

## Do Organisms Have An Ontological Status?

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ABSTRACT – The category “organism” has an ambiguous status: is it scientific or is it philosophical? Or, if one looks at it from within the relatively recent field or sub-field of philosophy of biology, is it a central, or at least legitimate category therein, or should it be dispensed with? In any case, it has long served as a kind of scientific bolstering for a philosophical train of argument which seeks to refute the mechanistic or reductionist trend, which has been perceived as dominant since the 17<sup>th</sup> century, whether in the case of Stahlian animism, Leibnizian monadology, the neo-vitalism of Hans Driesch, or, lastly, of the “phenomenology of organic life” in the 20<sup>th</sup> century, with authors such as Kurt Goldstein, Maurice Merleau-Ponty, and Georges Canguilhem. In this paper I try to reconstruct some of the main interpretive stages or layers of the concept of organism in order to evaluate it critically. How might organism be a useful concept if one rules out the excesses of organismic biology and metaphysics? Varieties of instrumentalism and what I call the projective concept of organism are appealing, but perhaps ultimately unsatisfying.

KEYWORDS – Organism, organization, holism, mechanism, reductionism, Kant, Goldstein, Varela

### I

What is an organism? There have been a variety of answers to this question, not just in the sense of different definitions (an organism is a biological individual; it is a living being; it is a self-organizing, metabolic system; etc.) but more tendentially, in the sense that philosophers, scientists, natural philosophers, and others have both *asserted* and *denied* the existence of organisms. And of course, the existence or better, the *reality* of organisms is intimately bound up with a host of other weighty matters, such as the emergence of biology as an autonomous discipline and its subsequent efforts to maintain that autonomy; how to account for the *animate* dimension of animate beings, in the absence of a con-

cept of immortal soul and more recent debates both internal to biology and spanning fields such as the philosophy *of* biology, such as the status of genes, populations, ecosystems, and so on. To inquire into the ontological status of organisms, in such a tense and overdetermined field of theories, polemics, and associations is somehow already to seem to take a stand, much like those professional skeptics who never seem to be able to shake off their life-long obsession with the paranormal. That is, if we seek to dispel some of the confusion and categorize some of the different positions on the issue, we are already granting that there *could be* an ontological status of organisms and that the question makes sense.

Disciplinary boundaries are not easy to employ here, because in one generation thinkers used organism as a term directly derived from natural philosophy with the (empirical, experimental) authority that this grants; in another generation it has become something fully conceptual or even ideological, as when Hans Jonas, opposing the world of conscious organisms to the dead world of mechanical nature, insists that “the point of life itself” lies in “its being self-centered individuality.” Jonas calls this “the ontological concept of an individual, as against a merely phenomenological one” (Jonas 1966, 79). Here we are being told not just that organisms exist and we should not deprive them of their reality in favor of molecules, genes, or populations. We are being told that such deprivation is *wrong*, almost morally wrong, which is not so surprising if we consider that historically, the case can be made that organism is initially a naturalistic substitute for soul (in the Leibniz-Stahl debate of the late 17<sup>th</sup> and early 18<sup>th</sup> century). “The history of the concept of organism in the 18<sup>th</sup> century can be summed up as the search, by naturalists, physicians and philosophers, for replacements or semantic equivalents for the soul, which could account for the increasingly well-established fact of the functional unity of a system of integrated parts” (Canguilhem 1989, 551).

Organism is a hybrid concept, located from the outset between different kinds of practices, constantly shifting in between the factual and what one might call the supra-factual. Organisms can thus be metaphysical, empirical-but-used-for-metaphysical-purposes, ideological, or restrictively biological concepts. They can be particular states of matter, or particular types of living beings chosen as experimental objects, like the fruit fly or *C. elegans*, which are model organisms. Worse still, at least for the sake of finding a manageable ontological box in which to fit them, on some definitions “humongous fungi” weighing ten tons, coral reefs, living and breathing termite mounds, or forests qualify as organisms (Turner 2000; Wilson 2007; Bouchard 2009). So even a study limiting

itself to the rhetoric of science would be very large.<sup>1</sup> It is not surprising that a short but insightful study of its history in modern biology called the organism “biology’s phoenix” (Benson 1989).

To sort out the disappearances and returns of this hybrid, “phoenix” concept, even in part, requires a combination of historical and critical analysis. The latter is not exactly identical with the type of analysis practiced by mainstream philosophy of biology, in which the task for the philosopher is indeed a kind of specialized conceptual analysis aiming at clarifying the implications and perhaps consequences of biological claims. So, for instance, a recent and influential definition of the discipline explains that it is “concerned with those biological debates in which conceptual and empirical issues are so entangled that progress demands both scientific knowledge and the tools of philosophical analysis” (Stotz, Griffiths and Knight 2004, 647). I concur with this definition, but wish in addition to *locate* something about the concept of organism and to *critique* it. In that sense I take quite seriously the moral that “biology’s exciting conclusions do not follow from the facts alone” (Sterelny and Griffiths 1999, 5).

The interpretive, conceptual, clarifying, and evaluative task at hand is not then just a matter of drawing subjective philosophical conclusions from an objective scientific set of facts. It involves making (and again, evaluating) ontological claims about the nature of biological entities, which have an irreducibly normative component (in the sense that their activity is interrelated with the norms of such activity). There is a role for the philosopher in discerning what gets to count as “real patterns,” in Dennett’s suggestive phrase (Dennett 1991). But for various reasons, not least the ever-shifting definitions provided by working biologists (embryological, genetic, molecular, ecological, and now systemic), philosophical reflection may benefit in addition from some historical considerations – rather than trying to adjudicate between various aprioristic claims and/or scientific definitions. After all, as Manfred Laubichler noted in a review essay with the endearing title, “The Organism is dead. Long live the organism!” (Laubichler 2000), there have been many histories of the gene and few, if any, histories of the organism (with the above-mentioned exception of Benson 1989, which is intended more as a programmatic statement).

In the next section, I provide a brief overview of the emergence of the term and its episodic history including in the 20<sup>th</sup> century, in order to specify the problem further of what sort of object we are addressing,

<sup>1</sup> See however Schlanger 1971; Schiller 1978 – which is in fact a polemic against the concept of organism despite its historical pretensions – and especially Cheung 2006 and 2010.

which sort of discourse is meant to be authoritative (who owns it), and so on. In section 3, I describe some of the polarizations that have arisen and suggest some basic criteria a theory of organism needs to abide by if it is to be viable. In section 4, I turn to the varieties of mechanistic approaches to organism, including the complexified and organizational approach we owe to Claude Bernard, in contradistinction to the conception of organism as a kind of paramount subjectivity. In section 5, I introduce the distinction between Kant's regulative approach to organism (which, I argue, can be extended through the work of Kurt Goldstein and Daniel Dennett) and the post-Kantian ontologization thereof. I extend this discussion in section 6 and introduce the distinction between *methodological* and *ontological* views of organism, but quickly point out the insufficiency of such distinctions. In section 7, I discuss various conceptions of the unity which is meant to characterize organisms and conclude, in section 8, with some critical reflections on holism and the theory of systems. Overall I argue for some combination of the projective view of organisms (Goldstein et al.) and the organizational view, recently restated by William Bechtel.

## II

If we look at the historical context, the word "organism" emerges in the late 17<sup>th</sup>-early 18<sup>th</sup> centuries, in particular in the debate between Leibniz and the chemist and physician Georg-Ernest Stahl (the author in 1708 of a treatise entitled *On the difference between mechanism and organism*), who was the chief representative of the *animist* position, according to which all animate motions are explainable in terms of the soul (Duchesneau 1998, 335 sq.; Duchesneau 2000). After this one does not find the term much used in our sense, in which it is opposed to machine, until the late 18<sup>th</sup> century. In Diderot and D'Alembert's *Encyclopédie* there are almost no occurrences of the term organism; one finds the adjective organic, dating back at least to the 14<sup>th</sup> century. And in several of its occurrences, organism (*organisme*) clearly does not yet have the sense we associate with it. The article *Fibre* speaks of "the organism or mechanism of these various parts" (Diderot and D'Alembert, 1751-1780, VI, 670) and the vitalist physician Bordeu, in a late work, the *Recherches sur les maladies chroniques* of 1775, speaks in a way we would find strange or confusing today, of the "*organism* of the living body" (Bordeu 1818, vol. 2, 1024).

The technical term in the Enlightenment for physiological structure was rather *organisation*, defined in the *Encyclopédie* as "arrangement des parties qui constituent les corps animés" (Diderot and D'Alembert,

1751-1780, IX, 629b). It is comparable and related to terms such as organized bodies and animal economy, the latter designating both a kind of theoretical approach in medicine and physiology to the living body and that body itself.<sup>2</sup> Even a work filled with teleology and purposiveness like Kant's Third *Critique* does not contain the term organism; it only appears in his *Opus postumum* (see Debru 1980; Huneman 2007; 2010). Kant speaks instead of "organized bodies." Notice, and this illustrates the hybridity of the concept, that the notion is located from the outset at the intersection of philosophical inquiry into the status of living beings (Leibniz, Kant) and properly biological reflection. The existence in addition of a variety of natural-philosophical works in this period, dealing with such topics, by authors such as Francis Glisson, Walter Charleton, Robert Boyle, or Claude Perrault (Wolfe 2010a), does not alter the fact of this hybridity.

Aside from the classical authors mentioned above, philosophers in the 20<sup>th</sup> century have had a certain interest in the concept of organism, especially phenomenologically motivated authors such as Kurt Goldstein, Hans Jonas, and on the other side of the Rhine, Henri Bergson, Gilbert Simondon, and Raymond Ruyer. All these figures argue for such a concept, although in different ways, as I shall discuss below (some, like Goldstein articulate a *projective* view of organism as a construct with benefits, so to speak, while others follow a line consonant with strong vitalism, in which the organism appears, not just ontologically specific but almost transcendent with regard to the rest of the natural world).<sup>3</sup> And there was of course a significant group of biologists in England in the early decades of the century who were equally concerned with organism and holism (Haldane et al. 1918), as well as geneticists who were, curiously enough, followers of Whitehead, including W.E. Agar, who late in his career wrote an entire treatise on organism (Agar 1943). It is worth noting that contrary to what one reads often, including in the brief historical references in most contemporary philosophy of biology (including Gilbert and Sarkar 2000), holism was never intended by any of its early 20<sup>th</sup>-century founders such as Jan Smuts (Smuts 1926) to be synonymous with organicism or

<sup>2</sup> On "organisation" and "organism" see Balan 1975; Figlio 1976; Guillo 2003; Wolfe 2004; Wolfe 2009; Cheung 2010; on the notion of the animal economy in vitalist medicine see Wolfe and Terada 2008.

<sup>3</sup> Ruyer, who in other respects was a significant philosopher, reads like the worst parts of Driesch when dealing with biological matters. He warns the reader that because of contemporary science we must choose between "a generalized 'theory of organism' and the theory of a 'generalized molecule'" (Ruyer 1952, 166). Indeed, he regrets that molecular explanations do away with Drieschian entelechies by reducing embryo development to physicochemical laws (Ruyer 1946, 80). Even Bergson is too mechanistic and Cartesian for Ruyer, in the sense that he had an excessively spatial understanding of the body (Ruyer 1946, 30)!

vitalism, for the simple reason that it seeks to find general organizational laws, inspired by physics, without insisting on the uniqueness of life; it is the thesis of “global dependence.”<sup>4</sup> But of course holism *could* be used to articulate organismic theory and it was. The theoretical point that emerges from this early 20<sup>th</sup>-century historical context is that there are two distinct areas of tension: first, an older but enduring tension between mechanism and organism, in which each of these allows of different degrees of interpretation and, second, a 20<sup>th</sup>-century tension between mechanists (reductionists) and holists. Again, the two can sometimes coincide and form a battery of arguments in favour of organicism.

We are familiar with the story of the eclipse of organism concepts in twentieth-century biology, which has multiple possible causes, ranging from the rise of genetics (from Watson and Crick in 1953 to the Human Genome Project) to the emergence of evolutionary biology in its own right. At first the latter may seem like a more receptive environment for organism concepts, as has been argued in recent decades by various strands of developmentalist theories, but in a very basic sense evolutionary biology tends to combine a supra-organismal level such as populations with a sub-organismal level (genes); the organism no longer has much explanatory force here (Walsh 2010). In addition, faced with the molecularization of biological entities, it is not just that the organism might seem old-fashioned or in need of deflationary treatment. It seems to proclaim by its very name that it transcends the mechanistic, causal world, or equally problematic, that it introduces other forms of causality, such as circular, top-down, or non-linear. This is partly captured in Haldane’s quip which makes it sound like the harmless word organism is in fact the mysterious technical term “norganism”: “but it’s a *norganism*, my dear young fellow, a *norganism* !” (Haldane, in: Huxley 1971, 138). Now, “both scientists and philosophers take ontological reduction for granted . . . . Organisms are ‘nothing but’ atoms, and that is that” (Hull 1981, 282). “Organisms have disappeared as the fundamental units of life. In their place we now have genes . . .” (Goodwin 1994, 1).

<sup>4</sup>So, e.g. Köhler’s Gestalt psychology is a form of holism, in which he tries to model psychological theory on the field theory of Faraday and Maxwell. Of course, there are also contradictory moments such as when the founder of systems biology, Ludwig von Bertalanffy, invokes holism as a total systemic standpoint (again, with no reference to any special status of living entities), but earlier says that it sheds particular light on embryology and how organisms are not mere machines (he refers both to their teleology and their “historical character,” a phrase we also find in Goldstein [von Bertalanffy 1933, 9, 33, 52]). He wrote further essays on organismic theory later in life. In other papers from the early years of systems theory there is also the recognition that the boundaries of a system are subjective. Hence, the boundary between the living and the non-living is not the issue.

At the very least, “the ‘organism’ turns out to be a highly contestable notion” (Sterelny and Griffiths 1999, 173). Yet, organisms are also paradigm cases of individuals and of purposive entities, without either of these notions having to rest on a particular restrictive definition of life versus non-life. The challenge for the philosopher is not just to pick out features of these entities (or conversely, reject the entire idea) but to navigate in between the Charybdis of self-contented molecular reductionism and the Scylla of knee-jerk, biophilosophical anti-reductionism. To inquire conceptually into the ontological status of organisms in this sense includes, as I indicated above, a critical and evaluative assessment of the overdeterminations, vocabulary shifts, and ideological commitments inherent in the notion. The goal is not to locate a *definition* of organism, whether in strict descriptive terms, e.g., as a “self-maintaining, autonomous and physically bounded entity” (Ruiz-Mirazo, Etxeberria et al. 2000, 222), or in more metaphysical terms as “the only type of individual” that combines “functional and self-reproductive identity” at once (Ruiz-Mirazo, Etxeberria et al. 2000, 229); for definitions run the risk of reverting to the form of assertions such as “the organism is essentially self-consciousness” or “the organism is in its essence temporal rather than merely spatial.” Instead, I discuss attempts to describe the category of organism in less definitional terms, either as forms of organization or as forms of projection.

### III

Is it possible to evaluate the value or the legitimacy of the concept of organism? Yes, inasmuch as it expresses a polarization between two visions of what living beings are, which implies, in turn, two visions of human being; that is, two visions of the place of human beings in the natural world and, by that token, two ideological attitudes towards science. In that sense there are not two different sets of concepts, one philosophical, and one scientific. Whenever the term is used in any sense beyond the completely neutral one, e.g. saying how many microorganisms inhabit a given space or which traits contribute to the fitness of an organism (cases in which organisms *per se* are not being distinguished from anything else), it possesses a kind of valuative dimension.

Thus the defender of the *strong* concept of organism, not content to assert à la Heidegger that “science does not think” and end it there, will try and shift the conflict into the territory of science itself, within science itself, and will claim that there should be a science of the organism itself, a holistic science and even a new paradigm (as was frequently proclaimed about chaos theory and then self-organi-

zation<sup>5</sup>) which would overcome or refute the excessively reductionist paradigm due to the Scientific Revolution. In some narratives, including reductionist reconstructions of the history of biology provided by figures such as the biochemist Jacques Loeb (Allen 2005, and for a similar argument from a historian's point of view, Schiller 1978), this paradigm is presented – positively of course – as being subsequently reinforced by the mechanization of the circulatory system with Harvey and Descartes, and Friedrich Wöhler's synthesis of urea in 1828. The latter event signifies the artificial production of organic substance by non-organic components, which rendered invalid the claim that the chemistry of the living body is categorically distinct from that of inanimate bodies (Brooke 1968; McKie 1944). In anti-reductionist narratives at least since Husserl's *Crisis*, the Scientific Revolution is frequently taken as a target for demystifying what should not have been demystified, and thus somehow severing the link between humanity and Nature, thus bringing about both the original explanatory gap(s), the problem of qualia (which, it is true, *is* a Scientific Revolution invention – Galileo's), human alienation and the exploitation of Nature (Merchant 1980).

A less emotional version of this sort of narrative is the theoretical biologist Robert Rosen's assertion that the Newtonian revolution erases the distinction between the organic and the inorganic. All material systems can be analyzed as groups of particles moving in force fields (with the relevant dynamical equations; Rosen 1985, 167). Darwin and especially Claude Bernard would have been surprised to learn that they were working in a scientific context in which there no longer was any distinction between the organic and the inorganic! Faced with this gradual process of mechanization and molecularization, the eminent scientist Niels Bohr claimed, if you want to push the observation of an organism as far as possible from the point of view of atomic theory, you will have to undertake an intervention that kills it.<sup>6</sup> We often encounter the judgment that so-called quantitative approaches lack finesse and miss something crucial about the qualitative dimensions of experience (mind, life, consciousness, etc.); the quantitative approach lacks a "feeling for the organism," to borrow Evelyn Fox Keller's (1983) phrase. Even when Jonas is avoiding overt normative language, he still declares that "waiving the intelligibility of life" (i.e., allowing the third-person descriptions

<sup>5</sup>In Küppers 1990, self-organization is presented as the greatest paradigm shift in science so far.

<sup>6</sup>Bohr 1993, 458a; 1961, 22. On Bohr's anti-reductionism about biological entities see Hoyningen-Huene 1994.



of scientists to trump the fact of human “inwardness”) has the consequence of “rendering the world unintelligible as well” (Jonas 1966, 25).<sup>7</sup>

Whether or not one accepts the verdict of mainstream science that the organism in itself either does not exist or does not matter (both molecular biology and evolutionary biology concur here in denying any inherent reality to the organism<sup>8</sup>), the problem is that most defenses or challenges have something deeply value-laden about them. It is in the name of a certain idea of *value* that one defends a particularity of life or living being. For example, consider the expression, “pro-life!” To that position which says that there is something about life which prior to argument is valuative, that is, normative in a desirable way, one can reply with Nietzsche’s comment in the *Gay Science* that “Life is not an argument. Among the conditions of life might be error” (Nietzsche 2001, § 121, 117), a comment which resonates with the Epicurean, anti-teleological, anti-finalist tradition, but which can also be heard in Darwinian terms. We need to *evaluate this value* in order to see if a certain kind of suspicion towards techno-science, AI, Darwinism, and reductionism in general is fully aware of what it is defending when it invokes the innate value of life or living being (*le vivant, das Lebendige*). In addition, such criticisms generally fail to take account of the obvious fact that Darwinism in almost all its forms is an anti-reductionist discipline or set of disciplines, either because they confuse a debunking dimension – Dennett’s “universal acid” – with reductionism proper, or more confusingly, because they build a narrative of the “Death of Nature” sort (Merchant 1980) and view Darwin as having proposed “mechanisms” of life, hence completing the evil task begun by Descartes and others.<sup>9</sup>

If, at the conclusion of this investigation we still have a useful concept of organism, I suggest it would have to be compatible with the following three conditions.

First, neither the human being nor the earthworm is, to speak with

<sup>7</sup> Anti-reductionist arguments are usually answered either by saying “it works!” (from medical materialism and psychophysics in the 19<sup>th</sup> century to molecular and genetic responses such as Loeb, Crick and Dawkins in the 20<sup>th</sup> century), or by showing how mechanism as a concept and mechanisms as things are more complex and diverse than the antireductionist thinks (Machamer, Darden and Craver 2000; Bechtel 2007; discussed below in § 4). It would be interesting in addition to show that the antireductionist’s history of science is often mistaken (cf. Thomson 1988; Gaukroger 2000; and Wolfe 2010b for possible illustrations).

<sup>8</sup> This maps onto Mayr’s distinction between functional and evolutionary biology; see Pradeu 2010.

<sup>9</sup> This goes hand-in-hand with the philosophically careless statement that Darwin was (for good or bad) the “Newton of a blade of grass” that Kant had said could not exist. That Darwinism is in many ways anti-reductionist or at least at odds with traditional reductionist programs does not however entail Robert Rosen’s claim that “Evolution has come to do for biology today what vitalism did for it previously” (Rosen 1991, 255).

Spinoza, a dominion within a dominion, an empire within an empire or kingdom within a kingdom (an *imperium in imperio*, in Spinoza's phrase from the Preface to Book III of the *Ethics*, in which he rejects the idea of a separate nature), including in the sense in which its interiority, subjectivity or intentionality would *in extremis* come and extract it from cold and inhuman (mechanical) causality. As Canguilhem put it in terms closer to von Uexküll's *Umwelt*, "the environment of man's sensitive and technical values is no more real, taken in itself, than the specific environment of the woodlouse or the gray mouse" (Canguilhem 1965, 154; cf. Wolfe, ms. 2009). Second, if the idea of reducing an organism to its components presents any danger, one would have to show *why*, rather than use the term reductionism as a term of opprobrium. I am not saying that all critiques of reductionism are mistaken. Indeed, below I will briefly try and present Kurt Goldstein's careful and original arguments for his *projective* and *implicative* brand of holism *cum* anti-reductionism. Third, if the organism exists in an entirely physical universe composed of physical elements, it will not be as an entity existing beyond the physical, like a vital force outside of causality. There can be no particular signature of entities like Walter Elsasser's organismic law of the 1960s (e.g. Elsasser 1964, 64; see also Elsasser 1961, 28, 30, 35). This is not to say that there is no "radical inhomogeneity" at "some level of organization" (Elsasser 1964, 54, 63), but such special organizational definitions are precisely the sorts of definitions I suggested I would not treat as viable answers, for categorical reasons.

On the contrary, given these conditions, if we continue to maintain a concept of organism, it would seem that it would have to be in a purely *instrumental* and *relational* sense, although there is something unsatisfying about the purely instrumentalist view, as I shall indicate in closing. When biology explains a phenomenon, what does it do? It seeks to identify the causes thereof and subsume them under *laws*. In a universe supposed to be exhaustively governed by the laws of physics, reduction is associated with the possibility of reducing the laws described by biology to the laws of physics and chemistry. The biologist could continue to speak of organisms or genes, but merely as conventional or instrumental terms. They belong (on this view) to an already superseded ontology. The question for the philosopher of biology would be, is this entity real or not? The instrumentalist position denies the essential existence of an entity apart from the physical universe and insists that the ontological commitments of a science are conventional. I will accept this instrumentalist *proviso* but will try and to give it a slightly more operational meaning. That is, if the organism cannot claim to have a privileged status, as in the renewal of Aristotelianism hoped for by some (for example, Marjorie

Grene<sup>10</sup>) and if the organism cannot claim to be the basis for a holistic science, the goal of which is to defend some value of living being faced with artificiality (cloning, biotechnology, and the like) or mechanization, than it can still have an existence other than the limbo to which it is condemned in molecular biology.

For instance, one can argue for a concept of organism as possessing its own historicity or temporality, which was expressed by Merleau-Ponty in very Goldsteinian terms as the *corps propre*, i.e. the type of private, ineffable relation i can have to my body which is not the same as the scientist's relation. Patricia Churchland has wittily challenged, not the existence of such relations but rather their uniqueness, pointing out in perfectly embodied fashion that we can claim to have a first-person, privileged relation to *all sorts* of physical things, including our stomach and bowels, in a state of "awareness of visceral circumstance" (Churchland 1988, 282). Similarly, as regards ineffable subjectivity, Bill Lycan notes that while it may be true that "I can refer to my pain using a concept that no one else can use to refer to my pain," and a bat (in a well-known example) can also "refer to its sonar sensation using a concept that no human could use," it does not however follow "that the bat knows or understands a *different fact*" (Lycan 1990, 121). The ontological status of organisms and debates about qualia, explanatory gaps, and the hard problem are less far removed than they might appear (this similarity at the level of subjectivity and inwardness is in addition to better-known shared problems such as the role of functions and teleological explanations, see Kraemer 1984). More recently Varela has also insisted on a kind of irreducible first-personness, under the influence of Merleau-Ponty, with a newer emphasis on the project of a "first-person science."<sup>11</sup>

However much some elements of this phenomenological interpretation provide interesting material on how organisms construct their worlds, I would also advocate a healthy suspicion towards this reinvestment by phenomenology, inasmuch as in this discourse organism seems to serve as an excuse to reiterate anti-naturalistic points about the subject or subjectivity. There is an anti-naturalist war machine in this tradition, launched by Husserl, perpetuating the old stiffness of the Cartesian *cogito* faced with the world of nature: "it is only when the mind ceases to naïvely turn towards the outside and returns to itself, in order to dwell

<sup>10</sup> Contemporary calls to return to what is called an "Aristotelian" perspective on nature over and against a perspective inherited from the Scientific Revolution include Jonas 1966; Grene 1968; Kass 1999. Kass is a prominent bioethicist who calls Jonas "[his] first real teacher in philosophical biology" (Kass 1995, 4). Changeux makes a helpful comment on the absurdity of trying to "return" to Aristotelianism in science in Changeux and Ricoeur 2002, 206-207.

<sup>11</sup> Varela and Shear 1999; for useful criticisms of the idea of a first-person science see Dennett 2001.

in itself, purely in itself, that it can be self-sufficient” (Husserl 1970, 297; translation modified). The extreme form of this insistence on subjectivity and the opposition between flesh and body is Merleau-Ponty’s sacralization of the living organism, when he equates the sensation of an embodied being to a mystical communion with divine presence (Merleau-Ponty 1962, 212). Of the figures we shall discuss, neither Goldstein nor Varela share this extreme, almost mystical way of presenting the organism. However, Varela retains this old insistence on the sovereignty of the individual over and against what he perceives as an impersonal evolutionary process.

I maintain that evolutionary thought, through its emphasis on diversity, reproduction, and the species in order to explain the dynamics of change, has obscured the necessity of looking at the autonomous nature of living units for the understanding of biological phenomenology. Also I think that the maintenance of identity and the invariance of defining relations in the living unities are at the base of all possible ontogenic and evolutionary transformation in biological systems. (Varela 1979, 5)

Goldstein has moments where he speaks of the organism’s life as somehow out of ordinary time, reaching an almost eternal state of self-creation. It is clear that if such theories are to be pertinent in a broadly naturalistic sense, we need to add – aside from additional philosophical translation – Darwinian constraints on Goldstein or Varela’s sheer positivity of organism. The organism is not a solitary, self-creating artist! Here the need becomes clear for a dialectical, interactionist vision of organism which is Darwinian-compatible and for that reason not so solipsistic, along the lines of Lewontin’s view that, “The environment is not an autonomous process but a reflection of the biology of the species. Just as there is no organism without an environment, so there is no environment without an organism” (Lewontin 1983/1985, 99).<sup>12</sup>

#### IV

To see how one might arrive at this understanding of organism, it is helpful to look historically again at how the notion appeared. It was

<sup>12</sup>Lewontin’s “dialectical” and Oyama’s “interactionist” theories of organism and environment as systems are by no means the same, but they are frequently discussed together and for present purposes serve as “flagbearers” of various movements to remove the organism from its Romantic solitude and consider it as one of many interacting entities (but without, conversely, reducing this process to a dematerialized, holistic theory either, as I discuss in closing). I am grateful to Thomas Pradeu for past conversations on these topics.

against the background of, or in contradistinction to, the notion of *machine*. The mechanical philosophy – Boyle, Hobbes, and Descartes but also iatromechanism as a research program in physiology and medicine, with figures such as Giorgio Baglivi and Hermann Boerhaave – rested on the notion that natural phenomena result from interactions between material particles governed by the laws of mechanics. This enabled the formulation of laws of motion and the invention of particular mechanisms (from clockwork to Vaucanson’s mechanical duck), the latter allowing one to explain particular phenomena. Baglivi stated in 1696 that he wanted to carry out a program which would demonstrate that “the human body is nothing other than a complex system of mechanical and chemical motions obeying mathematical laws” (Baglivi 1696, I, xi, §§ 6-7). In an equally influential 1703 lecture – explicitly entitled “The Usefulness of the Mechanical Method in Medicine” – Boerhaave stated with even more ontological surety that “the human body is in its nature the same as the whole of the Universe which is open to our view” (Boerhaave 1703/1983, 96).

What is curious is that biology – the science of life – emerges in this period. Biology is constituted *for* and *by* a mechanical, mechanistic model which is itself blind to the concept of life. Of course, the very fact that this model, or family of models, was so productive might lead one to suspect that the model was not so blind!<sup>13</sup> This point has been nicely brought to light, specifically with regard to the Paris Académie des Sciences, by Salomon-Bayet (1978). The Académie was set up to investigate natural phenomena on a mechanistic, Cartesian basis and yet from the outset its own reports, on natural history, physiology, and anatomy (including the famous “querelle des monstres,” see Wolfe 2005) contradicts that basis in all sorts of ways. Similarly, if one looked closely at La Mettrie’s famous *L’Homme-Machine* of 1748, one would find out that it is not really very mechanistic, at least in the traditional sense; that is, it aims at locating some of the physiological mechanisms particular to living, organic beings (Thomson 1988) without thereby eliminating all specifically organic properties in favour of mechanical ones (Wolfe 2010b). More than a century later, Claude Bernard stated that scientifically “we

<sup>13</sup> That the opposition between machines and organisms or mechanism and teleology is much less obvious than it appears, even in the early modern period, is a topic that goes beyond the scope of the present paper. Consider Boyle’s “hydraulic-pneumatic” model for the human body (and his defence of final causes); even Cartesian mechanistic physiology, far from denying the existence of goal-directed processes, was in fact replete with functional language, e.g. when discussing the circulation of blood and the motion of heart. The Cartesian point (following a suggestion in Gaukroger 2000) is not that bodies actually are machines (an eliminativist view) but rather that the structure and behaviour of bodies are to be explained in the same way that we explain the structure and behaviour of machines (a reductionist view). See also Wolfe (2010a; 2010b).

are right to treat the organism like a machine,” but he immediately introduces a somewhat puzzling distinction. We are “mistaken when we treat it as a *mechanical machine*, fixed and unchanging.” Rather, “the organism is an *organic machine*, which possesses a flexible mechanism, thanks to special organic processes which exist therein; but these do not transgress any of the general laws of mechanics, physics or chemistry” (Bernard 1937, cit. in Canguilhem 1989, 552).

Physiologists such as Walter Cannon, theoretical biologists such as Francisco Varela and philosophers such as William Bechtel have, in their respective ways, each promoted this Bernardian concept of an “organic machine” (as a homeostatic, autopoietic, or organizational whole comprised of micro-mechanisms) and, indeed, we have here a rare case where the historical and the conceptual complexities seem to cohere, around the status of “mechanism” (weak or strong), “mechanisms” (as pluralistic) and “mechanical models” (as essentially heuristic). The core insight derived from this is that *a mechanical model is nothing else than a heuristic model designed to explain something about the object which ‘organicists’ seek a monopoly on, namely Life*. Recent work on mechanism, like recent reevaluations of *organisation* or “animal economy,” tend to blur the divide between the two concepts.<sup>14</sup> Mechanism, Bechtel suggests, can provide an adequate account of organization (a more structural word for organism) by “placing as much emphasis on understanding the particular ways in which biological mechanisms are organized as it has on discovering the component parts of the mechanisms and their operations” (Bechtel 2007, 270). There is an important dialectical relationship between the mechanistic explanatory programme to study (by reduction, modeling, and componential analysis) the structures at work in organisms and the organicist (vitalist, holist) standpoint which minimally “remind[s] mechanists of the shortfalls of the mechanistic accounts on offer” for ideas such as “negative feedback, self-organizing positive feedback, and cyclic organization are critical to explaining the phenomena exhibited by living organisms” (Bechtel 2007, 296-297).

Vitalistically inclined figures such as Bichat and Bernard, in Bechtel’s argument (to which one can add the Montpellier vitalist Barthez a generation earlier), usefully formulate challenges to the mechanistic model (without, one might add, offering any foundationalist ontological rejection of it). Indeed, it is a characteristic trait of all these thinkers to reject their predecessors as “vitalists,” obviously in a pejorative sense, and also target earlier (iatro-)mechanists such as Baglivi or Boerhaave for not

<sup>14</sup> Machamer, Darden and Craver 2000; Bechtel 2007; Wolfe and Terada 2008, §§ 4-6. For a contrary view, reiterating the value – scientific and philosophical – of the opposition, see Gierer 1996.

fulfilling their scientific obligations. Théophile de Bordeu, a prominent Montpellier vitalist physician, complained explicitly about the obscurantism of some his teachers in his 1775 *Recherches sur les maladies chroniques*. “We used to ask . . . what this vital principle that was responsible for night and day (*qui opère le blanc et le noir*), and governed that which was opposed to it” (Bordeu 1818, vol. 2, 972). But a short time later, Cuvier includes Bordeu amongst the culprits. Stahlism, he claims, was taken on in modified form by the Montpellier vitalists “in addition to the contradictions and metaphysical obscurity generated by a purported local sensibility without perception, which all these physicians found to exist in particular organs, and some still maintain, one can also reproach them for over-using [the notion of] what they termed the *vital principle*, using this occult entity quite vaguely, in order to attribute to it all the phenomena they found difficult to explain” (Cuvier 1810, II, 232). The point is not just that vitalists frequently have to define themselves over and against vitalist predecessors, who they have to portray as being overly metaphysical and lacking experimental backing for their ideas, it is also that this rhetorical complexity is part of the nature of concepts such as organism or organization. Both are meant to explain the special features of living organisms, while also being concepts open to the mechanist (for further discussion of this sort of rhetorical tension surrounding terms like vitalism, see Oyama 2010).

An interesting point raised by Ruiz-Mirazo, Etxeberria et al. (the juxtaposition of the two points is mine, not theirs; Ruiz-Mirazo, Etxeberria et al. 2000, 231) is that organism may not be a necessary or necessarily interesting organizing point for biological inquiry, inasmuch as some biological fields will simply not need to make use of the concept. At the same time, it is a kind of primitive which cannot be reduced to its components, even if these are construed as mechanisms (which might be construed in the above sense of homeostatic wholes composed of various micromechanisms). Indeed, for every “uniquely biological concept” such as homeostasis (whether we take this as a merely empirical concept or in its more hypostatized form as a kind of ontological marker of life), there is a deflationary and mechanistically specifiable concept that will match it, such as H. Ross Ashby’s “homeostat.” But this should not entail that we dispense with all properties of organisms in favour of the properties of familiar machines. Rather, following intuitions of Boerhaave, La Mettrie, and Bernard, mechanisms, organization, and organisms should be understood more dialectically as *interrelated* concepts.

In sharp contrast to this vision in which organisms are real but not categorically separate from mechanisms or, put differently, that their reality is organizational rather than somehow essential to the extent that a

degree of interpretation (of projection, of heuristics) is incorporated in the concept of organism, we find the vision of organisms as paramount, embodied *subjectivities*. One must note that this is both equally compelling and equally congenial to common sense on some definitions (Dennett has written at great lengths about the feeling we have that “someone is home” when we are faced with a human, an animal, or a particularly mobile intentional agent of the robot variety) and has been espoused by a variety of important thinkers, as I indicate below. That does not mean it is a good argument or a satisfactory picture of what organisms are.

When Kant famously declares that there will never be a Newton of a blade of grass (“it is absurd for human beings . . . to hope that perhaps some day another Newton might arise who would explain to us, in terms of natural laws unordered by any intention, how even a mere blade of grass is produced,” Kant 1790/1987, § 75, 282-283), or when Leibniz insists that the difference between a machine of nature and an artificial machine is that a machine of nature, a living being, is a machine to infinity, they are both clinging to the idea of an invisible *inside* or *interiority* which constructions and reconstructions cannot grasp.

Moreover, by means of the soul or form there is a true unity corresponding to what is called the SELF [*moi*] in us; such a unity could not occur in artificial machines or in a mere mass of matter, however organized it may be; such a mass can only be considered as an army or a herd, or a pond full of fish, or like a watch composed of springs and wheels. (Leibniz 1695/1978, 482)

This closely resembles the view known as “agent causation” in action theory and moral philosophy more broadly. Just as the above descriptions of what a living agent (organism) is, stress that its unity is derived from a particular type of selfhood or internal unity, versus the “masses” or “aggregates” encountered in physical nature overall, theorists of agent causation insist that acts flow from an agent in a way completely different to, and unexplainable in terms of, the causal processes at work in the rest of the natural world. Agent causation was a prominent view in action theory starting in the 1960s and is sometimes traced back to Thomas Reid, but an early practitioner is in fact the Cambridge Platonist Ralph Cudworth, insisting in his posthumous treatise on free will that the soul exercises “hegemonic” control over itself: “ye whole Soule Redoubled upon it Selfe, which being as it were within it Selfe, and comprehending it Selfe . . . hath a *Sui potestas* over it Selfe, and can command it Selfe or turne it Selfe this way and that way” (Cudworth 1838, § X, 36). The organism as subjectivity is very much this self “redoubled upon itself,” which cannot be grasped by any componential analysis.

In contrast, the artificialist position points to the heuristic dimension



of a mechanism as being built so as to see what's inside it (in the sense articulated by the physicist William Thomson: "I am never content until I have constructed a mechanical model of the object that I am studying. If I succeed in making one, I understand; otherwise, I do not;" Thomson 1884, 270; Cassirer 1950, 115). Obviously, an organism construed in *instrumental, relational* and *projective* terms is not so far removed from such a mechanism. Does this prevent the biologist or the philosopher of biology from articulating laws of life? Not really. The specificity of life can be treated in functional terms, rather than arguing for a special *substance* (substantial vitalism). One can conceive of a *functional vitalism*, as Barthez (1806) did, using a Newtonian analogy. Call the vital force an X, an unknown, and that will allow me to formulate laws specific to living beings without making any ontological claims as to this force. To be precise, Barthez overtly says he will analyze the something that differentiates living bodies from dead bodies *like one analyzes the 'unknown quantities' of the geometers*: "The thing found in living beings which is not found in the dead, we shall call Soul, Archaeus, Vital Principle, X, Y, Z, like the unknown quantities of the geometers. We only need to determine the value of this unknown, the assumption of which facilitates and shortens the calculation of phenomena" (Barthez 1806, vol. 1, 16). The idea is that the relevant biological property will be treated in the way that Newton treated gravity *epistemologically*, as "a (provisionally) inexplicable explicative device" (Hall 1968, 14).

We might recognize in this functional vitalism a basic insight of functionalism in the philosophy of mind. But just as an *interrelated* concept of mechanism and organism allows one to retain a dimension of embodiment when dealing with mechanisms, and a dimension of structural or componential analysis when dealing with organisms, similarly, the defender of functional vitalism will still be preoccupied in explanatory terms with the fact that the systems she studies are alive, embodied in a particular kind of matter (Wolfe and Terada 2008). With respect to systems theories (a diverse family in which holism and functionalism can both be found), one must be careful not to leave out the matter.

## V

In more purely conceptual terms, there is no *a priori* criterion that allows one to distinguish a living being from a non-living being, whether the integrity of the organism, its self-regulation (homeostasis), or metabolism (selected by Hans Jonas as a crucial distinguishing feature of organisms). After all, the defining claim of cybernetics was to have produced working models of just such features, rehabilitating purpo-

sive concepts without any vitalist overtones).<sup>15</sup> These features are always *post facto* observations, starting from within a temporal process. In that sense, the relation between living and non-living, organism and machine, is an *empirical* relation, which does not allow one to claim qualitative differences between laws of nature. As Rosen says, “there is as yet no list of tests, characteristics or criteria we can apply to a given material system that can decide whether that system is an organism or not;” “the decision as to whether a given system is an organism is entirely a subjective, intuitive one, based on criteria that have so far resisted formalization” (Rosen 1985, 166-167).

In other words, given that the science of life is founded on mechanistic concepts which in and of themselves deny the specificity of life (even if these concepts or models, like Vaucanson’s duck, are also heuristic models of the complexity of living systems), its construction of a boundary concept called organism is necessarily *a posteriori*. What this entails is that any kind of strong (ontological) vitalism, strong claim about organism, essentialist-substantialist view, will be based on what is at best a heuristic fiction, which is not a problem (Wolfe 2006).

The term “heuristic fiction” refers to the Kantian point concerning organism as a *regulative principle* (instantiating the idea of a natural purpose), a point reiterated in different ways by Goldstein and Dennett. Kant is extremely cautious about the possibility that “nature as a whole is an animal,” a giant organism, as it were. It does indeed help to support the hypothesis of the purposiveness of nature, but if we really believe it to be true we fall into a circle since we are attributing to nature properties we know in organized beings but can never know if nature possesses these properties itself (Kant 1790/1987, § 73, 276). Epistemologically, the point one can derive from Kant, Goldstein, and Dennett is that in order to be able to understand an entity we need to project certain features onto it. But these features should not be held to be constitutive of certain regions of the real. Organism in this Kantian vein is a regulative ideal in the sense that it is something posited as necessary for our intellects to be able to grasp a nightingale or an orang-outang as intentional agents. It is not a statement about the properties of the real. Much work has been done in recent years on Kant’s ideas and their significance for contemporary philosophy of biology (see Huneman 2007). The emphasis here is that for Kant, organism is a “reflective” construct rather than a

<sup>15</sup> Wiener explicitly focused on Cannon’s idea of homeostasis when defining what he called “negative feedback” (Keller 2008; 2009); hence Ashby’s choice of the term “homeostat” (Ashby 1948). Current cognitive science even discusses “homeostatic plasticity” in robots (Barandirian and Di Paolo 2010).

“constitutive” feature of reality, and reflective judgments are “incapable of justifying any objective assertions” (Kant 1790/1987, § 67, 259; § 73, 277).<sup>16</sup>

In the shift from Kant to Goldstein and Dennett, what is new is that it is *the organism itself* that is being credited with this *projective* capacity. It has also been argued that the similarity between Kant’s regulative idea and Dennett’s intentional stance (Dennett 1987) indicates that Dennett’s naturalism fails, or is inadequate (Ratcliffe 2001). As I indicate below, I think the idea that we – along with other animals – are projectors, as it were, should not spell the end of any naturalistic project, except perhaps 1950s behaviorism. Dennett’s intentional stance idea is meant to account for

the ability of animals to make reliable predictions about the behavior of others given their complete ignorance of the biological mechanisms that govern behavior. Since we ordinarily have no access to the internal mechanisms governing the behavior of our fellow creatures, we must adopt . . . the *intentional stance* towards them. [This] is a strategy that begins with the assumption that other animals (including people) tend to pursue outcomes that serve their interests and that they have been equipped by natural selection with suitable perceptual and cognitive capacities . . . (Symons 2002, 43)

In the case of Goldstein, there is more of an emphasis on the organism as a producer of intelligible totalities, as a system which actualizes itself and thereby enters into an adequate relation to its environment (Goldstein 1995, 325). But in both cases there is a sense that our cognitive or perceptual make-up is necessarily organismic, and, indeed, its being so contributes to our aptitude for survival. In contrast, the genuinely Kantian view is not a description of any part of nature itself. It is, depending on the context, an *epistemological* view but is also a *projective* concept of organism.

Hegel and Schelling abandoned this Kantian self-limitation in their philosophies of nature as organism. Schelling described the organism as “the perfect mirror-image of the absolute in Nature and for Nature”

<sup>16</sup>Of course the posterity of Kant’s ideas in biology has little to do with his own strictures on how to approach organic life. Not only were the self-limitations of the critical philosophy ignored or deliberately reversed by Romantics, Naturphilosophen, Idealists such as Hegel and Schelling (Huneman 2006) but Kant has also served as a source of new biological ideas (including self-organization) repeatedly in the later 20<sup>th</sup> and early 21<sup>st</sup> centuries (e.g. Weber and Varela 2002), in ways he would not have approved of. Even Konrad Lorenz was part of this trend, contributing an essay to the *Yearbook of the Society for General Systems Theory* on how to interpret Kant’s notion of the a priori and the categories in the light of contemporary biology. Lorenz argues that the categories and our structures of perception overall are evolutionary adaptations of our nervous system to pressures of the real, natural world (Lorenz 1975).

(Schelling 1988, 51). For Hegel and Schelling, the task of writing a philosophy of nature is in large part in order to articulate a philosophy of organism, as a cosmic principle, an account of the universe itself as organic. To illustrate this tension, one can think of Goethe's story in *Poetry and Truth* (chapter IX), in which he describes his excitement upon ordering d'Holbach's *System of Nature*, because of its title, which for Goethe implied an animate, pantheistic universe; when it arrived, he was horrified at this "dark and cadaverous work."<sup>17</sup> Goethe stands for philosophy of nature as an attack upon mechanistic and quantitative science and its principle. He had mistakenly thought the *System of Nature* belonged to his intellectual family. This fits quite symmetrically with his response to Kant: "the *Critique of Judgment* fell into my hands and with this book a wonderful period came into my life" ("The influence of modern philosophy", cit. in Huneman 2006, 665). Judith Schlanger says nicely that Goethe "overevaluated organicity as individual life" (Schlanger 1971, 108).<sup>18</sup>

For different reasons, but always motivated by a certain concept of organism, usually buttressed by certain empirical claims (about embryo development, metabolism, or just the sovereignty of human beings in the natural universe, notably because of their particular mode of awareness or inwardness), the same ontologization of organism occurs in Driesch, Jonas, and those who favor a revival of Aristotelianism. While Jonas (and differently, Varela) are making claims about individuality and self-awareness, Driesch's argument for the uniqueness of organism via entelechies is the classic case of scientific concepts that have been oddly hypostatized. While his experiments had shown that perfectly normal organisms could develop from embryos which had suffered from severe injuries produced by the experiment – thus, whole organisms resulted from abnormal growth conditions – Driesch derived from this the consequence that since the "formative power" at work is not interfered with by division, separation or displacement, "it must be a 'something' without spatial character and to which no definite position in space can be assigned."<sup>19</sup> This was an entelechy.

Others (e.g. Schlick 1953, but also unexpected figures such as Bakhtin, see Bakhtin 1992) have pointed to the mistakes in scientific reasoning here. I only wish to emphasize that Driesch is one of a variety of figures

<sup>17</sup> Goethe, *Dichtung und Wahrheit*, XI, in Goethe 1887-1919, pt. 1, vol. 28, 69.

<sup>18</sup> On the shift from regulative ideals to the ontologization of organism and/or vital force, see Larson 1979; Richards 2002; Reill 2005; for more on this aspect of Kantian thought cf. Huneman 2007; 2010.

<sup>19</sup> Driesch 1908, I, B, "The Foundations of the Physiology of Development": "Experiments on the Egg of the Sea-Urchin."

for whom the reality of organisms is an essential fact, including in the sense that it flows from their essence. The mistake that concerns us here is that of turning potentially significant facts about embryo development into ontologically irreducible features. Where Driesch posits an entity that actually does not exist, the entelechy, Jonas makes the same kind of mistake, but on the basis of features that do exist, such as metabolism and homeostasis. This is basically what D'Arcy Thompson criticized Haldane for: "The alleged phenomena of self-production, self-maintenance, and self-regulation are the common currency of those who, finding the mechanistic theory difficult and unsatisfactory, are content to postulate a something 'which interferes with and guides the physical and chemical reactions'" (Thompson, in: Haldane, Thompson et al. 1918, 12). This form of "ontologization" is to be opposed to the *projective* view of Kurt Goldstein (just as it is to Kant's view).

## VI

One can distinguish, then, between a *methodological* (the functional view, or what Goldstein calls constructivist and I call projective) vision of organism and an *ontological* vision of organism (the ontologization of organism against which Kant argues).<sup>20</sup> However, I will not be content with reiterating this opposition, for both of these familiar positions suffer either from being impoverished or over-nourished. The methodological view is closely tied to the instrumental conception of biology and even more closely tied to functional conceptions, which run the risk of leaving out the *matter* in which systems are realized entirely. And the ontological view tells us too much; it should be possible to argue for an ontological status of organisms, e.g. in Bernardian realist terms, without being committed either to entelechies, contemplative inwardness, or eternal life.

In the 20<sup>th</sup> century, the ontological vision is espoused variously by figures including Driesch, Jonas, and Ruyer. This tension between a methodological, constructivist view and an ontological, essentialist view also runs through a good deal of biological thought. For instance, the methodological vision is compatible with functional vitalism. The Vienna Circle critique, beginning with Schlick, targets Driesch for not respecting the causal closure principle. Rather than being content with this response to the vitalist, my projection of intentional traits onto X serves

<sup>20</sup> This distinction unwittingly, but fittingly mirrors the first two out of three in Ayala's distinction between methodological, ontological, and theoretical reduction (Ayala 1974), although the latter would probably find an analogue in programs such as systems biology (one can imagine correlating "homeostatic property clusters" of different kinds of organismic wholes, real and simulated).

an evolutionary purpose, rather than treating X as a mass of molecules. Hence, in this way the Kantian-Goldsteinian view can be augmented in Darwinian fashion, in which the capacity of certain types of embodied agents to project organismic features onto other agents would reflect some part of their evolutionary history. This Darwinian dimension additionally allows for an approach to organisms other than the once-omnipresent non-reductive physicalism. It does not force one to hold that higher-level entities such as tigers and buttercups are constructs while the entities of physics are somehow more real (sometimes instrumentalist arguments rely on a kind of lazy sophism gesturing towards a physicalist ontology, from which one gains little; cf. Wilson 2006).

When drawing distinctions between two ways of viewing the concept of organism, it is important to note that Goldstein himself can be read both ways. On the one hand, he defends a strong, Goethean-ontological view he calls holistic and, on the other hand, he articulates a heuristic/methodological perspective as an approach to the brain-damaged patient's reconstituting of a personal unity.<sup>21</sup> Goldstein points empirically to the fact of the property of our brains to construct unity or totality as a normal state, but also in response to abnormal situations. But he also *ontologizes* this into a property of the organism that somehow removes it from the world of causality and mechanistic natural science. However, he wants to go on calling this biology. Is he a vitalist? Clearly, not in the sense of Driesch. And his concept of organism is not a self-production in the sense of a strong vitalism, since it is an interplay or debate (*Auseinandersetzung*) between internal needs and the environment (his fundamental biological law [*biologisches Grundgesetz*], which Goldstein sometimes equates with Wertheimer's *prägnanz* or *pregnanz* law in *Gestalt* psychology, even if he also expresses caution about applying the laws from one field to another and thus does not think one can directly have a *Gestalt* biology [Goldstein 1995, 285]). However, contrary to Pavlov or Sherrington, Goldstein's holism describes behavior, not in a localized sense as a reaction to an event in the environment, but as a function of organic totality, or even a kind of biological *a priori* that the organism always strives to achieve or attain (hence his frequent reference to actualization and self-actualization), as an individual norm. There is something metaphysical here. The position defined as instrumental, methodological, constructivist, or above all, projective, benefits

<sup>21</sup> Much of Goldstein 1995 is devoted to the problem and remains one of the major works on the topic. The first 2 chapters discuss empirical cases of brain-damaged patients in the process of rebuilding a sense of a unified world; chapters 9 and 11 are particularly devoted to biological theory (parts and wholes, organic hierarchies, etc.).

from insights drawn from the more methodologically oriented side of Goldstein's account. (No work that I am aware of brings out these two dimensions in Goldstein, certainly not the discussion of holism; Canguilhem's own philosophy of life, inspired by Goldstein, comes closest.<sup>22</sup>)

At this point a word of clarification is in order. It may seem as if I have presented an opposition between two views, a strong and a weak view of organism, and shown how the strong view is committed to various kinds of anti-naturalistic and perhaps solipsistic tenets which make it difficult to embrace as a view of organism consonant with our "best knowledge" of biological practice. While this may be true, the problem then remains as to what the weak view is and if there is only one. Indeed, if we turn to weak theories of organism, there is something very appealing about the *instrumental* view (organism is a useful concept inasmuch as it captures some of the empirical material we need to work out, but it can be discarded in favour of any other pragmatically useful concept; very much a *functionalist* view) and what I have called the *projective* view is partly related to this. The projective view, holds that organism is something we project onto the world, a kind of construction of intelligibility. It is then an *epistemological* version of the concept of organism, admittedly with a Darwinian twist when Dennett (partly anticipated by Konrad Lorenz, see Lorenz 1975) suggests that higher organisms *need* to be able to project what Goldstein would have called organismic totality onto certain types of agents, minimally for survival reasons, to which one could add various accounts of sociality, Machiavellian intelligence, and the like. But none of these views give us any purchase on realist notions of the organism as they existed – without metaphysical underpinnings – in the work of major figures in the history of biology, such as Claude Bernard. If we need such systems to make our theories come out right, then there is a sense in which organisms are part of our ontology, whatever the molecular stance may be.<sup>23</sup>

## VII

If the organism does not exist as such, there is no use in crying "reductionist!" in the face of de-naturing instances like cloning or prostheses! Much as Claude Bernard had stated that "there is only one physiology,"<sup>24</sup>

<sup>22</sup> Canguilhem explicitly credits Goldstein with influencing him on this point in the essay "The Normal and the Pathological" (Canguilhem 2008, 129, 132). For further discussion of this relationship see Borck, Hess and Schmidgen 2005, especially the contribution by A. Métraux; Wolfe (forthcoming).

<sup>23</sup> Thanks to Dominic Murphy for helping me see this more clearly.

<sup>24</sup> "Il n'y a qu'une seule manière de vivre, qu'une seule physiologie pour tous les êtres vivants" (Bernard 1885, 3<sup>e</sup> leçon, "Division des phénomènes de la vie," § III : "Réfutation générale des théories

we could broadly add that there are not two natures but one Nature. But is there not something that distinguishes higher organisms from the rest of the natural *imperium*? One can answer, with Goldstein, in the affirmative: individuality (Goldstein was in fact quite careful not to make claims for the uniqueness of human beings within the natural world, a mistake he diagnosed in the philosophical anthropology tradition). In a type of argument going back to Aristotle, the suggestion is to look around, and organisms are in fact the best candidates for individual substances. Organisms are “paradigmatic individuals”<sup>25</sup> or, as Gilbert Simondon put it, the production of a living being is a process of individuation.<sup>26</sup> One could also adduce Claude Bernard’s notion of *milieu intérieur* and his insistence that the organism must be treated as an individuality: “the physiologist and the physician must never forget that the living being comprises an organism and an individuality . . . If we decompose the living organism into its various parts, it is only for the sake of experimental analysis, not for them to be understood separately” (Bernard 1865/1984, II, ii, § 1, 137).

This individuality can also be conceived of phenomenologically through the features of temporality and historicity, as in Goldstein’s statement, “The organism is a historical being” (Goldstein 1995, 387). Does Goldstein just mean that the organism has a capacity to provide adaptive responses to the problems or challenges posed by the environment, as it selects the relevant events occurring in that environment (84)? While he does say this, he also goes on in more “Goethean” form (thereby matching the duality of methodological and ontological levels of his analysis) to say that “the organism is a being enduring in time,” and curiously enough “in eternal time, for it does not commence with procreation, certainly not with birth, and does not end with death” (387). We are reminded of his rather Romantic insistence on the organism’s perpetual self-actualization, which lacks a recognition of life’s more Darwinian challenges. “Life always has a positive character, it never manifests itself

dualistes de la vie entre les animaux et les végétaux,” 148-149). Similarly, in his summary and presentation of Bernard’s lectures, Paul Bert denies that there could be “two contradictory natures giving rise to two opposed orders of science” (Bernard 1885, xxviii-xxix).

<sup>25</sup> Schlanger 1971, 42; Hull 1992, 182. On the individuality of organisms in a related sense see Symons 2010; Pradeu 2010.

<sup>26</sup> Canguilhem and Simondon have in common the project of defending a particular notion of individuation within the biological realm itself, in the sense that “life is not possible without the individuation of living beings”. However, what distinguishes Simondon from this Goldsteinian trend is that he does not at all wish to reassert a metaphysics of the individual as an insurpassable term, but rather to “processualize” the individual, to display the individual as the result of a process of individuation. For Simondon, it is not the individual who is the ground of the process of individuation, but rather individuation which grounds the individual.



in negative terms” (388-389). Notice that, while Goldstein’s phrasing may make him seem remote at times from current biological theorizing, the view of the organism as a type of entity which either *can* be understood apart from evolutionary models and explanations, or indeed *should* be understood in such a way, is alive and well.

We cannot answer the question . . . “Why is a machine alive”? with the answer “Because its ancestors were alive”. Pedigrees, lineages, genealogies and the like, are quite irrelevant to the basic question. Ever more insistently over the past century, and never more so than today, we hear the argument that biology is evolution; that living systems instantiate evolutionary processes rather than life; and ironically, that these processes are devoid of entailment, immune to natural law, and hence outside of science completely. To me it is easy to conceive of life, and hence biology, without evolution. (Rosen 1991, 254-255; for a more cautious claim about understanding organisms apart from evolution see Wouters 2005)

This is not so different from Varela’s view that living systems need not or should not be grasped in evolutionary terms. But here I wish to emphasize the more naturalistic part of Goldstein’s point: the organism not only responds to challenges in real time, but has a temporal essence. As Skarda and Freeman put it, the difference between biological agents and non-biological agents is that non-biological agents do not operate under global constraints (neural or organismic; for more discussion of the specific constraints operating in organisms see Mossio and Moreno 2010):

Storms, for example, are self-organized phenomena that can be mathematically modeled using the same principles we use to model neural dynamics. A storm takes in and gives out energy. . . . Storms, however, do not exhibit adaptive responses; . . . their system does not incorporate information about its environment. The storm may, for example, move towards land, but it does not do so under the constraint to survive as a *unity*. (Skarda and Freeman 1987, 173)

Ruiz-Mirazo and Moreno call this autonomy rather than the broader term, unity. The capacity of a system to *manage* the flow of matter and energy through it so that it can, at the same time, regulate, modify, and control internal self-constructive processes and processes of exchange with the environment. Thus, the system must be able to generate and regenerate all the constraints, including part of its boundary conditions, that define it as such, together with its own particular way of interacting with the environment (Ruiz-Mirazo and Moreno 2004, 240).

The organism is a temporal-historical being in dialogue with its environment. However, this approach at times risks breaching the Kantian limit, making organism a category of meaning or value from the outset, not *a posteriori*. One can hold its unity (Skarda and Freeman), autono-

my (Ruiz-Mirazo and Moreno) or totality (Goldstein) to be real without positing an essence, an ineffable something threatened by a universe of measures and formalizations. Even the convinced reductionist should be able to accept the existence of a rudimentary teleology which pulls the organism towards a desirable state, like homeostasis, and this opens onto a systems perspective. Von Bertalanffy felt that it was “hardly a matter of dispute” that “phenomena in the organism are chiefly whole-forming or system-forming in character and that it is the task of biology to establish whether and to what extent they are so;” however, he acknowledged that the interpretive difficulty arises as soon as observers portray such forms of organization as embodying “will,” “purpose,” and “goals” (Bertalanffy 1932, in Cassirer 1950, 215). To repeat a formulation, one theorist’s homeostasis is another theorist’s homeostat; that is, for every purportedly irreducible and *real* form of organismic unity, there will be a *model* which seeks to reproduce it.

However, contrary to defenders of the ontological vision of organism, there is no danger in the mechanistic picture which was the basis for the articulation of biology in the first place! Metaphysically, the position suggested here – Kant read a certain way, Goldstein read a certain way – is that the form of life is there *for us*. It is a heuristic construction, a projection which reflects our desire to understand *x* as a totality. That we are, by dint of our nervous systems, projectors does not mean we project any structure we choose onto the world. “To understand is always to construct a (meaningful) totality.”<sup>27</sup> This is to be taken in intersubjective terms and there is no need to postulate a hidden interiority. Recall that organism, as a way of designating internal unity, served as a substitute for soul once there was no ghost in the machine to explain animation. It was exactly in those terms that Leibniz spoke of organisms, opposing the internal unity of organisms to the scattered heaps of matter or at best aggregates existing in the rest of the universe.

### VIII

If we subject the concept of organism to the three monistic conditions from the third section, the result is two somewhat disparate traits. First, organisms are real inasmuch as they exhibit certain forms of Bernardian, organizational unity and are not just *façons de parler*, verbal constructs. Second, part of their reality is to be projectors, to create intelligibility. In

<sup>27</sup> Starobinski 1956, 5, 11; Goldstein 1995, chap. 9. See also Barbaras 1999.

that sense one might speak of a production of a vital artificiality (Wolfe 2006). This is not a self-production in the sense of a strong vitalism, since it is an interplay or debate between internal needs and the environment, a dynamic equilibrium along the lines of Goldstein's "fundamental biological law," interrelating the organism's self-actualization, and the stimuli and constraints received from the environment. Far from being an appeal to a mysterious substance or wonder tissue, this sense of a stable process of self-actualization is very close to what we would call today a definition of organism in terms of its "causal closure," a process of modulation whereby organism/environment interactions are modulated so as to maintain the conditions under which the agent can retain those very interactions.<sup>28</sup>

This reconstructed concept of organism does not repeat the existentialist *leitmotif* of subjectivity, possibility, and mortality (even if, of course, we allowed for a *temporal* dimension of organism which implies the "sting" of mortality<sup>29</sup>). After all, this fundamental biological law of interchange between an internal system and its own environment, being an inherently *relational* concept, is doubtless expressible in structural terms, so that organisms can only be paradigmatic individuals in and through such a debate or relation to a population, a group or an environment as a whole (Lewontin 1983/1985; Oyama 2000).

But an apposite danger awaits the biological theorist who has fully de-substantialized her concept of organism, ridding it both of metaphysical flourishes like entelechies or *élans vitaux* and of category mistakes such as the assertion that the organism's self-maintenance or unity or metabolic transformation are markers of the uniqueness of life. She may arrive at a rather dematerialized form of holism, in which the emphasis on relations causes one to lose sight of the biological. At first it sounds perfectly plausible, if residually idealistic, to ask, like Paul Weiss: "Of what do we deprive a system when we dismember it and isolate its component parts, whether bodily or just in our mind? Plainly, of the *interrelations* that had existed among the parts while they were still united" (Weiss 1967, 802). This runs directly counter both to the old sense of mechanism as building a model in order to understand one's object (cf. Thomson 1884), as a form of maker's knowledge, and to more recent discussions of a kind of expanded, pluralistic sense of mechanism (Machamer, Darden and Craver 2000). The real problem with this kind of approach – systemic, processual, relational, or,

<sup>28</sup> Goldstein 1995, 101, 103, 107, 293; Christensen and Hooker 1998; on organizational constraints see Ruiz-Mirazo, Etxeberria et al. 2000; Ruiz-Mirazo and Moreno 2004; Mossio and Moreno 2010; Nuño de la Rosa 2010.

<sup>29</sup> Thinking of Jonas's comment that Whitehead's philosophy of organism lacks any awareness of death: "Death, where is thy sting?" (Jonas 1966, 96).

in other words, *holistic* – comes out more sharply in the formulation proposed by Robert Rosen. The reductionist approach to living systems is to “throw away the organization and keep the underlying matter,” whereas what he calls, following Nicolas Rashevsky, the “relational approach” in biology, recommends that “when studying an organized material system,” one should “throw away the matter and keep the underlying organization” (Rosen 1991, 119). This sounds much like Varela and Maturana claiming that to understand machines we must disregard their *materiality* (Varela and Maturana 1972, 380).

This is really both anti-materialist and informational in an obsessive way (see Oyama 2000 and 2010 for some reflections on the *non-dits* of the informational perspectives in biology). Ironically, this is the sort of mistake the early Montpellier vitalists protested about with respect to anatomy, which had had so much success in the century prior to their writings (the 16<sup>th</sup> and 17<sup>th</sup> primarily), giving the investigator much information about structure and nothing about the functioning of the living animal or human. Varela is quite blunt in his disregard for the material in which a system is realized. “We are thus saying that what defines a machine’s organization is relations, and hence that the organization of a machine has no connection with materiality, that is, with the properties of the components that define them as physical entities. In the organization of a machine, materiality is implied but does not enter *per se*” (Varela 1979, 9, cit. in Bechtel 2007, 294).<sup>30</sup>

Holism then suffers from a general weakness and a more specific problem. The more generic worry about holism and its relational emphasis was stated by Russell: “if all knowledge were knowledge of the universe as a whole, there would be no knowledge” (Russell, in Phillips 1976, 11). We could call this the *epistemological* criticism of holism. A more ontological criticism would be to say that a mistake has been made about what wholes *really are*

... the Whole itself is a product, produced as nothing more than a part alongside other parts, which it neither unifies nor totalizes, though it has an effect on other parts simply because it establishes aberrant paths of communication between noncommunicating vessels, transverse unities between elements that retain all their differences within their own particular boundaries. (Deleuze and Guattari 1973/1977, 42)

<sup>30</sup>Of course the dematerialized view also has some serious philosophy on its side (compare Symons 2010). “Many organisms totally exchange their substance several times over while they retain their individuality. Others undergo massive metamorphosis as well, changing their structure markedly. If organisms are paradigm individuals, then retention of neither substance nor structure is either necessary or sufficient for continued identity in material bodies” (Hull 1992, 182).

Granted, this seems to disregard the difference between different kinds of wholes, but it serves as a (mechanistic) reminder not to over-emphasize the value of the concept “whole.” Brains, organisms, and persons are wholes, to be sure, but so are lots of other entities, and conversely, different kinds of mechanist, componential, reductionist analysis tell us a lot about all of these wholes. But the more specific problem as it appears in the above quotations from Rosen and Varela is the complete disregard – it is even recommended! – for the material facts about the living system being studied. The Bernardian approach to organization and its contemporary reconstruction by Bechtel seems an obvious response, which precisely insists that one should *not* “throw away the matter” (contra Rosen). Notice that the second problem I have pointed to in holism/system theory exists in much the same form in functionalism. The disembodied tendency in multiple realizability arguments in which, as Putnam put it, “we could be made of Swiss cheese and it wouldn’t matter” (Putnam 1975, 291). Instead, we need to recognize that even the vitalist cannot ignore the biological matter in which a system is realized, the organizational features of a system.

That said, there are versions of the systems view which are consonant with the monistic criteria: “*system thinking* does not imply forgetting about the material mechanisms that are crucial to trigger off a biological type of phenomenon/behavior; rather, it means putting the emphasis on the interactive processes that make it up, that is, on the dynamic organization in which biomolecules (or, rather, their precursors) actually get integrated” (Ruiz-Mirazo and Moreno 2004, 238). This helps bridge the gap between the systems perspective and the more materialistic and embodied organizational perspective. The latter perspective seems to make the best of both worlds – mechanism and organism – without relying on a superannuated ontology, but also without opting for the non-committal comfort of pure instrumentalism. In addition, this perspective seems to capture something worthwhile about the history, as seen with Bichat and Bernard in Bechtel’s presentation, to which I have added the 18<sup>t</sup>-century medical vitalists. What is missing from this view is the projective aspect I reconstructed primarily from Goldstein’s rather suggestive discussion of organism.

Our inquiry into organism has produced two negatives and two positives. Concepts of organism to be *rejected* include ones which invoke theoretical entities such as organismic laws: this is a kind of category mistake and probably scientifically of little use, and also ones which rely on a kind of ineffable subjectivity to justify the uniqueness of organisms. We could add the problem of the forms of holism which dispense with materiality altogether but in some basic sense holism never intended to

be a specific theory of what living being is, even though the words holism and organicism have blurred into each other over time. Concepts of organism to be *accepted*, or integrated, include the Goldsteinian projective view (especially if it is mitigated with broadly Darwinian constraints), the non-metaphysical, functional vitalism of the 18<sup>th</sup> century (in which organism or rather the animal economy and organized bodies are explanatory targets without any ontological baggage), and the Bernard-Bechtel organizational view.

If, contrary to what strong ontological vitalism might assert, there is nothing unique and special about organisms over and against the rest of nature and if, as Buffon thought, “the organic is the most ordinary product of nature,” what *does* exist is a certain approach to reality, the projection of heuristic fictions which produce intelligibility and promote viable courses of action. What remains to be done is to articulate this philosophical position with work on biological organization.

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