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Theorizing epigenesis in a time of preexistence: From the end of the seventeenth century to the 1720s

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Abstract According to a classic periodization in the history of science, biological thought as it emerged in France from the last decades of the seventeenth century to the 1740s was strongly committed to the doctrine of the preexistence of germs. Nicolas Malebranche's role in disseminating this paradigm, particularly in the milieu of the *Académie Royale des Sciences* during the years when Bernard Le Bouyer de Fontenelle was its secretary, has been studied in detail, especially by Jacques Roger. However, much less has been said about the authors who argued against this doctrine prior to the appearance of the relevant pieces by Pierre-Louis Moreau de Maupertuis, Georges-Louis Leclerc, Comte de Buffon, and Denis Diderot. I aim to examine a series of French medical treatises and clandestine manuscripts that outlined a mechanist theory of epigenesis, between the end of the seventeenth century and the 1720s, to bring to light the strategies—often quite original—that allowed them to achieve this result. One interesting case is the heterodox readers of Malebranche, which use some of his own arguments (notably on the physiology of brain traces and the laws of nature) both against preexistence and to support epigenesis. I inquire into the historical worth of the positions defended by these authors as well as into the connections existing between the history of epigenesis and that of materialism in the early modern era.

Keywords Epigenesis · Preexistence · Malebranchism · Materialism

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1 The historical and theoretical background

In a few famous pages of the *Entretiens sur la métaphysique et sur la religion* (*Dialogues on Metaphysics and on Religion*; 1688), Nicolas Malebranche (1638–1715), a French Oratorian priest and philosopher, set out, for the first time in a complete and coherent manner, his opinions on the origin and reproduction of living beings. In *Entretien X*, the interlocutors ask themselves whether it is possible to account for the formation of plants and animals in the way René Descartes (1596–1650) had suggested, namely by resorting to the same laws of nature used to explain the genesis of the world. Théodore, the author's spokesperson, has no doubts about the question:

> Surely it is impossible that the laws of motion alone can, in respect of certain ends, adjust together an almost infinite number of organic parts, which comprise what we call an animal or a plant. It is much more the case that these simple general laws are sufficient to cause all those wonderful works, all of which God formed in the first days of the creation of the world, to grow insensibly and appear in due time. (Malebranche 1997b, pp. 175–176).

The *Description du corps humain* (*Description of the Human Body*; 1664), in which Descartes had attempted, within the framework of his own mechanism, to clarify how from the union of the homogeneous seeds from the two sexes a living being could gradually take shape, failed to convince Malebranche. In his view, the great complexity of plants and animals could not be deduced from the laws of Cartesian physics alone. Furthermore, as Malebranche already pointed out in *Recherche de la vérité* (*The Search after Truth*; 1674–1675), Descartes had conceived a biology "in general" and had not given too much attention to the problem of how specific differences are perpetuated (Malebranche 1997a, p. 117). In order to overcome these difficulties, the only alternative the Oratorian had was to espouse the hypothesis of the preexistence of germs, which meant that he had to attribute the creation of all embryos, encapsulated within each other and progressively miniaturized in the first individual of each species, to God, and leave their growth alone to the laws of nature.

Malebranche's arguments deserve attention on account for the wide following they came to acquire in France, particularly within the *Académie des sciences* (Schrecker 1938; Pyle 2006). As well as being philosophically and theologically well founded, Malebranche's doctrine of preexistence also possessed considerable scientific credibility, because it rested on the Cartesian theory of the infinite divisibility of matter and the more recent observations made with microscopes.[1] Furthermore, experimental investigation had already led scientists to posit that embryos (at least those of the second generation) were to be found preformed in the female seed (ovism) or the male seed (animalculism), a notion known as preformationism that should be distinguished from preexistence (Bowler 1971).

[1] In this respect, it should suffice to mention scientists such as Jan Swammerdam (1637–1680), Antonie van Leeuwenhœk (1632–1723) and Marcello Malpighi (1628–1694), whose work Malebranche himself refers to in order to illustrate the doctrine of preexistence (Pyle 2003, pp. 166–173).

The weight of this 'evidence' was and would be so great that even the heirs of Descartes who were hostile to preexistence hardly had any other option but to counter it with preformist alternatives (Solinas 1967; Roger 1993). In my essay, however, I shall deal with authors who, despite the tendencies of their times, attempted to rethink epigenesis on the basis of Cartesian mechanism. In particular, we shall examine two heterodox interpreters of Malebranche, who succeeded in deploying other theses of his in order to argue against the doctrine of preexistence (without however falling back into preformism). In their texts, not only do we see elements of the epigenesis of Descartes and his contemporaries re-surface, but also foreshadowings of ideas which would be adopted from the 1740s onwards by thinkers who would restore popularity to the epigenetic position thanks to a modified form of mechanism. While it is true that these attempts at theorisation were isolated (they were not fully part of the more prominent debates of the age), incomplete (they failed to provide a detailed description of embryonic development) and not entirely conclusive (they avoided or raised major problems), one has to recognise that they represent a clear effort to ascribe both the origin and the reproduction of living beings to nature, thus adding an important element to the history of epigenesis and casting light on its links with the development of early modern materialism.

2 Reintroducing a discarded hypothesis

The first case we shall focus on is that of Jean-François Vallade (16..–17..), a Huguenot physician and the author of *Idea generalis morborum et passionum hominis* ("General Idea of Human Diseases and Passions"; 1694) and *Discours philosophique sur la création et l'arrangement du monde* ("Philosophical Discourse on the Creation and Ordering of the World"; 1700). Despite some continuities, there are also significant differences between those two works, for example in the chapters dealing with the formation of living beings. On this specific issue, the more interesting of the two texts is the 1694 one, which Vallade in all likelihood drafted during a stay in England and which appears to have had limited circulation.[2] The mechanism of the *Idea generalis* is of a markedly eclectic nature. The author not only read French thinkers, Descartes and Malebranche in particular, but also British ones like Robert Boyle (1627–1691) and, very probably, Sir Kenelm Digby (1603–1665). This is already shown in the explanation the author provides for the origin of the world, which rests on a Cartesian-Malebranchian basis, onto which principles of atomistic theory and the lexicon of the chemical tradition are grafted.

[2] Very little is known about Vallade's biography. The information on his stay in England can be gleaned from his dedicatory *Epistola* and the sonnets which precede the *Idea generalis* (Vallade 1694, pp. ii–iv). This somewhat rare text appears to have been almost completely unknown to his contemporaries and to critics. The only review of it was provided by Étienne Chauvin (*Nouveau Journal des Savants*, March–April 1694, pp. 131–152) and there is only one study which refers to it (see Thyssen-Schoute 1989, pp. 199–202). The *Discours* on the other hand is better known. It was reviewed by Pierre Bayle (*Nouvelles de la République des Lettres*, October 1700, pp. 411–428) and mentioned in the entry *Rorarius* (K) of his *Dictionnaire historique et critique* (1702[2]). It is also quoted in secondary literature (see, e.g., Roger 1993, p. 363).

According to Vallade, after God created inert matter and introduced "motion in general" (or rectilinear motion) into it, God regulated collisions and established the communication of movements; matter, made up of "*minima*" (or atoms) of different figures, moved in compliance with these laws, configuring itself into the elements; finally, the coarser "*moleculæ*" aggregated so as to make up the inanimate "*mixta*" or bodies (Vallade 1694, pp. 16–22). Vallade also adopts a selective method in dealing with Cartesian sources: for example, whereas in physics he accepts Malebranche's criticism of the opposition between motion and stillness established by Descartes, in psychology he remains aligned with the positions of the *Meditationes de prima philosophia* (*Meditations on First Philosophy*; 1641), discarding Malebranche's thesis of the obscurity of the soul to itself (pp. 19–20 and 14–16). Eclecticism and selectivity are methodological attitudes we shall continue to find traces of in the pages which Vallade dedicates to the issue of the origin and reproduction of living beings.

As I mentioned, Vallade, in agreement with both Descartes and Malebranche, believes that inert matter is the product of physical laws (rectilinear motion and the communication of movements). In finding that such laws are insufficient for the formation of animated beings, he takes a position which is closer to Malebranche than to Descartes, however. Yet the *pars construens* of his discourse does not follow the solution that the mature Malebranche advanced in his *Entretiens*, but adopts a hypothesis contained in another text, which in its various drafts reflects the development of Malebranche's thought. The *Éclaircissement XV* in the *Recherche de la vérité*, in its editions published up to 1700, that is, before it was brought into line with the results of the *Entretiens*, actually reflected some hesitation on the part of the author on the problems posed by living beings, and left room to suggest an idea which Vallade took up while he was writing his *Idea generalis* (1694). What follows is the relevant text as it was up to 1700 (A) and in the wording it would take on later (B):

(A) For organized bodies depend on *many other natural laws*, which are perfectly unknown. It may be living bodies are not formed like others by a determinate number of natural laws. For there is great probability, they were all formed at the creation of the world, and that time only gives them a necessary growth, to make them visible to our eyes; nevertheless, it is certain, they receive that growth, by the general laws of nature… (Malebranche 1694, p. 176)

(B) For organized bodies depend on the initial construction of those of which they are born, and it is likely that they were formed at the creation of the world, though not as they appear to our eyes, and that with time they receive nothing more than the growth necessary to become visible. Nevertheless, it is certain that they receive that growth only through the general laws of nature… (Malebranche 1997a, p. 664)

It is precisely the idea that plants and animals depend on "other laws"—an attempted explanation Malebranche would later discard in order to postulate the 'miraculous' creation of all individuals on the part of God (Robinet 1970, pp. 377–431)—which re-appears in the *Idea generalis*. If the laws of Cartesian physics can produce only "several and confused molecules", i.e., the inorganic ones, Vallade points out that

> It must therefore have been God, after having established such laws, to then institute others, from which a portion of matter was determined so as to constitute animated beings; it was necessary, I say, that God willed a portion of matter to move in a determinate way and then take up other figures, that subsequently its parts met in many ways and, finally, that they became entangled, but in determinate ways, so as to form these countless bodies. (Vallade 1694, p. 23).[3]

The idea that God established a separate regime of laws for animate beings doubtless makes for difficulties if one considers it in relation to the Cartesian-Malebranchian model of natural laws. (1) It runs the risk of splitting the unity of nature by supposing that there exist within it two distinct systems of laws. Vallade seems to be aware of this and tries to remedy the problem by: (a) stating repeatedly that in both the case of the living and of the inert all that is involved is matter (or extension) and movement[4]; (b) specifying that the distinction between systems of laws (or between the divine laws establishing them) is not so much 'in itself' as 'for us': in the final analysis, we need to assume it because we are unable to deduce one from the other.[5] (2) The idea of a separate set of laws also re-introduces a certain degree of finalism into nature: the formation of living beings, although brought about by laws of nature, is the effect of a specific plan established by God. The problematic status of Vallade's "other laws" appears typical of a period in which the inadequacy of Descartes's physics in the realm of life has already been ascertained, but where a more complex mechanistic paradigm, which could be used to rethink the phenomenon of life more effectively, has yet to be developed.

In any case, having ascribed the formation of living beings to a series of specific laws or movements, Vallade is in a position to counter the Malebranchian doctrine of preexistence with an epigenesis which is less generic (at least in its intentions) than the one theorised by Descartes. In discussing the reproduction of animals, the author of the *Idea generalis* argues that the (male and female) seeds of a given species are processed in the genital organs so as to receive a "determination" which, when they come together and mix, triggers a phenomenon similar to fermentation, which leads to the differentiation of seminal material and the constitution of an individual similar to his or her parents (Vallade 1694, p. 26).[6] Through this process, the particular movements that brought about the production of the first individual of each species are reactivated in the seminal matter after fertilisation, thus allowing the specific differences to be perpetuated.[7] The formation of individuals occurs *ex*

[3] If not otherwise stated, all translations are my own.

[4] In this connection, Vallade considers it appropriate to insist on the uselessness of (sensitive and vegetative) souls, which the Aristotelians had resorted to in order to explain the phenomenon of life (pp. 22–23).

[5] This point had already been clarified by Vallade where, in explaining the origin of the world, he had attributed the introduction of motion in general and the institution of communication of movements to two distinct divine wills (pp. 18–19).

[6] Descartes explained this process in a very similar way, e.g. in his *Description du corps humain* (Descartes 1984, pp. 321–324).

[7] As Vallade clarifies, fermentation causes motion in general, transferred from certain particles of matter to others, to be determined in "countless particular movements", taken on by the particles themselves (p. 34).

novo in each new generation in the same way as for the first generation, since the laws which govern them must always apply in the same manner, through the ordinary concourse of God. Vallade does not provide any clearer indications on the individual moments of embryonic development, nor does he advance any hypotheses about the individual organ starting from which all the rest is produced. For greater details he refers the reader to "recent authors", in all likelihood Descartes or Digby, "who have written elegantly in relation to the generation of animals" (p. 30).[8] On the other hand, he directs a rather structured criticism to the "most recent" authors, i.e., the supporters of preformism and preexistence, which it is worth repeating here.

In his opinion, it is first of all necessary to reconsider the "experiments conducted with microscopes ": the fact that the seeds of plants are configured "as in an outline" does not imply that there are preformed parts in animal seed too (p. 27). This analogy had actually contributed to the rise of preformationism (Bowler 1971, p. 231). In rejecting it, Vallade appears, in any case, to be going back to earlier arguments rather than exploiting newly acquired knowledge of plant biology. Descartes, in the *Description du corps humain*, had already made a distinction between the seminal matter of animals, which is fluid and undifferentiated, from the seed of plants, which "being hard and solid, may have its parts arranged and situated in a precise way that cannot be altered without destroying their efficacy" (Descartes 1984, pp. 321–322). Vallade also opposes those who had fallen back on preformation after having realised that the Cartesian laws of physics only ensure growth. In actual fact, these people failed to realise that "the growth of bodies is almost a repetition of their production" and "occurs with equal difficulty as their generation" (Vallade 1694, p. 28). In growth, the matter of the nutrient juices must be reconfigured by particular movements in order to expand the organs of a living body. In the same way, after fertilisation, the separate set of laws governing living beings (the "other laws") ensure that the seeds, composed of matter "purified" by the genital organs, are transformed into the substance of the parts of a new individual. The analogy between growth and generation had already been deployed in support of epigenesis by Digby in his *Two Treatises* (1644). If a qualitative alteration takes place to transform the nutrient juices in parts of the body in order for it to expand, he commented, why deny that undifferentiated seminal matter can progressively be changed into the substance of the parts of a new individual? Just as it is not necessary for the nutrient juices to formally contain the parts of the body, the same can apply to the seeds (Digby 1644, pp. 215–219; Pyle 1987, p. 232).

On close inspection, it is clear that preexistence could not have convinced Vallade a priori, since his atomism prevented him, unlike Malebranche, from postulating the infinite divisibility of matter. His strongest objection against the

Footnote 7 continued
The fermentation of seminal matter is thus capable of reactivating the particular movements on which the formation of living beings in each species depends.

[8] Even if it seems likely that Vallade refers to those mechanist authors, one cannot rule out a priori that he took into consideration the work of other scientists, including William Harvey. In fact, only a few years later, Frenchmen like Maupertuis used precisely Harvey's experiences against preexistence (Terrall 2002, pp. 213–214).

doctrine however was actually fuelled by Malebranchism: to suppose the immediate creation of all individuals is something which would not comply with the idea that God acts through the most simple paths; it would thus be better to believe that a single divine will instituted the laws which govern the origin and reproduction of living species (Vallade 1694, p. 27). This position, notwithstanding the theological convictions underpinning it, also involved some risks. It is significant that Vallade took care to specify that the initial formation of plants and animals is not just the effect of the laws alone, but of the action of God in accordance with them (p. 25). We witness, in a way, the return of Descartes's caution with his fable of the world, together with Boyle's concept of a God guiding the initial movements of matter and then letting nature take over. Vallade also implied that living species remain unchanged over time, since he ascribed their reproduction to a separate set of fixed laws (the "other laws"). At the most, therefore, nature can produce monsters 'by mistake', certainly not new varieties of plants and animals. And yet Vallade feared that he had already granted too much agency to matter. This can be inferred from a question that he asked himself and which implied a profession of dualism:

> But, some say, if we envisage that it was enough for God to will matter to be arranged so as to produce the bodies of living beings in order for living beings to be produced, why did God not consider it equally sufficient to will that matter be able to think in order to create the rational animal? (Vallade 1694, p. 24).

One might here perceive an early echo of the hypothesis of thinking matter advanced by Locke in his *Essay concerning Human Understanding* (1690, b. IV, ch. III, § 6). In the same way as Vallade, Locke had God attribute a power to matter. We know, however, how much materialism issued from it (Yolton 1987, 1991).

3 Rearticulating natural legality

The fear that the claims in the *Idea generalis* might be open to materialist readings may explain why Vallade, in his *Discours philosophique* of 1700, abandoned the "other laws" and adopted decidedly providentialist tones in depicting the formation of plants and animals.[9] A very different attitude was adopted by the other author discussed in this essay, Jean Meslier (1664–1729), who in dealing with the origin and reproduction of living beings put a finishing touch on a philosophical position that was explicitly informed by materialism and atheism. His *Mémoire* (*Testament*; before 1729) only circulated in manuscript form up to 1762 when Voltaire (1694–1778) published an abridged and revised version of it, which was entitled *Extrait des sentiments de Jean Meslier* ("Abstract of Jean Meslier's opinions"). Being a country priest, Meslier had access to rather scanty sources: a few classical and scholastic authors, the main French moralists, Fénelon and, most of all,

[9] The *Discours philosophique* only makes a mention of "other laws" in one of the marginalia (Vallade 1700, pp. 33–37). Only knowing of this text (and not of the *Idea generalis* as well), Roger believed it right to place Vallade among the advocates of preformism and preexistence (Roger 1993, p. 363).

Malebranche (but not Descartes himself). Meslier's main reference was Malebranche's *Recherche de la vérité*, which he read in its second edition (1676), and thus without the *Éclaircissements* (Desné 1975; Deprun 1971). From his reading, Meslier derived most of the instruments he needed to develop an original Cartesian heterodoxy. We can see him at work when he lays down the metaphysical foundations of his system by re-interpreting the Malebranchian notion of "being in general". What for Malebranche was God (A), in the *Mémoire* becomes matter (B):

(A) The idea of God, or of being in general […] is not a complex idea that includes some contradiction; there is nothing simpler, although it includes everything that is or can be. Now, this simple and natural idea […] includes necessary existence; for it is evident that being (I do not say a *such being*) has its existence in itself. (Malebranche 1997a, p. 318)	(B) And so, we clearly see and imagine in the idea of matter, or extension, the actual and necessary existence of being in general […]. And there is reason to say that the simple and natural idea of this being includes everything that is and everything that can be, because everything that is or can be is really only matter or extension variously modified. (Meslier 2009, p. 488)

In Meslier's approach, everything that is and can be is explained through matter and movement, without any resort to further agents or principles. In arguing for this metaphysical principle, he finds himself forced to fluctuate between clinging to rigorous Cartesian mechanism and being tempted by a sort of dynamic mechanism, according to which material particles are originally endowed with some form of kinetic energy. On the one hand, in the *Mémoire,* the Cartesian identification of matter with extension (which excludes the existence of forces inherent in material particles) is often accompanied by doubts, perhaps due to the fear of undermining the idea, which the author was very much attached to, that matter moves by itself. On the other hand, despite conceiving of matter as eternal and in permanent agitation, Meslier denies that movement is part of its essence. Unable to understand its origin, he limits himself to acknowledging that it is present in matter and that it explains natural phenomena. In relation to the laws of movement, Meslier makes a rather clear distinction between two levels. (1) On a first level laws are, so to speak, constitutive of matter; this level is restricted to the laws of Cartesian physics (that a body tends to continue its motion in a straight line and that collisions between bodies determine the communication of movements) and characterised by absolute fixity and inviolability. (2) On a second level there are laws that derive from the laws of the preceding level and that came into play during the evolution of the universe; this level includes the regularities which have been progressively formed in matter since its parts began to aggregate; and it allows for exceptions, caused by parts which have stayed free or which, in other words, have not been integrated into ordered systems (Mori 1994). This further articulation of natural legality, which involves both the typical phenomena of inert matter (e.g., the cycle of water), and those which pertain to life, in no way undermines the Cartesian unity of nature and thus avoids one of the serious impasses Vallade had encountered.

In order to conceive of this particular order of laws (or regularities), Meslier once again turned to Malebranche. In his *Recherche de la vérité*, Malebranche had addressed the problem of the perpetuation of specific differences. In order to

overcome the gaps in this area which he saw in Descartes's *Description du corps humain*, he had not only referred to the doctrine of preexistence, but had dwelt upon the role performed by communication between mother and foetus during gestation by means of brain "traces" (Malebranche 1997a, p. 117). It is likely that this explanation made an impression on Meslier and led him to develop his own theory on the origin and reproduction of living species; a theory which hinges precisely on the definition of brain traces as enunciated by Malebranche in discussing memory in analogy with corporeal habits:

> It is obvious from what has just been said that there is a great similarity between memory and habits, and that in one sense, the memory may pass for a habit. For just as corporeal habits consist in the facility the spirits have acquired for flowing through certain places in our body, so memory consists in the traces the same spirits have imprinted upon the brain, which are the causes of our facility in recalling things to ourselves. (Malebranche 1997a, p. 108).[10]

Likewise for Meslier, the characteristic regularities of natural phenomena, and in particular of biological phenomena, are based on a kind of 'memory' or 'habit' acquired by matter:

> Since certain portions of matter accidentally took courses and made their way through the first generation of each species of plant and animal and in the circumstances they found themselves were conditioned to be assembled, joined, and modified in such or such a manner, it follows that every time the parts of matter are in similar encounters and circumstances they are likewise conditioned to follow the same routes. (Meslier 2009, p. 500).

The transposition of the concept of maternal influences, which had helped to explain certain similarities between mother and child, to the general problems of reproduction established the conditions whereby it was possible to rehabilitate Cartesian epigenesis by providing an explanation for the perpetuation of specific differences.[11] Although he does not venture far into issues of embryology, Meslier believes that male and female seeds derive from the reprocessing of nutrient juices and supply the parts of matter that, following fertilisation, provide the necessary condition for a living specimen of a given species to gradually take shape. Meslier appears to have been completely uninformed of preformist positions (which may have been an effect of his cultural isolation), nor does he seem to have fully understood the references to preexistence contained in *Recherche de la vérité* (which he ignores) or in Fénelon's *Démonstration de l'existence de Dieu* ("Demonstration of the Existence of God"; 1718) (which he rejects rather hastily). By attributing regularities observed in the reproduction of living beings to a kind of memory or habit of matter, he is able to effectively conceive of the 'errors' (e.g. the formation of monsters) which occur when "some obstacles" force the material

[10] The theory of brain traces, which is characteristic of the Cartesian model of memory, plays a pivotal role in Malebranche's psychophysiology (see Sutton 1998, pp. 50–113).

[11] Obviously, the Malebranchist concept used by Meslier was related to the widely held view that maternal imagination has an impact on the embryo (see Smith 2006, pp. 80–99).

particles to deviate from their path and take on other determinations (Meslier 2009, p. 498). This understanding of the laws governing the reproduction of living beings could even have allowed Meslier to present arguments on the transformation of species. His main concern, however, was to demonstrate, in opposition to the advocates of finalism, that natural phenomena occur on account of "necessary and accidental causes" and cannot be traced back to the design of any intelligence (p. 500). On this point too, therefore, the *Mémoire* appears to be more faithful to the spirit of Descartes than Vallade's *Idea generalis* was.

4 An ideal continuity?

Despite their differences, Vallade and Meslier's texts have something in common. They both attempt to rethink epigenesis and this goes hand in hand with a tendency to reform Cartesian mechanism, or to make it more complex. This was a need that in the 1740's would be expressed in a more mature form by those authors who are historically responsible for the real rebirth of the epigenetic model. Both Maupertuis, in his *Vénus physique* ("Physical Venus"; 1745), and Buffon, in his *Histoire naturelle* ("Natural History"; 1749), set out to build on the project outlined by Descartes and did so on the basis of philosophical resources (Newton and Leibniz, respectively) that allowed them to go beyond Cartesian physics. It is of course true that their updated mechanism also turned out to be contentious and was not without its own internal tensions. While Buffon failed to fully justify the transition from the inorganic to the organic, Maupertuis, in his *Système de la nature* ("System of Nature"; 1751), expressed his dissatisfaction with the application of Newtonian attraction to phenomena of organic reproduction and came to believe that it was necessary to posit the existence of further capacities of matter, such as desire, aversion and memory, to account for them (Solinas 1967, pp. 70–80 and 92–109; Roger 1993, pp. 468–487 and 527–584; Wolfe 2010). It is striking how the mature Maupertuis and Meslier shared nearly the same ideas about these phenomena, although it remains difficult to suppose more than a fortuitous agreement between the *Système* and the *Mémoire* (which was still unpublished in 1751).

Vallade and Meslier, who were still working within the boundaries of Cartesian-Malebranchian mechanism, thus stand out as early examples of natural philosophers who tried to defend epigenesis by devising ingenious, though problematical and somewhat approximate, solutions to the problems of organic reproduction. It seems remarkable that both of them attempted to construct an epigenetic theory starting out from Malebranche, i.e., the main advocate of the doctrine of preexistence (but 'unfaithful readings' are not a rare occurrence in the history of ideas). Finally, the materialistic implications of their reflections on the origin and reproduction of living beings bear witness to a continuity, at least as far as basic philosophical orientation is concerned, between the epigenesis of Descartes and that theorised by eighteenth-century French thinkers.

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