HOLISM, ORGANICISM AND THE RISK OF BIOCHAUVINISM

by Charles T. Wolfe

Abstract. *In this essay I seek to critically evaluate some forms of holism and organicism in biological thought, as a more deflationary echo to Gilbert and Sarkar's reflection on the need for an 'umbrella' concept to convey the new vitality of holistic concepts in biology (Gilbert and Sarkar 2000). Given that some recent discussions in theoretical biology call for an organism concept (from Moreno and Mossio's work on organization to Kirschner et al.'s research paper in Cell, 2000, building on chemistry to articulate what they called "molecular vitalism," studying the "vitalistic" properties of molecular, cellular, and organismal function, and Pepper and Herron's suggestion in their 2008 paper that organisms define a category that evolutionary biology cannot do without), the question, what concept of organicism are they calling for? To what extent are such claims philosophically committed to a non-naturalistic concept of organism as organizing centre, as a foundational rather than heuristic concept – or possibly a "biochauvinism," to use Di Paolo's term (Di Paolo 2009)? My aim in this paper is to conceptually clarify the forms of holism and organicism that are involved in these cases (and I acknowledge that the study of early 20th-century holisms [Peterson 2010] indicates that not all of them were in fact 'organicist' or 'biologistic'). I suggest that contemporary holists are still potentially beholden to a certain kind of vitalism or "biochauvinism"; but that when they reduce their claims to mere heuristics, conversely, they risk losing sight of a certain kind of organizational "thickness", a "vital materiality" (Wheeler 2010) which is characteristic of biological systems (Bechtel 2007). And I ask if it is possible to articulate a concept of biological holism or organicism which is neither an empirical 'biochauvinism' nor a metaphysical 'vitalism'?*

I. A question sometimes asked in recent reflections at the intersection of the philosophy of biology and so-called 'historical epistemology' is, do organisms have an ontological status? Now, we should note immediately that there are at least two very different ways to answer this question in the affirmative. One is more

philosophical, and seeks to provide criteria, e.g. of individuals which organisms instantiate particularly well; from Aristotle to Hegel and Jonas, this can be termed a strong holist option, but let us again stress, in a *philosophical* context, for as we shall see, it is possible to defend a holist claim for the ontological uniqueness of organisms, on a *biological* basis as well (to be clear, I do not have in mind a distinction between 'metaphysical' and 'experimental' here). A philosophical defense of strong holism as regards biological individuals will tend to be more stipulative, appealing for instance to the nature of whole/part relations and insisting that in organisms, there is a special type of interrelation between parts. In contrast, strong holism of the biological sort will typically appeal to the empirical criteria defining actual organisms – but which criteria?, would be the immediate retort, pointing to the lack of any unifying concept for the diversity of actual organisms, from drosophila to the Portuguese man-o-war[1].

There are also diverse answers of the negative variety, which I will be less interested in here. They include a kind of absolute physicalism, which is more of an intellectual *vue de l'esprit* than a position actually encountered amongst most working natural philosophers: on this view, what is real is the entities specified in fundamental physics, and since organisms do not belong to this class of entities (however much some former physicists struggled in the 1960s to find 'organismic laws', like Walter Elsasser[2]), they can have nothing other than a 'folk', 'cultural' or perhaps 'psychological' status. More common is a general dismissal of the very question, in the favor of a kind of evolving, instrumentalist consensus, according to which there is no point in debating the ultimate reality or ontological status of organisms, since what matters is the theoretical terms science uses in its work, and these constantly evolve (thus 'organism' gave way to 'gene', but even 'gene' now seems like a construct, since it can no longer be

[1] J. PEPPER, M HERRON, *Does biology need an organism concept?* «Biological Reviews», 83, 2008, pp. 621–627.

[2] W.M. ELSASSER, *Quanta and the concept of organismic law*, «Journal of Theoretical Biology», 1(1), 1961, pp. 27-58 ; *Reflections on a Theory of Organisms. Holism in Biology*, Johns Hopkins University Press, Baltimore, 1998.

thought of as «an inherently stable, discrete stretch of DNA that encodes information for producing a protein», which is copied faithfully before being passed on; rather, we now know that «stability lies in the system as a whole, not in the gene»[3]).

Closer to my general interests, although I will not explore this option here, is a more 'historicized' approach, in which the reality of organisms is neither bluntly asserted – as is predominant in theoretical biology and most Continental 'biophilosophy'[4] – or denied, in favor of atoms, molecules, or selfish genes. Instead, it is examined in a diversity of historical régimes, contexts, sometimes with an increased focus on the nature of the experimental scientific apparatus involved. For instance, Hans-Jörg Rheinberger describes experimental systems while emphasizing a cognitive, constructed level of the effectivity of scientific practices: experimental systems do not just inhabit a world of 'things' but also, what he calls «graphematic spaces», capable of «differential reproduction»[5]. Thus for our purposes, the reality of organisms for an embryologist in the school of Wilhelm Roux is not the same, e.g., as that experienced by an eighteenth-century Montpellier *medical* vitalist insisting on the difference between medical mechanistic models of the body and the 'animal econo-

[3] E. JABLONKA, M.J. LAMB, *Evolution in Four Dimensions: Genetic, Epigenetic, Behavioral and Symbolic Variation in the History of Life*, MIT Press, Cambridge, Mass., 2005, p. 7.

[4] 'Biophilosophy' is a term that was popular in the post-war decades in French 'épistémologie' (and to some extent also in the German versions, where authors like Kant and/or Hegel played a greater role, e.g. Gerhard Vollmer). It was often presented as not being guilty of the reductionist excesses of analytically oriented 'philosophy of biology'. My interest here is not to choose between the two but to judge the claims of certain forms of biological holism. On the emergence of philosophy of biology as a discipline in contrast to 'biophilosophy' see J. GAYON, *La philosophie et la biologie*, in *Encyclopédie philosophique universelle*, vol. IV, ed. J.-F. Mattéi, PUF, Paris, 1998, pp. 2152-2171, which he has reprised with the more specific focus of 'vitalism' in his Vitalisme et philosophie de la biologie, in *Repenser le vitalisme*, ed. P. Nouvel, PUF, Paris, 2011, pp. 15-31.

[5] H. J. RHEINBERGER, *Experimental Systems – Graphematic Spaces*, in T. LENOIR, (ed.), *Inscribing science: scientific texts and the materiality of communication*, Stanford University Press, Stanford, 1998, p. 287. Thanks to Claudia Manta for suggesting this reference.

my' (a term often used in that period to describe the functionally interdependent, physiological system of the body, as distinct from the mere machine). Curiously, both friends and foes of holism/organicism[6] ignore the potential resources the historical view would afford them, being content instead to assert or deny an ontological state of affairs.

Here I will not pursue this more historical route, as I shall be concerned with some varieties of biological holism, mainly in the twentieth and twenty-first centuries, which I will seek to evaluate, primarily in the form of a brief internal critique. To be clear, I am not arguing for one sharply delimited 'reductionist' or 'holist' position, but rather, I am evaluating some of the tensions or excessive commitments carried by various forms of holism, in order to see what can be saved therein. My goal is to assess a potential legitimacy of a certain kind of holism or organicism, which, I shall suggest, needs to steer clear of a variety of wrong-headed, anti-naturalistic or otherwise excessively falsifiable answers to the initial question. To borrow an expression from Daniel Dennett, the issue is: *which varieties of organicism are 'worth wanting'?* Since Scott Gilbert and Sahotra Sarkar's reflection on the need for an 'umbrella' or 'organizing' concept to convey the new vitality of systemic or holistic concepts in biology[7], seconded by Manfred Laubichler's paper proclaiming the return of the 'organism' as such an organizing concept[8], some scholarly work has been done which dispels earlier prejudices and gives us a more useful, nuanced sense both of these concepts in biological science and their possible pertinence today[9].

[6] I'll refrain from using the potentially convenient two-letter acronym.

[7] S. GILBERT, S. SARKAR, *Embracing complexity: organicism for the 21st century,* «Developmental Dynamics», 219, 2000, pp. 1-9.

[8] M. LAUBICHLER, *The Organism is dead. Long live the organism!* «Perspectives on Science», 8 (3), 2000, pp. 286-315.

[9] See e.g. P. HUNEMAN, C.T. WOLFE (eds.), *The Concept of Organism: Historical, Philosophical, Scientific Perspectives*, special issue of *History and Philosophy of the Life Sciences*, 32 (2-3), 2010 and T. CHEUNG, *From the Organism of a Body to the Body of an Organism: occurrence and meaning of the word 'organism' from the seventeenth to the nineteenth centuries*, «British Journal of the History of Science», 39, 2006, 319-339, on the history and theory of organism.

In addition, there has been some sustained work on these concepts in current biology. To name three recent examples, (1) in theoretical biology, the effort to articulate a model of «organized systems» and «organizational closure», in Alvaro Moreno and Matteo Mossio's research, alone or with collaborators[10]. A question arising in reaction to this research is the extent to which philosophically it is committed to a non-naturalistic concept of organism as organizing centre, as a foundational rather than heuristic concept – or possibly a «biochauvinism», to use Di Paolo's term[11]. He does not define it, but we can imagine that biochauvinism would be the present-day, naturalistic form of what was attacked by the Vienna Circle and others as vitalism: no longer the claim that there are immaterial vital forces which play a causal role in the functioning of living beings, but simply the claim that living beings, as distinct from tables, chairs and protons, are ontologically specific, not to say special. This is not an essay devoted to the work of Moreno et al. but I will state right away that I find their work especially free of these more inflated metaphysical claims that are characteristic of other, comparable theorists (including Francisco Varela, Robert Rosen and Evan Thompson).

(2) In biochemistry, Kirschner et al.'s research paper in *Cell* (Kirschner et al. 2000) on what they called «molecular vitalism» : they suggested that, faced with the limitations of genomics, researchers should investigate what the authors «whimsically» termed the «vitalistic» properties of molecular, cellular, and organismal function: «the organism has fashioned a very stable physiology and embryology […] It is this robustness that suggested 'vital forces', and it is this robustness that we wish ultimately to under-

[10] M. MOSSIO, A MORENO, *Organisational closure in biological organisms*, «History and Philosophy of the Life Sciences», 32(2-3), 2010, pp. 269-288; A MORENO, M. MOSSIO, *Biological autonomy. A Philosophical and theoretical enquiry*, Springer, Dordrecht, forthcoming, and earlier, K. RUIZ-MIRAZO, A ETXEBERRIA, A MORENO, J. IBÁÑEZ, *Organisms and their place in biology,* «Theory Bioscience», 119, 2000, pp. 209-233.

[11] E. DI PAOLO, *Extended Life,* «Topoi», 28, 2009, p. 10.

stand in terms of chemistry. We will have such an opportunity in this new century»[12].

(3) In evolutionary biology, Pepper and Herron's 2008 paper suggests that organisms define a category that evolutionary biology cannot do without, because it «relies heavily on the comparative method, and effective comparison requires that we first define a class of comparable entities», and they seek to articulate a «robust and general operational definition» of organism, which should distinguish between «which biological entities are organisms and which are not», particularly from *parts* of organisms and *groups* of organisms[13].

The above examples indicate that different trends in biological theory are articulating – or calling for – an organism concept. However, only the first of these three cases directly contributes to an explicitly holistic and organismic framework, which is the main focus of this essay.

My aim is to conceptually clarify these forms of holism and organicism. I acknowledge that the study of early twentieth-century holisms indicates that not all of them were in fact 'organicist' or 'biologistic'. That is, some of the original forms of self-described holism (I am not speaking of purported holists who include such diverse figures as Spinoza, Hegel and Whitehead) were primarily interested in systems *as such*, although they waver on the issue, sometimes even seeking to derive principles *from* biological systems *for the understanding* of other systems, as in Walter Cannon's suggestion that

> It seems not impossible that the means employed by the more highly evolved animals for preserving uniform and stable their internal economy (i.e., for preserving homeostasis) may present some general principles for the establishment, regulation and control of steady states, that would be suggestive for other kinds

[12] M. KIRSCHNER, J GERHART, T. MITCHISON, *Molecular "Vitalism"*, «Cell», 100, 2000, p. 87.

[13] J. PEPPER, M. HERRON, *Does biology need an organism concept?* , pp. 625, 621. For more on the issue of 'what units do biologists count?' see the original article by E. CLARKE, *The Multiple Realizability of Biological Individuals*, «The Journal of Philosophy», CX (8), 2013, pp. 413-435.

> of organization—even social and industrial—which suffer from distressing perturbations[14].

What is holism? As mentioned above, it is intimately bound up with systems theory, and with formally driven methods which sought to give a new kind of coherence to biology, although this 'systems' interest was not always specifically biological. The person often presented as the first theorist of holism, the South African segregationist statesman (and specialist of Walt Whitman) Jan Christiaan Smuts, as well as John von Neumann and Ludwig von Bertalanffy later, wavers between defining holism as a total systemic standpoint (with no particular reference to a special status for living entities) and holism as an approach or model which sheds particular light on embryology and how organisms are not mere machines (with reference to teleology and the "historical" or "learned" character of organisms).

Deliberately or inadvertently mirroring various other episodes in the history of mechanistic and organismic theories (including the Leibniz-Stahl debate), these original holists also specify abstract terms on which 'merely mechanical aggregates' are different from genuine wholes, including chemical compounds, and then specify that biological organisms are the exemplars of 'creative wholes', as Smuts calls them, i.e., wholes which create structures different from their constituents or parts[15]. Here I will not be concerned with holism as a general systems theory, but rather with holism/organicism as a claim to define what is unique in biological systems, i.e., a kind of biochauvinism.

[14] W.B. CANNON, *The Wisdom of the Body* (1932), revised and expanded edition, Norton, New York, 1963, p. 25 (thanks to Yelda Nasifoglu for help with this reference).

[15] J.C. SMUTS, *Holism and Evolution* (1926), Sherman Oaks, CA, Sierra Sunrise Books, 1999, pp. 140–141. The best general analysis and reconstruction of holism and organicism in early twentieth-century biological thought is E. PETERSONS' dissertation, *Finding Mind, Form, Organism, and Person in a Reductionist Age*, PhD, 2 vols., Program in History and Philosophy of Science, University of Notre Dame, 2010.

II. Two critical remarks on two strangely apposite pitfalls of holist-organicist theory:

(1) There is a strange appeal of Kantianism for these schools of thought, notably Varela's[16]. There is something deeply flawed in a procedure which invokes the authority of the Kantian 'projective' approach to organisms[17] in order to assert a set of ontological specificities about organisms. First, because this is precisely what the Kantian regulative ideal concept was designed to avoid, in explicit contrast to what he would have called 'rational metaphysics'. To provide an empirical set of criteria for why living beings are special and to claim that this supports or is supported by a Kantian framework, is not a good idea if this framework explicitly rejects the idea of giving empirical definitions of organism, inasmuch as Kant's organism concept is explicitly built around his notion of regulative ideal[18]. For Kant, organism is a «reflective» construct rather than a «constitutive» feature of reality, and reflective judgments are «incapable of justifying any objective assertions»[19].

Second, because it is not clear in any case why it counts as an argument against 'mechanistic science' or 'reductionism' to simply produce a list of key definitory features of Life, most classically, self-preservation, self-reproduction, self-reparation, and self-regulation[20], or in a more updated form, «reproduction, life-cycles, genetics, sex, developmental bottlenecks, germ-soma

[16] Instances of such confusions can be found in A. WEBER, F.J. VARELA, *Life after Kant: Natural purposes and the autopoietic foundations of biological individuality*. «Phenomenology and the Cognitive Sciences», 1, 2002, pp. 97-125; S. KAUFFMAN, G. LONGO, No Law Entails The Evolution Of The Biosphere, 2011, http://lifeboat.com/blog/2011/07/no-law-entails-the-evolution-of-the-biosphere; G. LONGO, M. MONTÉVIL, S. KAUFMAN, No entailing laws, but enablement in the evolution of the biosphere, 2012, http://arxiv.org/pdf/1201.2069.pdf

[17] P. HUNEMAN (ed.), *Understanding Purpose: Collected Essays on Kant and the Philosophy of Biology*, University of Rochester Press, North American Kant Society Publication Series, Rochester, 2007.

[18] I. KANT, *Critique of Judgment* (1790), tr. W. Pluhar, Hackett, Indianapolis, 1987, § 73, p. 276.

[19] I. KANT, *Critique of Judgment*, § 67, p. 259; § 73, p. 277.

[20] Cf. J. SCHLANGER, *Les métaphores de l'organisme*, Vrin, Paris, 1971, p. 14.

separation, policing mechanisms, spatial boundaries or contiguity, immune response, fitness maximization, cooperation and/or conflict, codispersal, adaptations, metabolic autonomy, and functional integration»[21] (but precisely, the list is neither absolute nor stable, which is why many thinkers, including prominent biologists, have declared that «Life as such does not exist»[22]), including because mechanistic explanations have shown themselves to be far more flexible and capable of integrating inter-level relations than the depiction of them as taking apart systems into component parts and leaving them there like broken toys.

Another puzzling feature of these projects in theoretical biology that invoke Kant but primarily seek to defend versions of self-organization, might be expressed as: why the need for philosophy? Why run the risk of lapsing into a kind of naïve, indeed precritical metaphysics of selfhood and interiority, or of anti-materialism? How could a working natural scientist take on board proclamations such as Thompson's: «Life is not physical in the standard materialist sense of purely external structure and function. Life realizes a kind of interiority, the interiority of selfhood and sense-making. We accordingly need an expanded notion of the physical to account for the organism or living being»[23]? This opposition between materialism and interiority is reminiscent of post-Kantian denunciations of attempts to find the 'seat of the soul'. Further, here Thompson is calling for an expanded notion of the physical, but often these kinds of theories, as I discuss below, end up explicitly recommending that we disregard materiality altogether – ironically given the desire on the part of, e.g., developmental systems theorists to move away from a disembodied understanding of biological information, towards a kind of vital materiality. More generally, if theoretical biology wants

[21] E. CLARKE, *The Multiple Realizability of Biological Individuals*, cit., p. 415.

[22] A. SZENT-GYÖRGI, *The Living State: With Observations on Cancer*, Academic Press, New York, 1972, p. 1 (thanks to Gil C. Santos for this reference).

[23] E. THOMPSON, *Mind in life: biology, phenomenology, and the sciences of mind*, Harvard University Press, Cambridge, Mass., 2007, p. 238. Would Thompson also endorse Hegel's assertion that « The spatiality of the organism has no truth whatsoever for the soul » (G.W.F. HEGEL, *Philosophy of Nature*, trans. A.V. Miller, Oxford University Press, Oxford, 1970, § 248Z, p. 18)?

organizational concepts, seeks to steer our attention away from the sirens of genetic reductionism and the informational gene, why should this entail being anti-materialists?) And I've noted elsewhere[24] that I think the appeal of Moreno, Mossio et al. is that they dispense with the somewhat foundationalist metaphysical appeals of these other forms of holism.

(2) the problem of seeking to justifying the autonomy and/or ontological uniqueness of Life, organisms, biological agents *in terms of empirical criteria*, of a laundry list of properties of Life (from the classic, self-preservation, self-reproduction, etc. as mentioned above, to organizational closure, autonomy and so on).[25] As I wrote a few years ago, one thinker's homeostasis will always end up being another thinker's homeostat[26]; or, one theorist's dynamic equilibrium of hearts, kidneys, termite mounds or chemotaxis will always end up being another theorist's dynamic equilibrium of storms or traffic jams. Not that all attempts to understand such systems have to fall prey to the problems of a foundational or otherwise ontologized empirical set of core criteria for Life: Moreno and Mossio do not, as noted, and speaking of termite mounds, when Turner presents them as a case of «embodied homeostasis»[27], he avoids these pitfalls since he does not *ontologize* the property. The interaction between individual termites, and between the termites and the termite mound, is a form of *organization* rather than a special *substance*, a point made brilliantly by the systems theorist von Bertalanffy:

> Organisms exhibit the properties of life not because of some special peculiarity of these compounds, but on account of the heterogeneous system into which these compounds are articu-

[24] C.T. WOLFE, *Do organisms have an ontological status?,* «History and Philosophy of the Life Sciences», 32 (2-3), 2010, pp. 195-232.

[25] For a more detailed, and sophisticated attempt to delineate a set of features of 'biological autonomy', see B. ROSSLENBROICH, *On the Origin of Autonomy – A new look at the major transitions in evolution*, Springer, Dordrecht, 2014.

[26] That is, one thinker's purportedly core biological feature can be artificially modeled by another. C.T. WOLFE, *Do organisms have an ontological status?*. Thanks to Olivier Surel for suggesting I clarify this.

[27] J.S. TURNER, *The Tinkerer's Accomplice: How Design Emerges From Life Itself*, Harvard University Press, Cambridge, Mass., 2007, p. 27.

> lated. There is no "living substance" because the characteristic of life is the organization of substances[28].

I note in passing, because that is a topic for a different paper, that one worthwhile holist-organicist strategy that does *not* invoke definitional properties of life (or barely), is Kurt Goldstein's, in his suggestion that rather than say what is unique about the biological, we look to the *observer*: to be an organism is to have a *point of view* on organisms; one which produces intelligibility, which reveals organisms as meaning-producing beings[29]. This approach – which has Kantian antecedents – is further extended after Goldstein, by Georges Canguilhem.

Either way, waving lists of properties is a poor way to counter the power of reductionism. The reductionist can always reply, in Pierre Duhem's words, that a body is «only *provisionally* simple; it has remained undecomposed until now, but tomorrow may yield to a new means of analysis»[30].

III. Holism or organicism, if it seeks to ontologize or otherwise absolutize features of life (digestion, proprioception, intentionality …) can run into some categorical problems, that is, category mistakes, but also the danger of making empirical claims to have identified absolute traits of life – à la Elsasser's organismic laws, or Varela's «autopoiesis is an explication of the autonomy of the living»[31], or Thompson's statement of what we might call the vulgate of biological holism, «parts arise from the whole. Part and whole co-emerge and mutually specify each other»[32],

[28] L.V. BERTALLANFY, *Modern theories of development*, trans. J.H. Woodger, Oxford University Press, H. Milford, London, 1933, p. 48.

[29] J. STAROBINSKI, *L'idée d'organisme*, Centre de Documentation Universitaire/Collège philosophique, Paris, 1956. The field of biosemiotics tarries at the limit between this flexible, non-literal idea of organisms as meaning-makers or world-makers, and a more stubbornly literal program.

[30] P. DUHEM *Le mixte et la combinaison chimique. Essai sur l'évolution d'une idée* (1902); reprint, Fayard-Corpus, Paris 1985, p. 50.

[31] F. VARELA, *Autonomy and Autopoiesis*, in G. Roth and H. Schwegler, eds., *Self-Organizing Systems*, Campus Verlag, Frankfurt 1981, p. 14.

[32] E. THOMPSON, *Mind in life*, cit., p. 38.

itself not really an argument – which may in the end go up in smoke, when it emerges that scientists cannot agree on a definition of life, and thus find it more helpful to eliminate the concept. If the concept of Life is rejected, as in Albert Szent-György's «Life as such does not exist» or better-known, the partly performative statement by François Jacob, «On n'interroge plus la vie aujourd'hui dans les laboratoires»[33], claims to have found its essential characteristics lose their foundation.

Further, sometimes the (former and current) holist and organicist insistence on opposing the systems they lovingly study to some apparently inferior opposed entity, whether matter itself, machines, corpses or the dehumanized world of Scientific Revolution science, starts to sound ideological rather than scientific or philosophically exploratory, even when it is put in deceptively plain terms, such as here in Alva Noë's recent book *Out of our heads*: «to do biology we need the resources to take up a non-mechanistic attitude to the organism»[34]. What would the mechanistic attitude be? That of Descartes (who wrote, «the preservation of health has always been the principal end of my studies»[35])? Of Claude Bernard (for whom «what distinguishes a living machine is not the nature of its physico-chemical properties, complex as they may be, but rather the creation of the machine which develops under our eyes in conditions proper to itself and according to a definite idea which expresses the living being's nature and the very essence of life»[36])? Of the contemporary 'mechanist' William Bechtel, for whom mechanism and organization stand in

[33] F. JACOB, *La logique du vivant*, Gallimard, Paris, 1970, p. 320. See the interesting reflections on this issue in Michel Morange's review essay M. MORANGE *Un retour du vitalisme ?*, Histoire de la recherche contemporaine 2(2), 2013, pp. 150-155).

[34] A. NOË, *Out of Our Heads; Why You Are Not Your Brain, and Other Lessons from the Biology of Consciousness,* Farrar, Straus and Giroux, New York, 2009, p. 41.

[35] In a letter to the Marquess of Newcastle, October 1645, in R. DESCARTES, *Œuvres*, eds. C. Adam and P. Tannery, 11 vols., Vrin, Paris 1964-1976, vol. IV, p. 329; *The Philosophical Writings of Descartes*, vol. 3: *The correspondence*, trans. J. Cottingham, R. Stoothoff, D. Murdoch and A. Kenny, Cambridge University Press, Cambridge, 1985, p. 275.

[36] C. BERNARD, *An Introduction to the Study of Experimental Medicine* (1865), Henry Schuman, New York, 1927, p. 93.

a complex and fruitful interaction? Mechanism, Bechtel suggests, can provide an adequate account of organization 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»[37]. But this does not reduce to some pure mechanist ontology. In fact, the holist/organicist standpoint 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 organism»[38].

I say *sometimes*, since biochauvinism, or some weaker form of it, need not be so ideological or oppositional. When it is not, it can be appealing as a stubbornly realist or materialist-friendly emphasis on genuine biological constraints. Consider the (somewhat restrictive) opposition Andy Clark proposes, between two arguments for embodiment (and here for 'embodiment' we could substitute 'biochauvinism', 'organismicity', etc.):

> One of those strands depicts the body as special, and the fine details of a creature's embodiment as a major constraint on the nature of its mind: a kind of new-wave body-centrism. The other depicts the body as just one element in a kind of equal-partners dance between brain, body and world, with the nature of the mind fixed by the overall balance thus achieved: a kind of extended functionalism (now with an even broader canvas for multiple realizability than ever before)[39].

I daresay most materialists except ones especially enamored of pure physics would want to say that «the fine details of a creature's embodiment» count as «a major constraint on the nature of its mind»; yet these fine details by no means imply that « the body

[37] W. BECHTEL, Biological mechanisms: Organized to maintain autonomy, in F. BOOGERD, F.J. BRUGGEMAN, J-H.S. HOFMEYER, AND H.V. WESTERHOFF (eds.), *Systems Biology: Philosophical Foundations*, Elsevier, Amsterdam, 2007, p. 270.

[38] Ivi, pp. 296-297.

[39] A. CLARCK, *Pressing the flesh: a tension in the study of the embodied embedded mind ?*, Philos. Phenomenol. Res., 76(1), 2008, p. 56.

is special» in any way, especially not that of an embodied or enactivist phenomenology founding itself on a claim of a foundational interiority – recall, again, Thompson's «Life is not physical in the standard materialist sense of purely external structure and function. Life realizes a kind of interiority, the interiority of selfhood and sense-making», to which we can add Varela's claim in a late paper that his project is to «reintroduce the subject into biology»[40]. Now, I am not rejecting as anti-naturalistic the latter part of Thompson's claim – namely, that organisms are engaged in 'sense-making', an idea we could fill in either 'biosemiotically' (with Uexküll's analysis of *Umwelt*, in which «even the simplest living organism creates a set of preferential partitions of the world, converting interactions with their surrounding media into elementary norms or values, as we will explain more extensively below. And here is where the nature of living systems as autonomous agents, as inventors of worlds with meaning, becomes manifest»[41]) or in 'constructivist' terms, appealing to Kurt Goldstein's idea that an organism, unlike a skeleton or a watch, is an meaning-producing entity. But these attempts to integrate 'sense-making' or 'world-making' into the province of biology have *nothing* to do with appeals to «the interiority of selfhood» or a «reintroduction of the subject into biology».

Selfhood or subjectivity is not a useful biological concept, any more than the soul was a useful medical concept (thus in the eighteenth century, the Montpellier vitalist physician Ménuret de Chambaud could seek to 'eliminate' soul from medical discourse, in an entry on «Death» in the *Encyclopédie*[42]). There is too much reliance here on an appeal to interiority, as if it was an unchallengeable philosophical concept. As Jean-Marie Schaeffer says, «In phenomenology, the problematic of embodiment (*corporéité*) is part of an approach that continues to accept the epistemic privi-

[40] A. WEBER, F.J. VARELA, *Life after Kant,* cit., p. 117.

[41] K. RUIZ-MIRAZO, A. MORENO, *Autonomy in evolution: from minimal to complex life*, Synthese, 185 (1), 2012,
p. 28.

[42] J-J. Menuret de Chambaud, *Mort*, «Encyclopédie», vol. X, Briasson, Paris, 1765, p. 718b.

lege of consciousness's self-investigation as axiomatic»[43]. From a naturalistic standpoint,

> there are no intrinsically subjective or perspectival facts that are either the special objects of self-regarding attitudes or facts of "what it is like". There are only states of subjects that both function in a particularly intimate way within those subjects and have the subjects themselves and their other states as inevitable referents. And that is all there is to "subjectivity"[44].

No one prevents philosophers from meditating on the inner life, subjectivity or interiority. Thinkers from Augustine to Paul Ricoeur have done so brilliantly[45]. But again, not only is selfhood or interiority not a recognized biological concept; it is unclear how it could play even a heuristic role therein (as opposed, e.g., to that of organization). To say it more positively, even if one is interested, not in living systems in general, but in 'minded' living systems, it remains the case that «things have a cognitive life because intelligence exists primarily as an enactive relation between and among people and things, not as a within-intracranial representation»[46]. We are better off thinking in terms of relations, systems and interaction than in terms of a substantival life-force, selfhood or interiority. But focusing on relations and networks should not mean leaving out the materiality: «*system thinking* does not imply forgetting about the material mechanisms that are crucial to trigger off a biological type of phenomenon/behavior;

[43] J.-M. SCHAEFFER, *La fin de l'exception humaine*, Gallimard, Paris, 2007, p. 118.
[44] W.G. LYCAN, What is the 'Subjectivity' of the Mental? *Philosophical Perspectives* 4: *Action Theory and the Philosophy of Mind*, 1990, p. 126.
[45] For a critique, see C.T. WOLFE, « Éléments pour une théorie matérialiste du soi », in F. Pépin, ed., *La Circulation entre les savoirs au siècle des Lumières*, Hermann, Paris, 2011, pp. 123-149.
[46] L. MALAFOURIS, C. RENFREW (eds.), *The cognitive life of things: recasting the boundaries of the mind*, McDonald Institute for Archaeological Research Publications, Cambridge, 2008, Introduction, p. 4. One can also be more charitable to Thompson's enactivism, as he is not always unhappily insisting on a foundational interiority (what some would call 'internalism'); he also describes living interiority as «compris[ing] the self-production of an inside that specifies an outside to which that inside is constitutively and normatively related» (E. THOMPSON, *Mind in life,* p. 225).

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»[47].

IV. In sum, holism/organicism can succumb to two major kinds of temptation: it can present itself as an empirical theory, providing the key empirical characteristics of organisms, over and against the rest of the natural world. Or, conversely, there is what one might call the transcendental problem, in the sense of a transcendentalizing of organism, or the flesh, or embodiment. One can indeed be reluctant to conceive of the organism in purely computational terms without invoking a mysticism of the flesh (from Merleau-Ponty's appeals to transubstantiation in seeking to highlight what is unique in the sensation of an embodied being[48] to Thompson's denial that «life is physical in the materialist sense»). Here, a third problem emerges: the addiction to formalisms at the expense of materiality.

Faced with certain holistic excesses, I am not, to repeat, advocating the extreme prudence of instrumentalism, in which the moral when it comes to the material realization of biological systems might be 'handsome is as handsome does'. Contemporary holists are often still potentially beholden to a certain kind of vitalism or «biochauvinism»[49]; but when, out of extreme caution,

[47] K. RUIZ-MIRAZO, A. MORENO *Basic Autonomy as a Fundamental Step in the Synthesis of Life*. Artificial Life, 10, 2004, p. 238.

[48] « Just as the sacrament not only symbolizes . . . an operation of Grace, but is also the real presence of God . . . in the same way the sensible has not only a motor and vital significance but is nothing other than a way of being in the world that our body takes over […] sensation is literally a communion » (M. MERLEAU-PONTY, *Phénoménologie de la perception,* Gallimard, Paris, 1945, p. 245).

[49] Again, this is not an essay in the historical epistemology of organisms, or a suggestion in how to rethink our presuppositions about vitalism, e.g. by revisiting its history. For some efforts in this direction, see C.T. WOLFE, *From substantival to functional vitalism and beyond, or from Stahlian animas to Canguilhemian attitudes*. Eidos, 14, 2011, pp. 212-235 ; S. NORMANDIN, C.T. WOLFE (eds.), *Vitalism and the scientific image in post-Enlightenment life science, 1800-2010*, Springer, Dordrecht, 2013.

they reduce their claims to mere heuristics, *conversely*, they risk losing sight of a certain kind of organizational « thickness », a «vital materiality» in Wheeler's terms[50]; he opposes vital to *implementational* materiality, without really *fleshing* out the distinction, so to speak, but I assume it is similar to what an earlier, perhaps the first theorist of vital materiality, Denis Diderot, expressed in a nice metaphor: «What a difference there is, between a sensing, living watch and a golden, iron, silver or copper watch!»[51].

If there was only implementational materiality, (**i**) we would fail to grasp any meaningful difference between a living watch and a silver or copper watch – and please note, this difference need not be justified in terms of a vital force, an entelechy, an *élan vital*, a centralizing soul or self, an irreducible intentionality or first-personness[52] – and (**ii**) we would lapse into a kind of lazy multiple realizability position[53] which disregards the material in which a system is realized, of the sort classically stated by Varela and later, Robert Rosen. Here is Varela:

> 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*.[54]

[50] M. WHEELER, *Mind, things and materiality*, in L. MALAFOURIS, C. RENFREW (eds.), *The cognitive life of things*, pp. 29-37.

[51] D. DIDEROT, *Éléments de physiologie*, in *Œuvres complètes*, dir. H. Dieckmann, J. Proust, J. Varloot, Éditions Hermann, Paris, 1975-, XVII, p. 335.

[52] Contra the Varela first-person business (e.g. F.J. VARELA, J. SHEAR, *First-person methodologies: why, when and how*, Journal of Consciousness Studies, 6(2-3) 1999, pp. 1-14).

[53] See the excellent history and analysis of multiple realizability arguments in J. BICKLE, Multiple Realizability. In E. ZALTA (ed.), *Stanford Encyclopedia of Philosophy*, http://plato.stanford.edu/entries/multiple-realizability/, 1998; updated 2013.

[54] F.J. VARELA, *Principles of Biological Autonomy*, Elsevier North Holland, New York, 1979, p. 9, cit. in W. BECHETEL, Biological mechanisms, *cit.*, p. 294. To be fair, in context Varela is not calling for multiple realizability, but it is not clear why or how he is not.

Using much the same language, Rosen describes his approach as «relational», which we might think of as congenial to the study of specific biological forms of organization, but no: he adds that the relational approach aims to «throw away the matter and keep the underlying organization»[55]. This is like the central dogma of functionalism, i.e., multiple realizability, by virtue of which the materiality of systems is held to be irrelevant: as expressed classically by the arch-functionalist Hilary Putnam, «we could be made of Swiss cheese and it wouldn't matter»[56].

To conclude, there is something endearing about vitalist claims especially when they *don't* invoke or rely on a foundational subjectivity, *including* because they don't revert to explaining biological systems (embodied agents) in fully systemic, formalized terms. So is a small amount of biochauvinism acceptable, or even desirable? If it means the effort to grasp the kind of vital materiality characteristic of biological systems – their organization, in the language of Moreno, and also Bechtel, who, like Scott Turner, invokes Claude Bernard as an important predecessor of this view[57]. Recall that for Bernard, «In order to study the phenomena pertaining to living beings and discover the laws that govern them, it is not necessary to know the essence of life itself»[58]. We could enlist Bernard in support of the view that an investigation of vital materiality need not transcendentalize Life or organism. But is this materiality «substance» or «organization»? It is not quite a biochauvinism, or very weakly, because it does not posit a vital substance, a foundational interiority or an absolute set of criteria for Life: recall von Bertalanffy's observation, «There is no

[55] R. ROSEN, *Life Itself*, Columbia University Press, New York, 1991, p. 119; cf. «throwing away the physics and keeping the underlying organization» (p. 280).
[56] H. PUTNAM, Philosophy and our Mental Life, in Putnam, *Mind, Language, and Reality. Philosophical Papers*, vol. 2, Cambridge University Press, Cambridge, 1975, p. 291.
[57] J. S. TURNER, cit., chapter 2 (on Bernard machines); *idem*, Homeostasis and the forgotten vitalist roots of adaptation, in S. NORMANDIN, C.T. WOLFE (eds.), *Vitalism and the scientific image*, cit.
[58] C. BERNARD, *Histoire de l'expérimentation physiologique – l'art d'expérimenter sur les êtres vivants*, Revue des cours scientifiques de la France et de l'étranger, 6e année, Germer Baillière, Paris, 1869, p. 194.

"living substance" because the characteristic of life is the organization of substances»[59]. However, as I've said earlier, a focus on organization and relations need not imply that we sacrifice its materiality in favour of 'Swiss cheese' multiple realizability. A biochauvinism implies a degree of ontological commitment (what I termed a «weakly ontological» view of organism in my earlier reflection on the topic[60]). A tangibility, implicit in what I above pointed to – that most materialists can accept a degree of embodiment (a.k.a. biochauvinism), granting that facts about bodies can act as 'major constraints' on facts about minds. Yet this tangibility, this embodiment appeal to no foundational interiority, no special inner life.

My suggestion then is that it should be possible to articulate a concept of biological holism or organicism (whether it is located in systems biology, theoretical biology, evolutionary biology or a philosophical reconstruction of several of these) which dispenses with the first-person obsession or the transubstantiation-friendly invocation of an ontology of the body as *corps propre*, although this is not the same as Clark's, Wheeler's or Malafouris' attention to vital materiality. Such a view is neither an empirical, laundry list 'biochauvinism' nor a metaphysical 'vitalism'.

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[59] L.V. BERTALLANFY, *Modern theories of development*, trans. J.H. Woodger, Oxford University Press, H. Milford, London, 1933, p. 48.
[60] C.T. WOLFE, *Do organisms have an ontological status?*, cit.