic phenomena. The author also shows that the awareness of the complexity of epigenetic phenomena led both researchers to ask universal questions about the course of developmental phenomena related to life processes in general and biological organisation.

Both Wolff and eventually Driesch questioned the validity and suitability of the mechanistic basis of the proposed natural parameter in the context of interpretations of individual sequences of changes in biological epigenetic development.

Chapter II. *Empirical observation & empirical data in epigenetic studies by Caspar Friedrich Wolff and Hans Driesch*

In the second chapter, Wolff's observations regarding development and the meaning and nature of biological experiments conducted by Driesch were shown in detail. In this context, the author also proves that they involved a clash between biological observations and the experimental method, which was a direct result of progress in embryological research. He also shows that detailed descriptions of the development of the organism's structures provided by Wolff and the broader scope of Driesch's experimental research constitute two key phases in the development of embryology and science in general. They reveal that Wolff, on the basis of his observations of the development of the chicken egg, questioned and then rejected the theory of preformation, thereby establishing the foundations of the theory of epigenesis in embryology. Driesch, on the other hand, using experimental methods that were modern at the time, extended his research in an attempt to understand the internal regulatory mechanisms, the knowledge of which proved crucial for the further development of embryology and developmental biology.

The difference between Wolff and Driesch in their approaches to empirical data show how embryology developed: from simple but precise observations to more complex experimental studies. The author also indicates that, in spite of differences in their approaches, both sought to elaborate a similar intellectual scheme in their attempts to specify the natural parameter *in actu*. This, in turn, meant that their studies at an empirical level provided a basis for further analysis and raised fundamental questions about the limits of mechanicism and its role in explaining morphogenetic processes. They also confirmed their assumptions regarding organic causation. Indeed, Driesch's departure from empiricism led him towards speculative metaphysics, which eventually resulted in the formulation of the non-quantitative of entelechy factor. As far as Wolff is concerned, he incorporated vitalistic explanations in his research as a result of the extension of the action of *vis essentialis* onto teratologic phenomena that are difficult to explain.

Chapter III. *Vis essentialis and entelechy. The morphogenetic dimension of organic causation*

The third chapter shows the methodological basis of Wolff's and Driesch's studies that reveals their research strategies that attempted to consolidate natural parameters in the field of embryology. In this context, the author thoroughly analyses how they understood the causality of specified concepts and their role in the progress of specific classes of morphogenetic phenomena. Both Wolff and Driesch treated their causal categories as factors that not only explain specific biological phenomena (Wolff – organogenesis, Driesch – regeneration and regulation) but also define the specificity of life in general.

Within this context, explanatory proposals put forward by other scholars of the time are presented. In the case of Wolff, the author highlights his opposition towards other factors of this type that were proposed in the 18th century. With regard to Driesch, the author shows his critical revision of the natural factors and stimuli that he originally regarded as having the potential to develop an appropriate natural parameter for the organic phenomena under study. Driesch believed that this kind of reason

may result from the physicochemical basis of organisation of biological life, which was a strong conviction in the first phase of his research.

Eventually, both Wolff's and Driesch's studies show that in morphogenetic development there is no room for the theory of preformation, and mere mechanistic explanation plays a limited role. In this light, a full understanding of the properties of *entelechy* and *vis essentialis* categories required the attribution of features that would be useful for understanding the biological phenomena under study. In the case of both Wolff and Driesch, an analysis of their research on the individual categories of action shows that both made use of natural categories at the limit of the cognitive capacity of science at that time. Their science was largely based on broad methodological foundations, as shown by the clearly demonstrated relationship between empirical research and theoretical assumptions within the scope of the phenomena concerned. Within this subject area, the author demonstrates an attempt to create a parametric vision of morphogenesis developed by both Wolff and Driesch and presents some differences in their research positions.

Chapter IV. *The modern methodological analysis of scientific aspects of biological studies by Caspar Friedrich Wolff and Hans Driesch*

The fourth chapter attempts to place Wolff's and Driesch's research in the scope of morphogenesis in the context of modern methodology. The analyses covered their actions that could be classified as scientific. These activities referred to the discovery and explanation of unknown properties of living organisms, where the postulated causal factors in the course of development and regulation occurring in individual animal organisms were to play a fundamental role.

Accordingly, the author identifies respective methodological structures applied by Wolff and Driesch that, to a certain extent, are compatible with each other and correspond to the assumptions of modern methodology.