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Is the concept of organism central in biology, or, which is not quite the same, in the history and philosophy of biology? Here, a process of naturalization of the monad, in the eighteenth century following Leibniz, is pointed to as a key source in the crystallization and conceptualization of a “pensée du vivant,” somewhere in between life science and theoretical and/or ‘framing’ considerations thereupon. Indeed, the Montpellier vitalist Théophile de Bordeu named monads, along with Buffon's organic molecules, as key hypotheses on the structure of organized bodies, and this is also explicit in Maupertuis’ ideas on ‘molecules’ possessed of desire, appetite and memory.¹ The Leibnizian guiding thread, the *Leitfaden* that Duchesneau follows in this book (which he calls a Leibnizian “phylum,” 476) is the idea that no monad can be understood without an organic body, and no body is substantial if it is not organic (21). This reviewer first learned of the view that this idea is a key part of post-Leibnizian biology-related projects, in Georges Canguilhem’s short essay on Leibniz and the birth of cell theory.² But Duchesneau notes that it's Ernst Cassirer’s point, first of all.³

Duchesneau returns to this core idea, extending his analyses in his recent books which first covered the context leading up to Leibniz, then focused on the organism concept *in* Leibniz.⁴ The present account builds on this earlier work (sometimes recapitulating it) and moves all the way to Kant’s theory of organized beings in the third *Critique*, which Duchesneau views as the major step in theories of organism prior to the emergence of biology as a science. Leibniz is

¹ T. de Bordeu, *Recherches sur les maladies chroniques*, § CXXXIII, in Bordeu, *Œuvres complètes* (Paris: Caille et Ravier, 1818), vol. II, 925. Cf. C.T. Wolfe, “Endowed molecules and emergent organization : the Maupertuis-Diderot debate,” *Early Science and Medicine* 15 (2010): 38-65.

² G. Canguilhem, “Note sur les rapports de la théorie cellulaire et de la philosophie de Leibniz,” Appendix II in his *La connaissance de la vie* (Paris: Vrin, revised edition 1980), 187-189.

³ E. Cassirer, *Leibniz’ System in seinem wissenschaftlichen Grundlagen* (1902; reprint, Hildesheim: G. Olms, 1962), 401-422, cit. Duchesneau, *Organisme et corps organique*, 12. R. Rey also emphasized that in these eighteenth-century thinkers, “what was a principle of change in [Leibnizian] substance becomes a property of living matter” (“L’âme, le corps et le vivant,” in M. Grmek, ed., *Histoire de la pensée médicale en Occident*, vol. 2 : *De la Renaissance aux Lumières* (Paris: Seuil, 1997), 122).

⁴ F. Duchesneau, *Les modèles du vivant de Descartes à Leibniz* (Paris: Vrin, 1998); *Leibniz – le vivant et l’organisme* (Paris: Vrin, 2010). See already Duchesneau, *La physiologie des Lumières. Empirisme, modèles et théories* (The Hague: Martinus Nijhoff, 1982), 65-102, on Leibniz’s impact on biology.

perhaps the first great modern theorist of organism, and this book focuses first on Leibniz's theory of generation (as a combination of empirical and metaphysical considerations) in order to then study its twists and turns in the eighteenth century up until and including Kant. This focus on organism (and preformation) is there in the *Theodicy*. Duchesneau also insists on Leibniz's changing views: we should not rely on the illusory systematicity of the *Monadology* to reinterpret all of Leibniz's discussion of organism, monads and organic bodies (63). Yet this is nevertheless a very systematic account.

A key locus in Leibniz is his actual usage of the term 'organism'. Duchesneau has an excellent synthetic account of recent work on the sources of the organism concept (notably Cheung's and Andrault's) and he notes that one can, depending on one's interpretive position, privilege Georg-Ernst Stahl (who used the term the earliest in this context), Friedrich Hoffmann (as Duchesneau does) or Nehemiah Grew (as Andrault does). In any case, he shows how Leibniz was acquainted with all of these versions of the idea and digested them, so to speak, in his own (24). The general idea here is that the Leibnizian pair 'monad – organic body' is a key component in eighteenth-century inquiry into life, providing a kind of framework, at times more overarching, at times more partial (and, importantly, with varying degrees of faithfulness to this framework). Duchesneau adds that there is a kind of mutual influence, in that Leibniz's concepts were inspired by medical and scientific discussions of the period, but also subsequently influenced them (63). Sometimes it is an "adjustment" of the Leibnizian model to new experimental and theoretical contexts (like experiments on generation of insects, polyps, etc.) (156).

Duchesneau emphasizes the influence on Leibniz of microscopical anatomy, 'micro-mechanism' à la Malpighi, in which organic machines are composed of tiny machines (22-23), which in Leibniz become "machines of nature" (which are machines to infinity). They are similar, but the former bottom out. Duchesneau discusses an important passage from a letter of Leibniz to Hoffmann of September 1699, in which Leibniz states that indeed, everything occurs in nature mechanically, *but* that the general principles of mechanism stem from a "higher source" (*ex altiore fonte*).⁵ But he stresses that Leibniz is just as keen to proffer mechanistic rebuttals, notably to Stahl, in accordance with the principle of sufficient reason (whatever occurs in matter can only be an effect of a preceding state of matter: 41), so that the perceptive and cognitive capacities of monads cannot be effects of the geometrical and mechanical properties of bodies, and vice versa (42). Contra Stahl, in their debate, Leibniz thus insists that animate principles in the soul do not causally effect vital processes (45). This is a good example of how broad categories like mechanism and vitalism are to be handled with care in interpreting these texts. One does get the impression Duchesneau finds the former both more applicable and more fruitful as a category, perhaps because it was more historically appropriate than 'vitalism'.

⁵ Letter to Hoffmann of 27 September 1699, Dutens II-1, 260, cit. Duchesneau, 37.

Clearly, elements in both Stahl and Haller count as 'vitalistic', but Duchesneau is cautious here because the term was not yet in use in this period (the late seventeenth century) (30, 81).

Here, figures studied in the wake of Leibniz include Bourguet, Needham, Buffon, Maupertuis, Haller, Condillac, Bonnet, Diderot, La Méthérie (but also Christian Wolff, Bilfinger, Canz, Winckler as well as Hanov, Blumembach and Kielmeyer), all the way to Kant. In Wolff, monadology is no longer about the infinite but about monads which are 'atoms of force' (16). In case we thought Duchesneau was making it up, or at least claiming to connect a series of hitherto unconnected authors, later in the book he cites a letter from Mendelssohn to Lavater in which Mendelssohn explicitly speaks of the "monadists since Leibniz," naming some of the Wolffians and asserting that this tradition leads to Bonnet (cit. 279). One of the striking novelties of this book is that it includes a chapter-length of the Wolffian Michael Christoph Hanov's work on philosophy of nature of 1762 (a work which, as Peter McLaughlin showed some years ago, uses the term 'biology' forty years before Lamarck and Treviranus did).⁶

What happens in the aftermath of Leibniz, in eighteenth-century natural philosophy and life science with its more or less explicitly Leibnizian invocations? Notably, to use a term that is recurrent throughout the book (I didn't count the usages but it appears at least 15 times), it is a process of *naturalization*. This is obvious in authors like Maupertuis and Bonnet (and indeed had been noted, if not literally in these terms, by Canguilhem, and earlier Cassirer, as noted above). But Duchesneau, in the chapter on Christian Wolff and the Wolffians, notes that even there, there is already a kind of "naturalization" of the monad (119), in the sense that life is no longer understood, as in Leibniz, as perception and appetite, but as the persistence of structural combinations.

Duchesneau uses the same expression regarding Louis Bourguet; this time, naturalization is defined as the "possible reduction of the metaphysical content" (of the monad) to its "corresponding empirical connotations" (138). In the case of Maupertuis, Duchesneau speaks of "physiological monads" (a term he had used in earlier work: cf. 146, 167). Maupertuis "denounces in the monad a transcendent subject to which the bodies in the universe would be reduced, as mere phenomena" (482). Duchesneau emphasizes the importance of Condillac's then-unattributed essay on monads in this context: in another variant of this naturalization, Condillac treats perceptual representation as an effect of force, and collapses the physical and the phenomenal levels of force into one (155). We are also treated to a long (full chapter) analysis of the priest and naturalist John Turberville Needham (1713-1781), famous for his microscopical discoveries. Here, we get perhaps the first inkling that the Leibnizian framework (including as a process of emancipation from Leibniz himself, in a process of 'naturalization')

⁶ M.C. Hanov, *Philosophiæ naturalis sive physicæ dogmaticæ tomus I continens physicam generalem, cœlestem et ætheream. Tanquam continuationem systematis philosophici Christiani L.B. de Wolff* (Halle, 1762); reprint (Hildesheim: G. Olms, 1997); P. McLaughlin, "Naming biology," *Journal of the History of Biology* 35 (2002): 1-4.

might be a bit of a Procrustean bed in Duchesneau's hands. In his rich and nuanced analysis of Needham's negotiations on generation, between preexistence and epigenesis, he reads perhaps more Leibniz than is there into the texts (196). One has the same impression with the analysis of Haller (that Bonnet wanted to integrate Haller into his own, post-Leibnizian project does not make it any easier to find Leibnizian commitments in Haller) (275).

Duchesneau's story is at its most straightforward in cases of explicit naturalization of the monad, when it becomes an elementary unit of life (167), e.g. in the case of what he had earlier called "physiological monads," or a "reduction," as in Bonnet (301), who he also describes as "merging" the monadological and the physical levels which Leibniz has striven to keep apart (306). But it is not always so straightforward.

Sometimes, as I noted regarding Needham and is quite apparent in the analysis of Diderot, Duchesneau's insistence on a kind of *longue durée* endurance of monadic concepts seems too strong, e.g. when he describes Diderot's "décalage" of the Leibnizian monad, in which it becomes a "basic physiological entity" (375), or when he presents Diderot's active-matter theory as Leibnizian because of Diderot's description of "living and sensing points" (490). While I concur that Leibniz was very important to Diderot (a relationship explored in earlier times by Yvon Belaval), these "points sensibles et vivants" are also very Epicuro-Lucretian! (and this dimension of Diderot's materialism makes much more sense of texts like the *Lettre sur les aveugles* and the *Rêve de D'Alembert* than a strictly Leibnizian interpretation⁷).

At other times, the account of naturalization becomes very, very nuanced – quite convincing in detail but increasingly removed from a clear framework of origin⁸: almost a 'family resemblance' concept. Then, Duchesneau starts to speak of hybridization or of 'deviant' forms of naturalization (in French this term does not necessarily have a normative connotation!). This seems to be the case in Buffon and Needham, among others (251). Sometimes the naturalization is not a deviation but a 'broadening' of the monadological concept: "the naturalization of monadic properties. . . broadens. . . the initial Leibnizian vision" (141). This could fit Buffon's desire to present an account of the animal economy (including organic molecules and internal moulds) which is precisely, broader than the strictly mechanistic models. In Charles Bonnet, Leibnizian machines of nature are integrated with a Hallerian account of the nervous system, a Newtonian physics or at least philosophy of nature, and elements of

⁷ The same applies to the *Eléments de physiologie*, which is more 'Hallerian' than 'Leibnizian'.

⁸ Compare, in a different but not *so* different context, the problem of applying the category 'empiricism' to different early modern texts: the position taken e.g. by Peter Anstey is that so many meanings and nuances are involved that the term ceases to be useful or applicable. I mention this simply as an interesting point of (methodological) comparison. See my "Rethinking Early Modern Empiricism: The Case of Locke," *Studi Lockiani* 2022: 281-304 for some discussion.

frameworks derived from empiricism and experimental philosophy (288⁹): this certainly qualifies as hybridization of the Leibnizian original! (Which is not to deny that Bonnet himself is explicit that his work should be seen as Leibnizian.) Duchesneau also describes how Bonnet's naturalization of the monad is a bit of a roller-coaster, given that Bonnet initially rejected the account in the *Monadology*, but integrated it into his work later on (281).

As I have already noted, it is an unusual feature of the present narrative that it goes up to and includes Kant. One reason it is unusual is that Kant is often studied either in isolation (as a 'great thinker') or in a very Germanic and temporally restricted context. And after all, the distinction between regulative and constitutive, the idea of an 'epigenesis of pure reason' and much of the account of teleology in the third *Critique* seem *sui generis*. How are they to be related to Leibniz and to Leibnizian or post-Leibnizian 'expansions' of and 'deviations' from the monadological vision? One figure who bridges the two worlds, as it were, was Johann Friedrich Blumenbach, who viewed himself as carrying out a Kantian project in the study of development (with some explicit validation from Kant himself). Here, Duchesneau profitably although briefly engages with what has become known as the 'Lenoir Thesis' (411): the claim that early nineteenth-century German biology had a coherent Kantian-influenced research program, which Lenoir described as 'teleomechanist'.¹⁰ Duchesneau is careful here, observing for instance that the idea that there was a coherent teleomechanist research program is implausible, including because teleology and mechanism are strongly "dissociated" by Kant (463n.). However, he supports a modified version of the thesis, not just as a philosophical framework which is then used by biologists, but as a hybrid constellation including explicit engagements with theories of organized beings (425).

One might see Duchesneau as endorsing a broad version of Lenoir's idea, because it allows him to further emphasize a kind of developmental narrative from Leibniz to Kant via these other authors (rather than dissociating Kant from the projects for foundation of life science that were active in this *naturphilosophisch* context). Nevertheless, it is hard to see how Kant fits here. For he is explicitly suspicious about a lot of the theories of generation detailed in this book as the interim between Leibniz and Kant. It's clear how Kant is close to Blumenbach (he says so) but neither Blumenbach nor Kant seem as close to the Leibnizian models that were explicit in the first chapters of the book (and that gradually became further and further 'naturalized' and/or 'deviant'...). As Duchesneau himself observes, "the organic body that the Leibnizians understood

⁹ Duchesneau cites a very telling passage from Bonnet's *Palingénésie philosophique* (bk XII, chap. VIII) in which he defends Leibniz and Haller against the judgment of unnamed contemporaries (293).

¹⁰ Cf. T. Lenoir, *The Strategy of Life: Teleology and Mechanics in Nineteenth-Century German Biology* (Dordrecht: Reidel, 1982) and the criticism of K.L. Caneva, "Teleology with regrets," *Annals of Science* 47 (1990): 291-300. It would be ideal if we could take Duchesneau's, Lenoir's and John Zammito's recent work on the emergence of German biology together, for they are complementary works. See also the essays collected as *Philosophy of Biology before Biology*, eds. C. Bognon-Küss and C.T. Wolfe (London: Routledge, 2019).

as a machine of nature can only be interpreted and analyzed from a Kantian point of view according to the idea of this organization as a principle of regulation of any subordinate causal analysis” (473). If Kant did start from a neo-Leibnizian vision of organized bodies as functionally integrated machines of nature, he nevertheless radically departed from this vision when he asserted that principles of causality and of purposiveness were heteronomous in determining actual organic processes (462).

Overall, this is a fascinating and important book, whether or we not we see all the figures it studies in as ‘Leibnizian’ a light as the author does. It contributes significantly to placing Leibniz, if not at centre stage, nevertheless in a key position in the formation of Enlightenment and post-Enlightenment biological ideas (to use an approximate phrase). Duchesneau is not reconstructing Leibniz’s philosophy of biology (like Justin Smith¹¹ and others have done in recent work, including Duchesneau himself in his previous monograph on Leibniz and organism); he is, on the surface, studying a kind of reception and influence – a *Wirkungsgeschichte* of Leibniz’s ideas on monads and organic bodies – but also, implicitly, arguing for Leibniz’s contribution to the development of biology (or to theories of vital organization, which he describes as “at the threshold of biology”: (476), as he acknowledges in the conclusion.

¹¹ J.E.H. Smith, *Divine Machines Leibniz and the Sciences of Life* (Princeton: Princeton University Press, 2011).