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Hegel's Philosophy of Biology? A Programmatic Overview

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Abstract

This paper presents what we call 'Hegel's philosophy of biology' to a target audience of both Hegel scholars and philosophers of biology. It also serves to introduce a special issue of the *Hegel Bulletin* entirely dedicated to a first mapping of this yet to be explored domain of Hegel studies. We submit that Hegel's philosophy of biology can be understood as a radicalization of the Kantian approach to organisms, and as prefiguring current philosophy of biology in important ways, especially with regard to the nature of biological organization, the role of teleology in biological explanation, and the relation between life and cognition.

I. Introduction

The concept of life is a key concept of classical German philosophy as a whole and it would be reductive to think of it only in biological terms. The attention to the notion of life in the post-Kantian debate has a critical function with respect to all forms of dualism that have marked modern philosophy: those between soul and body, thought and world, and therefore, of course, spirit and nature. Life is, in fact, for post-Kantian philosophers, an embodied soul or an animated body, a mind that is never entirely separated from nature.

From the very beginning of his philosophical quest, Hegel's work presents itself as a 'philosophy of life', that is a philosophy that must do justice to the multiform experience of life, without falling into the abstract image provided by the intellect (*Verstand*), where the dynamism and vitality (*Lebendigkeit*) of concrete reality gets lost.

The concept of life finds its specific treatment both in the critical writings of the Jena period, in the *Phenomenology of Spirit* (in particular the parts dedicated to Self-Consciousness and to Observing Reason), the *Science of Logic* (where Life is described as the first form of the Idea), the *Philosophy of Nature* (where it occupies the third part, Organic Physics) and in the *Philosophy of the Spirit* (where it comes to

the theme especially in Anthropology, but touches also on the Objective Spirit and the Absolute Spirit).

The question at the origin of this paper, and the issue of the *Hegel Bulletin* it introduces, however, is whether it is possible not only to talk about Hegel's philosophy as a philosophy of life (which would be obvious) but whether it is possible to find in Hegel a 'philosophy of biology'.

Philosophy of biology established itself as a discipline in the 1970s with the work of authors such as Marjorie Grene, David Hull and Michael Ruse and grew to prominence in the following decades as an independent field in philosophy of science, concerned with the philosophical issues of evolutionary biology entering the 1990s as a fully equipped discipline with its own companions, journals, and scientific societies.

What does it mean to talk about a 'Hegelian' philosophy of biology? The use of such terminology might be deemed improper for at least two different orders of reasons. A *historical* order of reasons concerns the development of biology as a proper science in Germany, which in recent years has become the object of renewed scholarly attention (Gambarotto 2018; Zammito 2018; Steigerwald 2019). Peter McLaughlin (2002) has stressed that despite the term 'biology' having already appeared in the writings of Wolffian natural philosopher Michael Christoph Hanov (*Philosophia naturalis sive physica dogmatica*, Halle, 1762–1768), the concept of biology as we understand it today, identifying a general science of living beings, emerged simultaneously in Jean-Baptiste Lamarck's *Considérations sur l'organisation des corps vivants* and the first volume of Gottfried Reinhold Treviranus's monumental *Biologie, oder Philosophie der lebenden Natur für Naturforscher und Aerzte* (1802–1822), in 1802.

When Hegel was composing those parts of the system in which 'biological' notions play a role—the part dedicated to the 'Organics' in the unpublished Jena's system projects (1802–1806), the chapter 'Observing Reason' in the *Phenomenology of Spirit* (1807), the sections 'Objectivity' and 'Idea' in the *Science of Logic* (1816) and the third part of the *Philosophy of Nature* (1817, 1827, 1830)—'biology' as a proper science was just taking its first steps, and was well away from the established science it would become after Darwin. In these writings, Hegel does not even use the term 'biology' [*Biologie*], preferring the expression 'organic physics' [*organische Physik*] instead.

Yet a historical defence of our use of the term 'philosophy of biology' in relation to Hegel is available. As Charles Wolfe and Cécilia Bognon-Küss have recently argued, philosophers, physicians and naturalists did not wait until the theory of evolution by natural selection was available to start asking questions about the nature of the living in general: by contrast with the natural order described by the 'new physics' of the scientific revolution, the 'scandalous' character of life was a lively topic of discussion at least since the debate between Leibniz and Stahl. In this sense, our approach to Hegel's 'philosophy of biology' is justified

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within the framework of what has been defined as a 'philosophy of biology before biology' (Wolfe 2019; Bognon-Küss and Wolfe 2019).

The second, *philosophical* order of reasons concerns instead the fact that Hegel's treatment of organisms displays an 'ontological edge' that is largely absent from the landscape of current philosophy of science. Although philosophy of biology does not always share the prejudice towards metaphysical issues that has often characterized the philosophy of general science (cf. e.g., the debates over the notion of biological individuality or the problem of species), a decidedly ontological approach such as the Hegelian one may appear in many ways alien to the way in which the philosophy of biology is understood today.

Francesca Michelini (2012) has emphasized that Hegel develops a 'metaphysics of life', i.e., as a philosophical conceptualization of the ontologically distinctive aspects of the 'living' as a general philosophical category. This feature of his treatment of organisms is shared with the general context of Romantic *Naturphilosophie*. For example, Schelling, using a method of transcendental deduction, attempted to establish a metaphysical foundation for the theories found in the works of naturalists like Johann Friedrich Blumenbach and Carl Friedrich Kielmeyer (an attempt not essentially dissimilar in nature to the one we find in Kant's *Metaphysical Foundations of Natural Science* with regard to Newtonian mechanics). These metaphysical foundations concerned notions like development, organism, organization and purposiveness, all belonging to the conceptuality inherent in emerging biological science.

A defence of our use of the term 'philosophy of biology' with respect to Hegel is also available on philosophical grounds. For the kind of 'ontological' questioning characteristic of his project is only apparently absent from contemporary biological theorizing. We may think, for example, of questions concerning major transitions in evolution (Maynard Smith and Szathmáry 1995), biological individuality (Pradeu 2012; Bouchard and Huneman 2013; Lidgard and Nyhart 2017), or the species problem (Richards 2010).

Furthermore, among those who aim to criticize the scientific framework that currently dominates evolutionary biology, the so-called 'modern evolutionary synthesis' (MES), references to 'Germanic' conceptual models are livelier than ever. A paradigmatic example was Stephen Jay Gould's and Richard Lewontin's idea of a structural *Bauplan* (a concept borrowed from 'Romantic' transcendental morphology) inherent to biological development (Gould and Lewontin 1979). More recently, Scott Gilbert and Sahotra Sarkar (2000) have argued that Kant's 'organicist' view of organisms should in fact be understood as a precondition of contemporary developmental biology, while complex systems theorists like Francisco Varela and Stuart Kauffman have portrayed Kant's critique of teleological judgment as the template for biological self-organization and autonomy (Kauffman 2000; Weber and Varela 2002).

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The interest in organisms and their development has produced a vast array of literature on Kant's 'philosophy of biology' (Zumbach 1984; McLaughlin 1990; Ginsborg 2001; Kreines 2005; Quarfood 2006; Zammito 2006; Breitenbach 2009; Huneman 2007, 2008; Van den Berg 2014; Goy and Watkins 2014 to cite just a few). Yet, while the *Critique of Judgement* is generally considered a fundamental turning point in the conception of organisms, references to Hegel on this topic are rare, or rather non-existent. This is perhaps due to the critiques of *Naturphilosophie* in the second half of the nineteenth century, which were responsible for a lasting prejudice against the philosophy of nature in general, and Hegel's in particular. In his book on the history of natural philosophy, for example, Edward Grant explicitly excludes 'discussions about nineteenth-century *Naturphilosophie*, associated with the names of Schelling, Fichte, Hegel, and others' (Grant 2007: xii).

The recent 'Hegel renaissance' in Anglophone philosophy, led by post-Sellarsian philosophers Robert Brandom and John McDowell along with Sellars-inspired Hegel scholars like Robert Pippin and Terry Pinkard (Corti 2014, 2018), has so far not extended to a revision of this negative view of Hegel's philosophy of nature (with the exception of Pinkard 2012, which has contributed to starting the revision in Anglophone scholarship). At present, only a few studies have examined Hegel's philosophy of nature (Illetterati 1995; Houlgate 1998; Stone 2004; Rand 2007, 2017; Furlotte 2018), a still smaller number addressing his philosophy of biology directly (Michelini 2012; Illetterati 2014; Rand 2015). Annette Sell (2013), Luca Illetterati (2019), Stefania Achella (2020) and Karen Ng (2020) have focused on the relevance of the 'logical' concept of life and have shown that it plays a constitutive, systematic role in how Hegel conceives of the activities of reason and thought.

The German-speaking literature on the topic has focused either on historical contextualization (Breidbach 1982; von Engelhardt 1986), on conceptual reconstructions wholly within Hegelian systematics (Hösle 1987; Wandschneider 1987; Spahn 2007) or finally on the concept of life as the basis upon which notions of autonomy, self-determination, and therefore of freedom, obtain their foundation and meaning (Khurana 2017).

The aim of the present special issue is to counter the long-lasting negative preconception of Hegel's philosophy of nature, opening a conversation about the theoretical potential of Hegel's philosophy of biology. We submit that Hegel's philosophy of biology can be understood as prefiguring current philosophy of biology in important ways, especially with regard to the nature of biological organization (Moreno and Mossio 2015), the role of teleology in biological explanation (Weber and Varela 2002; Mossio and Bich 2017; Cooper 2018), and the relation between life and cognition (Thompson 2007; Deacon 2011; Gallagher 2017).

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In the remainder of this paper, we provide some general background for this claim. In Section II we emphasize the relation between Hegel's understanding of biological purposiveness (in opposition to Kant's) and current criticisms of the MES. We argue that these calls can ultimately be understood in terms of a 'dialectical turn' in contemporary biological theory—a turn vocally advocated by Lewontin since the 1980s, and for which Hegel can provide a consistent philosophical counterpart. In Section III we provide a general overview of 'Hegel's philosophy of biology', based on the three sections of his 'Organic Physics', namely: the geological organism (III.i), the modular architecture of plants (III.ii), and animal organisms as living subjects (III.iii). In Section IV we sketch how Hegel's philosophy of biology provides us with the theoretical framework we need to overcome challenges emerging from the so-called 'question of naturalism'.

II. Teleology and the 'dialectical turn' in biology

The central concept that runs through both the Kantian and Hegelian philosophy of biology is that of teleology, and it is in many ways around this core concept that the actuality or outdatedness of these two perspectives is played out.

According to Kant, in order to comprehend the peculiar organization of living beings we have to assume a teleological framework of explanation and turn to a model of causality that is not efficient but final causality. The problem, according to Kant, is that considering something natural to be characterized by a purpose seems necessarily to presuppose a 'supernatural mind', some sort of intelligence at the origin of that organization and purposiveness. The Kantian strategy to avoid such a 'super-naturalistic' outcome is to think of this purposiveness not as something that actually belongs to natural organized entities, but as a way through which we understand them. In this sense, we can say that for Kant teleological judgment is no more than a heuristic tool to make sense of vital organization, without considering it as a constitutive feature of biological systems.

According to Hegel, Kant's focus on the concept of purpose is one of the most profound contributions made in the entire critical philosophy. But at the same time, in his view, the way in which Kant understands the concept of purposiveness provides evidence of the narrowness of Kantian philosophy. Hegel's great challenge is precisely that of thinking about the teleological structure of organisms without being trapped in Kantian 'projectivism', in which teleology is simply a 'regulative principle'. In this sense we can speak of Hegel as advocating a 'naturalization of teleology'.

For Kant, teleology can only be understood through the metaphor of intention and, when applied to nature, is to be understood merely as a projection of human cognition. Rediscovering the Aristotelian understanding of purposiveness,

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by contrast, Hegel separates the notion of purposiveness from the idea of 'conscious intention', considering it rather as an intrinsic property inherent to biological organization itself.

In a similar way, theoreticians have recently begun to argue that development in organisms should not be understood as the mere execution of a 'genetic program' but rather as a dynamic interplay between organism and environment, a point explicitly made e.g., by 'developmental systems theory' (Oyama 1985; Gray, Griffith and Oyama 2001). The same dynamic interplay is emphasized, with regard to evolution, by niche construction theory and ecological perspectives such as 'Eco-Evo-Devo' (Gilbert, Bosch and Ledón-Rettig 2015). These phenomena point to a dialectical interrelation between organism and environment, an aspect with regard to which Hegel's perspective can prove to be especially fruitful.

The early advocate of such a dialectical and ecological approach was Lewontin. In 'The Organism as the Subject and Object of Evolution', Lewontin argues that from the perspective of the Modern Evolutionary Synthesis (MES), the organism is a pure object acted upon by 'internal' and 'external' forces. The former are genes, whose variation is random and on which the organism has no influence. The latter are environmental pressures which act on this random variation, again without the organism having a say at any stage of the process. Evolution is thus understood as a relation between genes and environment, while the organism is relegated to the role of a mere '*medium* by which the external forces of the environment confront the internal forces that produce variation' (Lewontin 1985: 88).

Richard Dawkins (1976) was perhaps the most outspoken promoter of this view and deeply embedded in the fundamental framework of the MES, for which the individual organism has ultimately no evolutionary significance beyond being a carrier of genes and a token of a population facing environmental challenges. This view was strongly criticized by Stephen Jay Gould and Richard Lewontin in their landmark paper (1979). On his part, Lewontin argues that 'the organism cannot be regarded as simply the passive object of autonomous internal and external forces; it is also the subject of its own evolution' (1985: 89).

Drawing on Lewontin's pioneering work from the mid-80s, we submit that recent calls for an 'Extended Evolutionary Synthesis' (EES) can be unitarily understood together as a call towards a 'dialectical turn' in biology. We submit that the clash between MES and EES—or, in Kantian terms, the clash between design and self-organization—turns out to involve a larger question concerning a fundamental ontology of life, occupied with how we understand organisms to work and what we take them ultimately to be. This question is implicitly addressed, e.g., in Levins and Lewontin's *The Dialectical Biologist* (1985), yet this book itself remains a manifesto of a philosophical research programme at best, while the

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implementation of that programme from a philosophical point of view remains largely unaccomplished.

A striking example of this unfinished situation is the current understanding of the teleological nature of living organisms. On this issue, thirty years after Levins and Lewontin's manifesto, a dialectically-inclined philosopher of biology like Denis Walsh points out that while on the one hand 'organisms are fundamentally purposive entities', on the other hand 'biologists [still] have an animadversion to purpose' (Walsh 2015: ix).

What we face here is a clash between the scientific image to which biology is called to adapt, one that recognizes mechanism as the sole acceptable explanation, and the manifest image of the organism as an intrinsically purposive entity, which biology cannot give up. In this sense, we could say that, as far as its relation to teleology is concerned, biology stands precisely at the crossroads between scientific image and manifest image, and that this boundary position endows it with rich philosophical potential.

We suggest that it is precisely for this kind of questioning that Hegel's philosophy can provide helpful insights. Such helpfulness does not mean that this philosophy will provide specific solutions to the problems of contemporary philosophy of biology, nor that Hegel 'anticipates' what has been developed two centuries later. We rather believe that a historical perspective is a crucial resource for the philosophy of science, because it provides an archive of lost theoretical alternatives with the potential to open up innovative solutions to contemporary issues (Gambarotto and Illetterati 2014; Gambarotto 2019).

This 'combination' of historical and theoretical perspectives requires a twofold move: (1) on the one hand, to use the language of contemporary philosophy of biology to clarify and at least partially 'translate' concepts from Hegel's 'organic physics', which would otherwise remain unproductive if expressed in the obscure language of Romantic *Naturphilosophie*; (2) on the other hand, every time we encounter a form of 'resistance' to our intended theoretical translation, we should question whether that resistance is related to historical contingency, i.e., Hegel relying on theories that have been proven wrong (e.g., Hegel's controversial relation to the idea of 'evolution'), or whether that resistance in fact raises compelling questions for our mainstream biological theories.

A good example of this is Hegel's understanding of animal organisms as living 'subjects', which points to an understanding of 'subjectivity' as a biological category that is absent from our contemporary biological vocabulary. As we will point out in the following section, this understanding of organisms as 'subjects' is perhaps one of the most innovative aspects of Hegel's philosophy of biology, productively bringing together various streams of contemporary biological thought.

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III. Hegel's philosophy of biology: an overview

Hegel's organic physics is subdivided into three parts which are entitled by Hegel as follows: A. Geological Nature, B. Plant Nature and C. Animal Organism. Thus in Hegel's titles the term 'organism' appears only in relation to the third part, the one devoted to animals. And in fact for Hegel it is only in its animal form that the organism is really such, and it is therefore only in the consideration of the animal's way of being that one can understand the way of being of 'organisms' in general. This focus on the animal does not prevent Hegel from speaking of a 'vegetal' and even 'geological organism', but in his view neither the plant nor the earth ultimately actualizes the concept of organism per se.

Here we intend to point out some traits of Hegel's organic physics that display a peculiar originality with respect to contemporary biological theories: Hegel's treatment of the Earth in terms of its being a 'geological organism' (III.i); the peculiar ontological features he attributes to plants (III.ii); and his approach to the concept of the animal organism in terms of living subjectivity (III.iii).

III.i. The 'geological organism'

Considering the Earth in organic terms, so that it is, in Hegel's words, 'shape, or the universal type of life' (*PN*: §337),[1] is in many ways consistent with the scientific framework of his time. As is well known, the science of the earth has been intertwined with the life sciences since the beginning of its modern development. The great debate on fossils—which is related to the question of the history of life on earth and therefore to the progressive discovery of what has been called 'deep time' to indicate the disproportion between cosmological and geological scales of time and the scale of human history (Gould 1987; Rudwick 1992)—had a decisive influence on the birth of modern geology and is in many ways a debate inherent in the life sciences themselves. An example of this are both the investigations of Cuvier, who can be considered the founder of vertebrate palaeontology, and those of Lamarck, whose idea of evolution has research on fossils as its basis (Rudwick 1997). But there is also something more to Hegelian consideration of the earth in organic terms.[2]

First of all, the geological organism is the condition for something like life to actually be given: 'The land, and to a greater extent the sea, are therefore the real possibility of life' (*PN*: §341). What we call the biosphere today, namely that portion of the Earth's crust, water and atmosphere that is able to accommodate life, for Hegel necessarily falls, as a precondition for life, within the scientific consideration of the living.

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Secondly, the geological organism, although not properly alive—'the primary organism, in so far as it is initially determined as immediate or implicit, is not a living existence' (*PN*: §338)—can be considered as something organic, because it is, we might say today, a sort of 'macro-ecosystem', an 'ecosphere' governed by a relationship between the parts in such a way that the modification of a part always implies the modification of the whole. If for Kant the organized products of nature are those 'in which everything is end and reciprocally a means as well' (*CPJ*: §66, 247–48/376), the Earth is an organic system because its parts are precisely in a relationship of reciprocity with each other such that 'the thing which is on the one hand designated as an effect nevertheless deserves, in ascent, the name of a cause of the same thing of which it is the effect' (*CPJ*: §65, 244/372).

To think of the Earth in organic terms—even though it is a lifeless organism—means to think of the earth as a holistic structure, a kind of superorganism in which all its constituents participate in the stability of the system, in a process similar to the process of self-regulation that characterizes living beings. Thinking of the earth as an ecosystem means therefore thinking of the earth not trivially as the background within which life takes place, but as something intimately related to life: in a line of thought that leads to something similar to the Gaia hypothesis (Lovelock 2000 [1979]) or system ecology (Kitching 1983), it involves thinking of the Earth as an eco-systemic structure largely self-regulating and integrating all living beings and their relationships.

However, what needs to be clearly emphasized is that to think of the earth in organismic terms does not mean to think of the earth as a 'living' organism. The criticisms that the Gaia hypothesis met were often linked to this specific element that risked leading to forms of panpsychism. Hegel does not endorse a hylozoistic representation of the cosmos like those of the Renaissance, which enjoyed so much attention within Romantic philosophy and natural science. For Hegel, the Earth is only 'the corpse of the living process' (*PN*: §337), 'the crystal of life' of an 'inanimate [*totliegende*] being' (*PN*: §341), but at the same time it is not something other than life, because it is not indifferent to the possibility of life.

The Earth is a system, a holistic structure that stands on interdependencies and not a mere aggregate. In this sense, as stressed by Wendell Kisner (2014), Hegel's account of the Earth as a 'lifeless organism' might thereby sharpen the debates about the Gaia hypothesis by differentiating between explicitly living (autopoietic) systems such as living cells and implicitly living systems like the earth.

III.ii. The 'modular' structure of plants

The first true living form within Hegel's organic physics is the plant. The plant for Hegel, unlike that *skeleton of life* that is the earth, is truly alive, and yet for Hegel even the plant is not an organism in the fullest sense of the term. In what sense does the

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plant not fully realize the structure of the organism? For Hegel, the organism is essentially the processual unity of different functions that are articulated in different members. The organism is, in Hegel's language, a 'concrete unity', i.e., a unity that is articulated in difference, a unity of specialized parts that act as such only within the organic whole. Coherently with this 'strong' conception of the organism, it is evident that the parts, if separated from the whole of which they are parts, cease to be anything properly organic, and fall into the 'mechanical' and 'chemical' domains.

The plant does not realize this concept of the organism because its articulation in parts is not yet a subdivision into differentiated members, but is rather 'one in which it comes forth from itself, and falls apart into several individuals' (*PN*: §343). The parts in the plant, rather than being members of an individual, are therefore themselves individuals: 'The singleness of the whole individual is simply the basis of these, rather than a subjective unity of members; the part-bud, branch, and so on, is also the whole plant' (*PN*: §343). Parts are in plants not properly 'organs', but rather semi-autonomous 'modules'.

In short, in the plant there is not that differentiation of parts and functions that makes the organic unity a *concrete unity*. The parts and functions are in many ways interchangeable, in the plant: '*the differentiation of the organic parts* is merely a superficial *metamorphosis*, and that one part can easily assume the function of the other' (*PN*: §343). This interchangeability means, for Hegel, that the plant is not, in the proper sense, an individual entity and precisely because it is not an individual entity it is not even, in the proper sense, an organism. The individual is such (*in-dividuum*) only when it is a totality that cannot be divided without losing its distinctive qualities.[3] The plant is not an individual because it is not indivisible, because its parts are not parts, but replicas of the same individual of which they are parts, that is, they are themselves individuals. In this sense, Hegel would agree with plant 'neurobiologist' Stefano Mancuso, who argues—recovering an idea that had already been put forward by Goethe and by Erasmus Darwin—that plants must be conceived more as a colony than as an individual:

> In plants, no single part is essential; and, in fact, the structure is mostly redundant, made up of repeated modules that interact with one another and that in certain conditions can even survive autonomously. These characteristics make plants very different from animals and more like a colony than an individual. (Mancuso and Viola 2015: 125).

The most distinctive trait of the plant for Hegel is this *indifferentiation*. In the plant, in fact, the processes in which life is articulated (the process of formation, the process of assimilation and the genus-process) overlap each other. This *indifferentiation* also manifests itself, according to Hegel, in the fact that in the plant there are no

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highly specialized organs: a plant's functions are not related to organs. The functions in the plant are widespread and this derives precisely from what Hegel defines as its *immediacy*. Somehow what Hegel highlights in the plant is what today we tend to call the *modular structure*, or even its *modular architecture*. Modular organisms, instead of making the multicellular unit itself larger and more complex, 'bud off more units of that multicellular form, in an open-ended way and a way that preserves some degree of autonomy for the parts, metabolic and/or reproductive' (Godfrey-Smith 2016: 785).

In this sense, plants, like some marine organisms such as salps and siphonophores, are what Darwin called *composed entities* 'where in some respects the individuality of each is not completed' (Darwin 1839: 128). A plant is a modular organism because it is made up of repeating modules:

> While animals have evolved to concentrate almost all their most important vital functions in a few organs such as the brain, lungs, stomach, and so on, plants have taken into account the reality of being easy prey, and avoided concentrating their faculties in a few neurological areas. (Mancuso and Viola 2015: 34)

This means that in the plant, unlike in highly specialized organisms, such as animals, 'each part is important, but none is truly indispensable' (Mancuso and Viola 2015: 34).

Hegel reads this immediacy within a hierarchical perspective as a kind of incompleteness, as a less developed and more backward stage compared to the completed organism, i.e., the animal. On the other hand, current approaches to plant signalling and behaviour that have recently led scientists to talk of 'plant intelligence' (e.g., Baluska and Mancuso 2007; Trewavas 2014; Baluska et al. 2018) give us reasons to question Hegel's 'zoo-centric' approach to the organic world and what has been called 'vertebrate bias' or even 'organism syndrome', in which an unjustified exemplary value is attributed to the organic structure of vertebrates (Borghini and Casetta 2019). Yet even within this somewhat biased perspective, Hegel brings to light fundamental features of plant life, features which remain relevant (and are in fact been currently addressed by the most state-of-the-art biological research) even beyond Hegel's hierarchical image of the organic world.

III.iii. Towards a theory of living subjects

Over the last decade several prominent biologists have questioned whether evolutionary theory needs a 'rethink' or 'extension' (e.g., Pigliucci and Müller 2010; Laland et al. 2014). From a philosophical perspective, the most important aspect of this shift is the move from considering organisms to be passive objects of environmental pressures to seeing them as subjects of their own evolution (Walsh 2015).

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As previously mentioned, this view was first advocated by Lewontin, one of the earliest critics of 'ultradarwinist' views, who called for a 'dialectical biology' that would redefine organism and environment as two mutually co-determining poles.

In his pioneering essay, Lewontin suggests that organisms not only *materially* alter the environment with which they interact (through niche construction) but also do so *cognitively*, engaging and constituting their environment by processing and incorporating information: 'organisms determine which elements of the external world are put together to make their environments and what relations are among the elements that are relevant to them' (Lewontin 2000: 51).

While such cognitive agency has been partially incorporated into the framework of the EES (Laland, Odling-Smee and Feldman 2000; Jablonka and Lamb 2005), it has been the central focus of the research programme in cognitive science known as 'enactivism'. First formulated in the early 1990s (Varela et al. 1991), this programme is currently being developed in multiple directions (Ward et al. 2017). In his seminal book, Varela argued that 'Neo-Darwinism is to evolutionary theory what cognitivism is to cognitive science' (Varela et al. 1991: 185), since both conceive of the organism as a passive object—of environmental pressures and sensory stimulations, respectively. The enactivist approach to organisms as 'living subjects' was controversially epitomized in the description of a bacterium swimming in a glucose gradient as 'going to get dinner' (Varela 1997; Kauffman 2000).

Hegel's treatment of the 'animal organism' constitutes perhaps the first philosophical instance of such an enactivist understanding of biological organisms as 'living subjects'. The animal organism is for Hegel 'an *impregnated* and *negative* unity, which by relating itself to itself, has become essentially *self-centred* and *subjective*' (*PN*: §337). The concept characterizing the domain of animal organisms is thus that of *subjectivity*, a notion used and defined by Hegel first in the philosophy of nature, before appearing as a key concept of his philosophy of 'mind' (*Philosophie des Geistes*). This fact per se marks a strong break with the Kantian transcendental understanding of subjectivity as defined by abstract cognitive structures, and develops the idea, sketched for the first time by the young Schelling, of 'nature as subject' (Grant 2006).

The animal is a subject, according to Hegel, because it is a structure of unitary and centralized organization of a plurality of parts that, although they each perform one or more specific functions, find their focus in the unitary structure that makes the animal an individual. The animal is therefore a subject in so far as it is a *concrete unit*; not just a formal unit like that of the plant, where the parts of the individual are themselves individuals, but rather a unity that is 'realized in difference', i.e., a unity whose parts, if separated from the whole, would lose their specific organic meaning and cease to be what they are. In this sense the animal is a subject because it is an *individual* in the proper sense of the term, namely because it has in itself the principle of its own unity.

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A further sense in which the animal is a subject, according to Hegel, relies on the concept of autonomy: since the animal is a concrete and self-centred unit, it develops a form of autonomy that reveals itself as a process of emancipation from mere 'natural dependencies': 'It is here therefore that gravity is first truly overcome, for the centre has been filled, has itself as object, and has therefore initiated its true being-for-self' (*PN*: §350A, 103/430). The animal is no longer directly dependent, like the plant, on natural powers that are external to it. The animal is a natural being that frees itself from natural constraints. Being a subject means therefore for Hegel to be a centre of autonomous action, that is, to be a structure that acts on its own behalf.

This side of subjectivity is evident for Hegel in the fact that animals are the only natural forms capable of local self-movement. Being capable of self-movement means for Hegel to be capable of overcoming the control of externality and to self-determine according to its own location, but also its own needs and 'reasons'. That means that for Hegel, the animal is not moved, as happens in the plants, by an external element like sunlight; as a centre of *agency* the animal moves from itself—the movement originates within the organism itself—and towards a goal that has its own 'raison d'être' in the organism itself.

Expressed in contemporary terms, this *natural agency* 'consists in the agent's capacity to marshal its causal resources in a manner that brings about the reliable attainment and maintenance of an end state' (Walsh 2018: 173). To say, as Hegel does, that the animal moves from itself and always in the direction of its own realization, is to say that the animal is characterized as an activity having its purpose in itself and that it is an agent whose action is rooted in a peculiar form of natural normativity. And it is this form of independence that makes animals in a certain sense *autonomous* and capable of an ancestral form of *self-determination* (cf. Khurana 2017).

Yet this self-determination is intrinsically connected to a sense of lack, which turns into need. The need is precisely the feeling of lack and at the same time the drive to take it away, to deny it, to find in the environment what can suppress the sense of incompleteness produced by that lack. For Hegel, the activity of life is always an activity that arises from lack. This means that if a living being had no needs or deficiencies, it would no longer be a living being. *Any living organism*, regardless of its size or complexity, needs to demolish and reconstruct its constituent materials through its metabolic activities: assimilation, transformation, and elimination. The constant exchange of matter and energy with the environment are the traits that determine the persistence of the living organisms: 'They cease to exist when their material constitution ceases to change' (Walsh 2018: 168).

At an even more articulated level than those we have seen so far, the animal is subject, for Hegel, as it is able—unlike the other kind of organisms—*to feel* the lack, and it is an activity that develops from this feeling of lack. One could perhaps

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express these dynamics with the idea of Hans Jonas, according to which the organism is characterized by a *needful freedom* (Jonas 1966: 80), where freedom is precisely the capacity of the organism, of organic subjectivity, to react autonomously to the state of need.

A living being is in constant transformation, in a process in which the organism acts on itself and on the external world to continue to be itself in transforming itself. Its being characterized by a process that develops in response to a sense of lack (*die Tätigkeit des Mangels*) is what differentiates the living being from inorganic matter, which is always identical to itself.[4] A lack that in the plant acts without being felt, which is instead felt by the animal and which is then totally re-determined, but never disappears, within the spiritual world.

Deficiency, for all that is living, is not simply a weakness that can be overcome. The lack that characterizes the living being is not to be understood as the absence of a piece that prevents the system from functioning. On the contrary, one might say that the system works only as long as the feeling of lack sets it in motion. Deficiency (just like illness and in a sense death itself) is for Hegel an integral part of life.

Summing up: the distinctive trait of the Hegelian treatment of the animal organism is the recognition of it as a subject. The being subject of the animal manifests itself first of all in the fact that it is a concrete unity, that is to say that it is really an individual, a unity of different parts which perform different functions. At a further level the subjectivity of the animal manifests itself in the specific autonomy of the animal, that is in its capacity to move from itself and not be moved by external powers. At a further level the animal is a subject because it has the ability to feel its own self, and in such feeling, to feel first of all as a being that is always characterized by a lack and the urge to overcome it. Being a subject means in this sense, for Hegel, to be an activity produced by the feeling of a lack that is structural to one's being.

IV. Steps to a 'teleological' naturalism

In animal subjectivity, nature, according to Hegel, comes to its most complex and articulated manifestation. It is at this extreme point of its realization that nature reveals a tendency to go beyond itself, a sort of impulse to overcome that strict necessity which, according to Hegel, is the main characteristic of nature as such. What Hegel seems to question here is the dichotomy between *nature* and *freedom*. The structure of subjectivity and the kind of 'freedom' that it embodies do not for Hegel originate outside of nature, but rather results from a dynamics inherent in nature itself. This aspect of Hegel's philosophy of biology has an important theoretical potential not only with regard to biological theory, but also with regard to

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the larger theoretical framework of contemporary philosophical naturalism, to which we now turn.

With regard to the possibility of reading Hegel's philosophy as a form of naturalism, Alison Stone (2018) has stressed how Hegel interpreters divide between those who read Hegel in 'liberal-naturalist' terms (e.g., Pinkard 2012, 2018; Giladi 2014) and those who interpret it as plainly 'anti-naturalistic', i.e., implying explanatory principles that go beyond the realm of material nature (e.g., Gardner 2007, 2011; Papazoglou 2012).

What is interesting, however, is that the respective descriptions of the characteristics proper to Hegel's philosophy are substantially coherent with one another. According to Beiser, for example, Hegel and the Idealists remain naturalists in so far as they believe that organic processes unfold in structured, rationally intelligible, necessary ways—governed by the laws peculiar to organic processes, laws of self-differentiation and self-articulation (Beiser 2005). On the other hand, Gardner explains that while the Idealists saw themselves as pursuing a naturalist project, their position was 'historically revealed to be not "genuinely naturalistic" after all', but to be super-naturalistic by later standards (Gardner 2007: 46). For her part, Stone defines Hegel's philosophy as a form of 'broad' naturalism, i.e., a form of naturalism which stays in the middle of the spectrum that runs from the most naturalistic positions to the most anti-naturalistic.

Without entering into a detailed discussion about the possibility of reading Hegelian philosophy as a naturalistic philosophy or not—a discussion that should take into consideration the different characteristics that a philosophy must have in order to be considered 'naturalistic'—what emerges from what we have defined as 'Hegel's philosophy of biology' is a position that seems, on the one hand, to go towards a *naturalization of the subject,* showing how the features of subjectivity, like autonomy and self-determination, develop primarily in nature, and most consistently in animal organisms. On the other hand, it also involves a radical rethinking of the notion of nature itself, a sort of *denaturalization of nature*. By *denaturalization*, we mean the overcoming of an understanding of nature in terms of 'otherness' with respect to everything that we traditionally attribute exclusively to humans. Denaturalizing nature means freeing it from a reductive conception that reads it in purely physical-chemical terms, and conceiving it instead in terms of goal-directedness and, ultimately, freedom.

Such an approach is based on the idea, common to both Hegel and Varela, that organisms should be understood as intrinsically teleological regimes and that mindedness is fundamentally grounded in this intrinsic purposiveness. In this perspective, what Hegel calls *Geist* is not a different substance compared to nature, because the phenomena of 'mindedness' are fundamentally rooted in the structural organization of biological systems. As Maturana and Varela would put it, 'cognition is a biological phenomenon and can only be understood as such'

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(Maturana and Varela 1980: 7). But this means that nature cannot be read as the pure opposite of 'spirit'. In this sense, the opposition to a physicalist reduction of nature produces in Hegel neither a disembodied conception of mindedness, nor a plain reduction of mind to matter.

Showing the genesis of subjectivity within nature is what allows Hegel to think about the relationship between nature and freedom beyond the dualism between 'concepts of nature' and 'concepts of freedom' he inherited from Kant. If one thinks of the relationship between nature and freedom as a relationship of opposition, subjectivity is something that appears only *after* and *beyond* nature, within social practices and dynamics, or as the irruption of a supernatural principle into the natural order. Our reading of Hegel, by contrast, in no way removes the difference between nature on the one hand and 'spirit', i.e., the domain of reality characterized by 'mindedness' in the full-fledged sense of the term (the one implying, among other things, conceptual capacities, institutions and self-consciousness) on the other, but emphatically marks a radical understanding of 'subjectivity' as a fundamentally biological phenomenon.

V. Concluding remarks

In the present paper, we have tried to sketch some of the main routes through which Hegel's understanding of living organisms and, more generally, his philosophy of nature, can potentially impact current understandings of biological systems —including the mentioned debates over the EES as well as other theoretical discussions over notions of biological autonomy, teleology and cognition—along with our overall understanding of nature as a philosophical category.

Our goal was to avoid both the rhetoric of anticipation that has sometimes characterized the attempts to rehabilitate Hegel's philosophy of nature and the indifference to contemporary debates that often characterizes a purely historiographical-contextualizing approach. What we want to propose is instead a hopefully productive interaction between Hegel studies and philosophy of biology, aware of the radical differences that mark the two conceptual frameworks, but also convinced that the clash between such frameworks can prove fruitful for both the interpretation of Hegel's philosophy and the questioning of contemporary philosophical assumptions on the nature of organisms.

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Notes

[1] Abbreviations used:

CPJ = Kant, *Critique of the Power of Judgement,* ed. P. Guyer, trans. P. Guyer and E. Matthews (Cambridge: Cambridge University Press, 2000)/*Kritik der Urteilskraft*, in *Kants gesammelte Schriften* (Akademie Ausgabe), Bd. 5, Berlin 1913.

PN = Hegel, *Philosophy of Nature*, trans. M. J. Petry (New York: Routledge, 1970)/*Enzyklopädie der philosophischen Wissenschaften im Grundrisse Zweiter Teil* (Frankfurt: Suhrkamp, 1970). After the abbreviation is indicated only the paragraph number. Page number is indicated only if the quotation refers to the Additions (*Zusätze*).

[2] For a discussion of the question of deep time in relation to Hegel's philosophy, cf. Bouton (2018), which shows in a convincing manner how Hegel, unlike Kant, defends in his philosophy of nature a realist conception of time capable of coherently integrating the geological discoveries of his epoch, in so far as they bore on the history of the earth.

[3] The discussion about the notion of the individual in biology is quite extensive: See Clarke (2010); Boniolo and Testa (2012); Huneman (2014a, 2014b); Sterner (2015); Godfrey-Smith (2016); Pradeu (2012); Lidgard and Nyhart (2017); Gilbert (2017); Baedke (2019). According to Hegel, the biological individual is a unitary structure in which its component parts cannot exist outside the relationship to the whole of which they are parts and in which the parts are such that they cannot be separated from the whole without changing its structure.

[4] The expression 'activity of lacking' (*Thätigkeit des Mangels*) is used by Hegel in a fragment entitled *Zum Mechanismus, Chemismus, Organismus und Erkennen* (published as annex in Hegel 1985) to determine the structure of impulse (*Trieb*) belonging to living being. In relation to this text and its value for theory in general and Hegel specifically, see Illetterati 1996.

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