

BUILDING BRIDGES – BETWEEN, IN
AND FOR THE PHILOSOPHY OF BIOLOGY.
INTRODUCTION
TO THE MONOTHEMATIC SECTION

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Is philosophy of biology at a turning point? There is a growing amount of clues that points out to an affirmative answer to this pivotal question. Indeed, what is emerging from the past decades of biological and medical research is that a biological entity, a living being, acts as dynamic multi-unity, rather than as a parts-whole organization. Since the maintenance and persistence of its constitution requires two different modes of causation – that is, a differentiation between? causal dynamics (accounting for multiplicity) and a state-holder causality (accounting for unity) – what is at stake in the definition of a new epistemological thinking in life sciences is *unity*, or the essential feature of any biological system, which is processual in its nature and is revealed by the way of integration of the organism's organization and growth. Living beings and the heterogeneous phenomena of life are, essentially, constituted by a complex system of relationships. In this issue, biology always describes differences, and biological understanding is always achieved in terms of relationships, rather than by isolating supposed causal factors. In fact, the identification and study of any part (gene, cell, cell type, tissue etc.) requires *relative terms* and entails *relational issues* (Bertolaso, 2016).

These new acknowledgements within biology are influencing epistemological reflection as well. Since in recent years there has been a significant tendency in scientific practice to move towards the study of biological systems, as well as to elaborate complex and multilevel models accounting for biological dynamics, this trend has started to reflect itself in the emergence of a new debate in the philosophy of life sciences. This shift in philosophical thought revolves around the overcoming of several “epistemic obstacles” that are nowadays widely acknowledged by philosophers of science and scientists alike. Some of the very foundational categories of traditional biologi-

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cal thinking (“unit”, “individuality”, “organism”, “form”, “function”, “mechanism” and so on) are being questioned, and eventually revised, in order to account for what appears as the pivotal feature of biological systems – that is, for their being ascribed to a relational ontology, an open network of dynamic interdependent relationships.

Deterministic and mechanistic explanations of the phenomena of life are facing a challenge. This is, at the very same time, a major opportunity both for biomedical science and their philosophy (Keller, 2010). Since systemic approaches have been advocated to account for the dynamical and multilevel phenomena of life exhibited by biological systems, scientific models often have emerged in the form of networks of interactions, whose elements acquire a specific explanatory relevance depending on the scientific question. While the emphasis on the choice of questions represents, of course, an important window of opportunity (within which we can explore new paths for the interaction biology, its practice and its philosophy) there is even more at stake. In fact, this epistemic landscape offers to different traditions in the philosophy of life sciences the open space for a dialogue – whose main feature could be the acknowledgement of the need for a rich plurality of perspectives. If natural phenomena can – and maybe *should* – be addressed at different levels, as well as understood through a systemic approach, this implies that we encompass the ontological features of biological systems (and of their regulation), i.e. their entangled, interacting stratifications of levels.

Since the 1970s, scholars as John Dupré and Stuart Kauffman have debated on the potentialities and the epistemological insights provided by the then-growing discipline of systems biology, nowadays in its maturity (Kauffman, 1970; Dupré, 2007). Putting traditions in dialogue means to connect perspectives both in a synchronic and in a diachronic way. Indeed, while philosophers must confront the growing biological (as well as biomedical and biotechnological) knowledge, they also have to confront with contrapositions between different schools of thought in the philosophy of life sciences. The almost “classical” separation between analytic or Anglo-Saxon and another “continental” philosophy is slowly becoming an useless antinomy – while at the very same time biological science and its philosophy advocates for looking at things from a more systemic, global and complex point of view, both in biological practice and in the epistemological reflection upon it. Contemporary philosophy of biology is increasingly committing itself to this quest for integration. And further, it is discovering the deep value of dialogue between historical traditions: with the earlier classical roots of its philosophical origins of course, but also through the rediscovery of several authors from 19th and 20th century. This debate, in all its on-going processes, is assuming the shape and the functions of an *interface*, even more than an intersection, since it provides the construction of networks between philosophers, and of bridges between

the several different point of views we need for our scientific understanding of life. The Monothematic Section of «Acta Philosophica» aims to offer to the readers a glimpse of this bridge-building process.

The first two papers of the Section are centered around the biology of Aristotle, object of a recent renewed interest in the analytical tradition – mostly with the pioneering works of David Balme (1987), Allan Gotthelf and James G. Lennox (1987, 2001). Aristotle's biology, however, has also been a classical concern within the tradition of continental philosophy, which from the Middle Ages on, has paid intense attention to Aristotle in all its facets, including his works of greatest biological philosophical content.

The acknowledgement of this common interest towards Aristotle's work is at the core of the paper by Alfredo Marcos (University of Valladolid), entitled "Living Beings as Differences". Marcos' paper discloses to his readers a philosophical argumentation on how difference, one of the key terms of Aristotelian biology, might be important in the contemporary reflection on life and biology. In the article, Marcos argues that the notion of difference, in addition to connecting the classic, Anglo-Saxon and continental traditions, is crucial to understanding the ontological features of living beings – their individuality and identity – since it is generated precisely by *differentiation*, as it is held by contemporary developmental biology. In order to achieve this goal, his discourse aims to operate a research on two entangled levels. The first is soundly rooted in the historical perspective, and it is concerned with the meaning of the term "difference" (*diaphora*) in the work of the Stagirite. Aristotle thought that living entities *constituted themselves* through and by differences: this idea of an identity derived from differences acts as a *fil rouge* between the classical thinker and philosophers of the 20th century continental tradition. Marcos acknowledges the philosophical role of the term "difference" as a "connective keyword" – that is, an idea able to put in dialogue the origins of the philosophical reflection on life with Deleuze and Heidegger, and nowadays with contemporary developmental biology. But furthermore Marcos – stressing the double meaning of "logical" and "physical" difference accorded to the word by Aristotle – suggests that difference could be the gate for building a bridge between two different way to think the phenomena of life. On these bases, he compares the two main perspectives that deal with them: the *philosophy of life* and the *philosophy of biology*. Marcos' essay underlines how the cooperation between both these traditions is today required, and while his argumentation performs perfectly in describing the new trends in contemporary philosophy of science – if only for reaffirming the reasons to overcome the epistemic obstacles of deterministic and positivistic approaches –, it does more than that. In this way, the reflection on difference directly addresses the epistemological and metaphysical debate, inviting them to a confrontation aimed to overcome the epistemological obstacles of a straight division of perspectives.

Indeed Marcos' paper advocates for laying the foundations of a *new philosophy* concerned with *concrete living beings*, to be seen through a real ontology of difference. But this implies both the acceptance of what is the *dia-pherein* of living beings, as well as what is their obvious characteristic *meta-pherein*: that is, their likeness for analogy, similarity and metaphor – in other words, those very philosophical perspectives that we cannot exclude any more from our scientific effort towards the understanding of life.

Considering the difference as one of the cornerstone for a renewed project in the philosophy of life science is also one of the main points of the work authored by James G. Lennox (University of Pittsburgh), under the title "Aristotle's Biology: Form, Function and Development". In his article Lennox, acknowledging the rise of "neo-Aristotelian" tendencies in philosophy of science, asks himself and his readers «what would a neo-Aristotelian philosophy of biology look like?». The result is an important reflection on some aspects of the *metaphysics of life* that was at the core of Aristotle's unique approach to living beings, whose main feature was the integration of biological form, biological function and biological development (that is, generation).

Instead of considering biological differences as an unclear and vague notion, Lennox shows the richness of the difference as the favourite epistemic instruments of Aristotle's philosophy of biology. Indeed, by a rigorous and detailed analysis of the primary sources, Lennox describes how variations in form – between kinds and within them – constitute Aristotle's inter-nested and multidimensional vision of the relationships between living beings. But the heuristic value accorded by Aristotle to difference in form is needed also for the understanding of functions in the organism, since the similarities and differences in parts and bodies as a whole are «for the sake of performing certain activities and living certain kinds of lives»; and this is also true for the generation – that is, the development of the living beings – in which Aristotle sees the very constitution of the organism, the result of a complex, orchestrated, goal-directed process of "be-come-ing". From this perspective Lennox, in the final part of his contribution, indicates to evolutionary biology and to its philosophy a possible road to explore for overcoming some limits: that is, the rejection of the mechanistic analytical approach to organisms, whose main epistemic obstacle lies in the tendency to think of the living being as a disintegrated, abstract entity, made up of the independent "traits" or "units", to the detriment of its constitutive integrative features of them.

The interview to Jean Gayon (Université Paris 1 Panthéon-Sorbonne) by Anna Maria Dieli highlights another pivotal bridge which needs to be built in the philosophy of living beings: that is, the new allegiance between the history of biomedical sciences and the philosophy of biology and medicine. While the historical dimension of organisms has always been a concern for the epistemological and theoretical reflections on life, there are nowadays several im-

portant reasons to stress again the emphasis on the historical dimension in and of biology. Outside of any presentist orientation, the philosophy of living beings will find at least two advantages if it would adopt a longitudinal and diachronic perspective on the phenomena of life. First, historically informing its reflection, it will gain an empirical benchmark to test the consistency and value of its models, as demonstrated by Gayon himself debating the historical aspects of the evolutionary theory. Second, and maybe most important, such a new “historical philosophy” of living beings could easily demonstrate the meagre consistency of deterministic and purely mechanistic *explananda* – if only by highlighting the constitutive importance of dynamical interactions within and between living beings, which exploit the historical perspective to account for complex emergent properties or behaviours in the living.

The following paper, by Emanuele Serrelli (University of Milano-Bicocca) uses evolutionary biology as an example to reflect on the role of philosophy of science, as well as on the transformations that philosophy is constantly stimulated to undergo in its approaches when dealing with science – especially biomedical. The bridges built by Serrelli’s reflection develop themselves on a vertical perspective, rather than on a horizontal one, since the author underlines how the intellectual movements within evolutionary biology – the various calls for “synthesis” that have been appealed in the recent past of biological science – express metascientific values. Here the philosophical ideas play a pivotal and fundamental role, which is in turn a continuous appeal to a close dialogue between epistemic and scientific methods, not limited exclusively to those coming from biomedical sciences. From this perspective, the attention to scientific *practice* leads philosophy to meet and complete the scientific approach to life phenomena. Serrelli suggests – that is, what is at stake in the philosophical reflection on science – is to imagine metascientific views that account for a deep interdisciplinary approach, in order to avoid partiality, subjectivity and superficial impressionism in describing the scientific community, its practices and its goals. Serrelli accounts also for the naïve myth of “data-driven” research, especially in this field, as well as for other complex themes that call for a serious and always dynamical philosophical reflection on scientific practice – from which could stem several potential benefits, encompassing issues as education and training, research lines in laboratory setting, to navigate career development, to connect specific researches to broader contexts, and to make policy decisions on research funding and reward, all in order to make the field advance for the better.

Finally, integration is again one of the main themes resonating through the thematic bibliography provided by Anna Maria Dieli (University of Rome “Tor Vergata” – Université Paris 1 Panthéon-Sorbonne), dealing with the recent developments of the debate on individuality in biology. On this philosophical issue, aimed to overcome the constraints posed by the identity be-

tween the concept of biological unit and that of unit of selection, it has been gathered a wide literature in recent years. The proposed selection of volumes traces the shape of the most interesting contributions to this debate, and it underlines again how the idea of individuality as a complex and dynamics organization has nowadays found a central place in the philosophical reflection on (and in) life sciences. Dieli chooses to focus on four nexus, carefully selected amongst the constellation of issues revolving around the debate on individuality. They are the philosophical dimensions of individuality, the issue on the different levels of individuality in biological sciences, the relationship between individual and development, the analysis of the levels of individuality through pathology (i.e. cancer) and, finally, the very rejection of the concept of “biological individuality” in favour of the acknowledgement of the living as a hierarchy of processes (Dupré, 2012). From the essay review by Dieli, it emerges that the definition of what a biological individuality should be must account for the levels of organization of the living beings. These are characterized by constitutive and hierarchical interactions of their parts, which in turn define the parts identity. This seems to suggest again that, rather than looking for a unique and uncomfortable definition of individual, we should adopt a perspective aware of the relational ontology of levels that seems to characterize life (Bertolaso 2013). This, Dieli concludes, «will allow understanding how each level is the result of relations among underlying parts», highlighting and confirming what the other authors of this issue believe crucial for the development of a new philosophy of life sciences.

In conclusion, it is worth to note how the contributions we have gathered in this Monothematic Section overtly converge in underlining the two-folded role of diversity and integration. On one hand, they represent the trend topic of contemporary biology and of its philosophy; on the other, they also provide some precious clues towards the realisation of what is perceived as the main goal of this debate – that is, the construction of epistemological bridges between traditions and perspective, quite analogically with the acknowledgement of the value of complexity in biological systems. Indeed, for our attempt to understand the phenomena of life in its complexity and on different aspects (as it is the case for one of its close filiation, namely “biodiversity”: see Valera and Bertolaso 2016), it is required that we take into account the living beings not by a single, unique and exclusive perspective. Rather we should try to elaborate an all-encompassing approach, open to redefine its own boundaries and categories.

The common hope is that, by such a dialogue between different philosophical traditions and epistemic positions, it could emerge a scientific account of living beings fully aware of how much a richness of perspectives is needed – that is, if we really want to account for their multi-dimensional features and metaproperties, whose interaction constitutes what we call and experience,

in continuous wondering, as “life”. Biological and medical sciences – whose major goal still remains to provide adequate accounts of explanations for the phenomena of life – need a deeper understanding of the role of causal notions in order to overcome mereology and to encompass the complex, holistic and ecologic dimension of life. The debate is still at its climax, and several argumentations will be needed in order to make a new philosophical consciousness of biomedical practice emerge. However, since what is at stake here is the possibility to shape the contours of a very new way to understand biology both in theory and practice, it would be too simplistic to dismiss the dialogue between philosophical and scientific disciplines as a mere luxury. For all these reasons, we aimed to bring to the readers’ attention, by the contributions we have selected and edited for this Monothematic Section of «Acta Philosophica», how a new philosophy of living beings is shaping itself in the contemporary dialogue within and between scientific practice. Of course, as it is usual in dialogue and in life as well, it is not clear what scientific path will be opened by these efforts. Nevertheless, today there is a real possibility for a shift towards a new multiplicity of theories, models and scientific facts, all of these crossing their trajectories to converge in a new human understanding of life itself – and the Monothematic Section the reader is about to meditate is our humble and little effort to this patient, constant and growing act of bridge-building.

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