

Autonomous Multicellular Organisms and Regulatory Developmental Mechanisms

Argyris Arnellos

IAS-Research Centre for Life, Mind, and Society - Department of Logic and Philosophy of Science

University of the Basque Country

Donostia - San Sebastián, Spain

e-mail address: argyris.arnellos@ehu.es

The notion of 'organism' in biology is not simple. There is an intuitive grasp of the properties that our common sense takes as important about organisms, but this fails to accommodate many examples we can think of in real life. There will always be cases of MC groups that will surprise us, and judging from the situation so far, there will always be candidates whose criteria could be interpreted, conceived and operationalized in multiple different ways. And yet, the clarification of this concept is an important philosophical and scientific problem, not only because the idea of organism has played a key role in the history of biology (as a central part of biological explanations -- i.e., as the locus of mechanisms, of adaptations, of selective-evolutionary dynamics); but also because, without a strong idea of organism it would be very difficult to provide a naturalized account of other fundamental concepts like functionality, agency, autonomy, genetic information, etc. All in all, if biology has to focus on understanding organisational issues, then the concept of organism becomes of paramount importance.

The majority of contemporary attempts to define individual organisms in biology fall under three main categories: *evolutionary*, *hybrid* (suggesting a set of criteria or considering the relation between cooperation and conflict as the base of reference), and *organisational*. All three have their own problems, however of a different nature. Evolutionary approaches seem not to be able to solve all the objections to the mechanistic explanations, and to provide a complete account of the intrinsic functioning of organisms. Hybrid approaches are using too many criteria that are not easy to be operationalized, while approaches that suggest *high collaboration* and *low conflict* as the primary characteristic of an organism end up being grounded on the property of *adaptation*, which is also not easily operationalized and quite difficult to be cashed out in a consensual way. After all, everything is more or less adapted to some degree to an environment. In the organizational perspective an organism is considered a functionally differentiated and integrated whole operating interdependently with its environment, thus exhibiting a degree of *autonomy*. Again, pretty everything could be said to be *functionally integrated*, and 'autonomy' is difficult to be operationalized, at least in a way that it would suffice to distinguish between parts, groups of parts, and wholes.

Our aim in this talk is to suggest several aspects that have to do with the *organizational* conditions required for the formation of organisms at the multicellular level. More specifically, we shall propose a general theoretical scheme according to which a multicellular organism should not only be capable of reproducing each of its own parts but also to regulate the development of its own global/collective organization. Adopting an organizational perspective we investigate in detail the ontogenetic development of three multicellular systems from the point of view of autonomy (i.e. of the self-determination capacities of different multicellularities). We suggest that a specific type of functional integration among the cells of a multicellular ensemble, i.e. a regulatory control system consisted in several intercellular mechanisms that modulate the developmental process, is needed to qualify the ensemble as organism. Finally, we argue why a multicellular system exhibiting this type of organization should be actually considered as a second-order autonomous system.