

FICTIONS OF THE WORLD IN DESCARTES' AND GASSENDI'S PHYSICS

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Abstract. Both Gassendi and Descartes used fables in order to account for the formation of the world. The first aim of this paper is to argue that, in both cases, the use of fiction does not merely wish to avoid competing with the account of Genesis. On the contrary, fiction appears to be a proper conceptual tool. Subsequently, I will claim that Gassendi's and Descartes' fables of the world, in spite of their resemblances, serve rather different goals: Gassendi used the fictional account to underline the limits of the physical explanation in cosmology, while Descartes used his fable to account for the functioning of the world.

Keywords: Fable of the world, René Descartes, *The World*, *Discourse in the Method*, *Principles of philosophy*, Pierre Gassendi, *Syntagma philosophicum*

Introduction

My paper aims to explore the use of fiction in rational thought in seventeenth century philosophy, throughout the investigation of the role and purpose of two apparently similar devices, used by Descartes and Gassendi, to discuss what looks like an account of the origin and formation of the world. In the fifth part of his *Discourse on the Method*, Descartes claims that in *The World*, the treatise left unpublished, he gave an explanation of how, if God created a new world in imaginary spaces out of material chaos, a world could be formed. Gassendi, in the *Physics* of the *Syntagma philosophicum*, posthumously published in 1658, considers how, if God reduced the world to chaos, a new world could be formed. Using Cartesian vocabulary, we are faced with two *fables of the world*, two fictions destined to say something about our world, not by describing the way that it was actually formed, but rather by imagining how the world that we know could have been formed. These devices can be considered as presentation strategies: as the *Genesis* already tells us the truth about the formation of the world, a different narrative could be legitimated by not being presented as truth but as mere fiction. However, it could be interesting to go beyond such an analysis, as these fables are fully part of the argument and appear both as fictions *and* as conceptual devices.

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Gassendi's recourse to fiction might have been inspired by the fifth part of the *Discourse on the Method*. Nevertheless, Descartes' and Gassendi's fictions serve rather different purposes. Indeed, Gassendi used a fiction because the physicist, being unable to observe the formation of the world, can only provide a probable and undetailed description of it, whereas Descartes used a fiction because, even if the world was actually formed *at one go*, its organization could be better understood if we imagine how it could have been formed *through several steps*.

For Gassendi: fiction as a delimitation of the extent of the physicist's knowledge

Gassendi presents a hypothesis on the formation of the world by going through its previous destruction.¹ This fiction of the destruction of the world intervenes in the "Physics" of the *Syntagma philosophicum*, more specifically in the first part, which deals with "things of nature in general," and even more specifically in the last book of that first part, which deals with "the birth and destruction, or the generation and corruption of things." Wondering about "the first birth of things,"² Gassendi proposes the fiction of the destruction of the world, and then of its reconstitution. Now, the fiction takes place within a discourse which proceeds by successive reformulations of the question of knowing how the world has effectively been formed, and I will try to determine how the use of that fiction contributes to the examination of the question.

First, Gassendi opposes the truth of *Genesis* to the falsity of hypotheses that Ancient physicists managed to formulate about the formation of the world. The various cosmogeneses of Ancient physicists have, in fact, three main flaws. First, they all suppose an uncreated matter, which is opposed to creation. Second, some of them wrongly consider that the world was created by accident, while there really is a finality presiding over the arrangement of the world – this rejection of finality being not only impious, but also opposed to reason. Third, the various writings describing the stages of the organization of the world are nothing more than inventions, which vary depending on each author's imagination. These flaws prevent considering that one of these cosmogeneses would be more likely than another, and they must all be rejected altogether – including the atomist hypothesis. On the contrary, the world has been formed such as the Bible states in *Genesis*, which is more than a statement of belief, since the physicist may draw the following conclusions from it: God has created the world out of nothing, He has created an ordered world, He has ordered the world according to a finality, and He has formed it, not all of a sudden, but in several stages – in six days.

The question is thus reformulated: if we admit that God is an intelligent agent, who acts by choice and does everything out of reason, one can wonder which matter God must have appropriately chosen, and what force (*vis*) it was convenient for Him to give to it, so that left to itself with only God's general collaboration, it could arrange itself in such a way that it forms the world as we know it. If we can

wonder about this, it is because, whether it be matter as it is today or such as it was in the beginning, it still remains the same matter, and more generally because the preservation of the world is a continuous creation. In that framework, it is thus legitimate to formulate various cosmological hypotheses. We have no reason to decide among the various hypotheses: none of them is more likely than another. Therefore, in the first examination of cosmological hypotheses, none of them were favoured, whereas, in the second, they appear as equally likely, the key being not to favour one at the expense of the others.

Gassendi thus seems to use the epicurean epistemological principle, according to which all possible hypotheses must be identified when no final reason allows us to decide between them. In the *Letter to Pythocles* on meteors, Epicurus indeed considers that for celestial phenomena, several explanations agree with sensations and that one must prevent oneself from arbitrarily favouring one.³ This recourse to a plurality of causes thus aims at reaching the same certainty as when a single explanation permits to account for phenomena: the certainty that all proposed hypotheses are admissible. On the contrary, if one explanation were chosen rather than another, that choice could be nothing but arbitrary, and uncertainty would prevail. Arbitrarily favouring a hypothesis is “falling into myth:” to consider the likely as the real is as mistaken as to consider the false as the real. This pluralism is legitimate only within very clear boundaries. Therefore, the formulation of a plurality of hypotheses to explain particular phenomena lies on the absolutely certain knowledge of the fundamentals of physics, *i.e.* the knowledge of the primary principles which are the atoms and the void, of their nature and properties, and of their interactions. Multiple explanations can only intervene at the level of the apprehension of certain particular phenomena, and not at that of the primary principles. The model is concerned with a specific category of phenomena: the celestial phenomena. It mainly has to do with their remoteness, which prevents us from observing the way they are produced. One must then be satisfied to observe the effects, and to reason upon them by analogy with the phenomena that occur near us.⁴ The system thus includes certain principles, and only locally formulates multiple explanations. However, for the cases in which a plurality of explanations may be admitted, one has to be satisfied with likelihood.

Such being the case, it seems that Gassendi here applies such a use of a plurality of hypotheses. The first step is, in fact, the rejection of all hypotheses, because they do not agree with the fundamental principles of Gassendi's system. In a second phase, the hypotheses are formulated in the context of the system: all the hypotheses must agree with the creation of matter by God, and with a single conception of matter and force. It is only in these conditions that several cosmological hypotheses can be examined in order to determine how “matter gifted with the motor capability must have moved, turned, split, spread and adjust, for the Earth to appear here, the Sun there, and likewise for the other parts of the world.”⁵ There is no way to know how the world was formed, no empirical evidence

accessible to the human mind; what we can do is only to formulate hypotheses. On the contrary, if we favored one hypothesis over the other we would fall into myth: the physicist who imagines how the world actually formed, and who wants what he has imagined to correspond to what has effectively occurred, is constructing a myth. But the one who considers the various hypotheses as merely possible, without favouring any of them, has a perfectly legitimate approach.

However, Gassendi does not stop there. He develops the fiction of the destruction of the world, in the context of the examination of various possible cosmological hypotheses. Matter being such, force being such, what would happen if the world – that is, the organized whole that we know – were reduced to chaos? Would a world be re-formed? Would matter be ordered, and if so, according to which order? Let us emphasize that the world in such a case is not annihilated: it is only its arrangement that is destroyed. The reformulation of the question thus consists in replacing the question of knowing how the world could have been formed, with the question of knowing how it could be re-formed.

Wondering about the re-formation of the world, and not about its first formation, allows Gassendi to place the discourse on a different level from that of the *Genesis*, and so not to compete with it. It also shows that, no matter what, whether the world be first formed or whether it is formed again, it would always be the same, with the exact same configuration.

Such a reconstruction, however, from matter endowed with a certain force attached to it, would necessarily preserve the same structure and configuration the world previously had. But it is also necessary, first, that this matter, far from being homogenous, be constituted of differentiated atoms, and second, that these atoms be already assembled in seeds having differentiated properties. Therefore, if the Earth, the Sun and all the other things are reduced to particles, these particles are constituted in seeds which have kept the nature of their whole. The particles that are initially in a confused mass would reorganize themselves into their original states, by virtue of their own natures, and they would once again compose the same bodies as before, the similar parts joining their peers. It is thus on the basis of the specific properties of the various seeds that the particles can be organized. And it is because these properties remain the same that the world is reconstituted according to the same configuration.

Gassendi, then, does not mention how the various seeds are being arranged to constitute the world as we know it. But it is not because he would not be capable of doing so: it is rather because he estimates that it is not possible to rationally account for the modalities of the disposition of the world:

Nothing is said here but in general; since reason cannot determine in particular what was the disposition of the world, reason, I say, which until now could not determine whether the world is round or not, and if it be round, whether the Earth or the Sun is at its centre; such being the case, if

reason cannot have us know that, how will it have us know in which order the particles of the world in that supposition would be disposed, or were once disposed? It is thus more than obvious from everything that has been said until now that one could not conjure up a way of making the world which satisfies, which would be established by reason, or which could not be fought by reason.⁶

The physicists who attempt to do so can thus only be mistaken.

As Olivier Bloch emphasized it in *La philosophie de Gassendi*,⁷ the fiction of the disappearance and reconstitution of the world allows the formulation of a (modified) atomist cosmology. On the traditional atomist conception of the formation of the world, Gassendi imposes the following conditions: (1) The matter is created; (2) it is ordered according to a finality; (3) the number of atoms is infinite, and (4) it is God who gathers them in a certain portion of the infinite space to form a finite world. Moreover, the only world which could thus be formed would be exactly as ours, with the configuration we know. However, even in that context, even if the fiction of the reduction of the world to chaos allowed the physicist to imagine that God could have also created a confused mass of atoms or particles in the beginning, which would then have been organized based on their properties, this remains nothing more than a supposition, and cannot be confirmed by reason:

after all it will only be a pure supposition, and there is no reason allowing us to see that, at the beginning of the world, God made such a chaos that he could make one now, or that he ordered that all the parts be sorted, and distinguished in that way, or that he waited for them to be arranged and disposed the way they are now.⁸

It thus seems to me that in the conclusion of the chapter which claims - referring to a quotation from *Ecclesiastes*,⁹ - that the human spirit is much too weak to know the making of the universe, the issue at stake is not only theological, but also scientific: since the physicist cannot determine with certainty and precision the way in which the world was formed, he therefore must remain within very specific boundaries in order not to fall into myth.

Olivier Bloch brilliantly showed¹⁰ that the presentation of the atomist hypothesis by means of the fiction of the destruction and reconstitution of the world is part of a broader undertaking destined to prevent that the *Genesis* and the epicurean cosmogony could be considered as two irreconcilable truths only set side by side. More specifically, comparing the text of *De Vita et Doctrina Epicuri* (1642) and the *Syntagma*, Bloch considers that the presentation of the atomist hypothesis by means of the fiction of the destruction and reconstitution of the world is part of the reorganization of the atomist material used by Gassendi in the *Syntagma* in order to diminish the opposition between Epicurean and Christian conceptions. The cutting

and dismantling of the text of Chapter 5 of Book XX of *De Mundo*, in addition to the reorganization and dismantling of the excerpt on the origin of the world,¹¹ modifies the tone and the significance of the original material. The coherence of the epicurean cosmogony is undermined in order to prevent it from forming a coherent bloc against *Genesis*. For Olivier Bloch, the cosmogonic hypothesis offered by Gassendi in *Syntagma*, cannot rise against revelation because it is presented as a fiction which could be perfectly integrated into the dogma and which would never be established as a rational certainty. According to this analysis, the fable of the world intervenes first and foremost as a writing strategy destined not to give the status of truth to the atomist cosmogony.

However, without overturning such an analysis, it seems to me that the organization of the chapter on “the origin of things” can also be understood as an attempt to determine further the modal status of the discourse on the formation of the world. Indeed, even outside of any theological issue, what can be known about a process that we cannot experience? Whether God has ordered the world out of chaos is unknown, but what is known is that the properties He has given to the atoms and to the moving force are such that the world can be ordered out of chaos, and by necessity takes the configuration we know. It is therefore certain that, from atoms gifted with a moving force, differentiated and assembled in seeds, our world *can* emerge. Only a general discourse can be formulated, and one cannot know according to which stages matter has been ordered, or show why it has been ordered in such a way and not in another. Several hypotheses compatible with such a conception of matter and of the moving force must be admitted. In that context, the fiction of the destruction and reformation of the world, far from removing a degree of certainty to the atomist hypothesis, permits, by concretely contemplating its realization, to reaffirm its likelihood: if the order of the world was destroyed, it is likely that it is according to the atomist cosmogony that it would be re-formed.

Gassendi presents his narrative of the destruction and the reformation of the world as a *hypothesis* and a *supposition*. Therefore, it is not pure fiction. At the same time, it is beyond the scope of what reason can demonstrate. Gassendi does not simply oppose the truth of *Genesis* to the mistakes of physicists, but rather determines which conditions and boundaries make it possible for the physicists to say something about the formation of the world. By developing *a posteriori* the hypothesis wherein the world is reduced to chaos and then reconstructed, Gassendi proposes a thought experiment, supposed to imagine the newly reformulated atomist hypothesis, namely that atoms have been created conjointly with their moving force, and already assembled in infinitesimal seeds. Therefore, the fable is far from being a simple strategy devised in such a way as to be compatible with the *Genesis*. On the contrary, it gives a status to the physicist's discourse on the formation of the world that allows him to get out of myth. It is thus particularly interesting to emphasize that the fiction of the destruction and reformation of the world strengthens the atomist hypothesis, even if it does not confirm it. The fable

does not oppose the atomist hypothesis to reality, but considers the likelihood of its realization.

For Descartes: fiction as a tool to build the physicist's knowledge

Descartes' hypothesis on the formation of the world does not appeal to the scenario of the world's previous annihilation. The hypothesis is presented in three text: in *The World*, unpublished while Descartes was alive, then in the excerpt of the fifth part of the *Discourse on the Method* in which Descartes summarizes the content of *The World*, and finally in the third part of the *Principles of Philosophy*. The first two are broadly similar, whereas the account from the *Principles* differs. As such, I will analyze the differences that have direct repercussion for the status of the proposed hypothesis. I will attempt to show that, as in Gassendi's case, one can see more than a writing strategy in the use of fiction.¹²

In *The World*, as in the *Principles*, Descartes imagines how the world could have formed and reached the current configuration, from, on the one hand, God's creation of matter, motion and rest, and of the laws of motion, and, on the other hand, the application of these laws to matter. But then, why does he formulate hypotheses, and not say with certainty how the world has, in fact, been formed?

A first issue is, indeed, theological: the possible competition between this narrative and that of *Genesis*. Descartes can thus claim, on one hand, that the world has been formed such as described in *Genesis*, but that, on the other hand, the physicist can wonder what the properties of matter and laws of motion should be for the world to get, from them, the configuration we know. On that level, Gassendi's and Descartes' approaches seem to be similar.

However, it seems to me that the main issue is clearly scientific. The question is to know if God has formed the world "all of a sudden," by giving it the configuration we know from the beginning, or if the world has been progressively formed, as a result of the creation of matter and its setting in motion. We have seen that, for Gassendi, the six-day narrative of *Genesis* allowed him to consider that the world has been formed in several stages, through the progressive unscrambling of an initial chaos. For Descartes, on the contrary, the main characteristic of the narrative of *Genesis* is that God creates completely formed beings.

In *The World*, Descartes considers that: For God has established these laws [the ordinary laws of Nature] in such a marvellous way that even if we suppose he creates nothing beyond what I have mentioned, and sets up no order or proportion within it but composes from it a chaos as confused and muddled as any the poets could describe, the laws of nature are sufficient to cause the parts of this chaos to disentangle themselves and arrange themselves in such good order that they will have the form of a quite perfect world – a world in which we shall be able to see not only

light but also all the other things, general as well as particular, which appear in the real world.¹³

By commenting, in the fifth part of the *Discourse on the Method*, on what he has done in *The World*, Descartes reaffirms that his narrative is possible, even if “it is much more likely that from the beginning God made it just as it had to be.”¹⁴

So, even if in the beginning God had given the world only the form of a chaos, provided that he established the laws of nature and then lent his concurrence to enable nature to operate as it normally does, we may believe without impugning the miracle of creation that by this means alone all purely material things could in the course of time have come to be just as we now see them.¹⁵

He adds that the genetic narrative allows us to know the things which form the world better: “and their nature is much easier to conceive if we see them develop gradually in this way than if we consider them only in their completed form.”¹⁶

If we compare the fiction of *The World* and that of the *Syntagma*, we notice that they both imagine the formation of a world similar to ours out of matter and its setting in motion in another time (for Gassendi) or in another place (for Descartes). What forms out of chaos is not just a world – that is, an ordered whole – but a world similar to ours. Gassendi puts forward the properties of that matter, and the properties of the force (*vis*) with which it is imprinted, whereas Descartes puts forward the *laws* of motion and asserts their universality. In the *Discourse on the Method*, he specifies that the laws of nature “are such that, even if God created many worlds, there could not be any in which they failed to be observed.”¹⁷

In the third part of the *Principles* (III 45), we are no longer faced with two more or less probable possibilities. “For there is no doubt that the world was created right from the start with all the perfection which it now has. The sun and earth and moon and stars thus existed in the beginning, and, what is more, the earth contained not just the seeds of plants but the plants themselves; and Adam and Eve were not born as babies but were created as fully grown people,” and that, not only because “this is the doctrine of the Christian faith,” but yet because “our natural reason convinces us that it was so. For if we consider the infinite power of God, we cannot think that he ever created anything that was not wholly perfect of its kind.” Thus, it is “absolutely false” (this expression being from the French version) that the things which are in the world have been produced little by little from the application of the laws of motion to matter.¹⁸ However, as it was already the case in *The World*, we can know things better if we are interested in their possible genesis, than if we consider them immediately formed:

Nevertheless, if we want to understand the nature of plants or of men, it is much better to consider how they can gradually grow from seeds than to consider how they were created by God at the very beginning of the world. Thus we may be able to think up certain very simple and easily known principles which can serve, as it were, as the seeds from which we can demonstrate that the stars, the earth and indeed everything we observe in this visible world could have sprung. For although we know for sure that they never did arise in this way, we shall be able to provide a much better explanation of their nature by this method than if we merely described them as they now are <or as we believe them to have been created>.¹⁹

For Gassendi, the fact that the conservation of the world is a continuous creation legitimizes the fact that physicists could wonder about the formation of the world in the same way they wonder about the world such as it is now. For his part, Descartes also puts forward that “the act by which God now preserves it is just the same as that by which he created it.”²⁰ However, he goes further in drawing the conclusion that it is by imagining how the world could have been formed that we can understand how, once formed, it functions.

As we know, the specificity of the narrative of *The World* resides in the fact that Descartes proposes a *fable* which, rather than directly challenging the scholastic conception of the world, will position itself beside the latter, even though, ultimately, it is destined to replace it. In the *Principles*, on the other hand, such a process has disappeared and we are no longer positioned in another place. The world whose formation Descartes describes is really our world.

Furthermore, the geneses of *The World* and that of the *Principles* differ slightly, especially to their starting points. In both cases, on account of the application of the laws of motion to matter, the parts of matter are ordered little by little until the world is formed as we know it. However, in *The World*, Descartes presupposes a matter divided in various figures and motions, whereas in the *Principles*, God has first divided matter in equal parts, which begin to move through motions of equal force. Anyway, in both cases, even out of the most scrambled chaos, the application of the laws of motion to matter would suffice to order the world.²¹ Both scenarios are possible, mainly because as hypotheses they are compatible to the ‘true’ conclusion, that is, the ordered world that we live in.

But then, if it matters little whether matter is originally divided without order or according to a certain order, and if the application of the laws of nature is enough to arrange matter according to the specific order of our world, it is because “by the operation of these laws matter must successively assume all the forms of which it is capable;” so that, “if we consider these forms in order, we will eventually be able to arrive at the form which characterizes the universe in its present state.”²² Therefore, with this assertion, Descartes seems to differ from Gassendi. Interestingly enough,

this is also the point where Gassendi himself differs from the traditional atomist cosmogony. Indeed, the atomists consider that matter successively takes all the forms that it is capable of and that the formation of our world is only a temporary assembly of atoms, stabilized after the application of a large number of other combinations. Gassendi, on the contrary, opposing to the absence of finality that such a conception implies, considers that God has created matter in such a way and has invested it with such a force that a single configuration can result from it. This fundamental assertion of the *Principles* also breaks away from the formulation of *The World* which was content with stating that out of chaos the world that occurs is such as ours. However, Gassendi, like the atomists, considers that the disposition of matter originates in the properties of atoms, whereas Descartes, unlike the atomists, considers that it comes from the application of the laws of nature to matter.²³

Finally, for Descartes, the question of the genesis of the world, far from being a point amongst others, as it is the case for Gassendi, is particularly important since he considers that the genetic approach is the best way to account for natural things. And therefore, the explanation not only of the bodies of the visible Universe (in the third part of the *Principles*) but also of everything that we observe on Earth (in the fourth part of the *Principles*) is based on their supposed genesis.

What can then be said of the status of the hypotheses proposed through the use of this fictional device? Far from pretending to provide a final and conclusive answer to that difficult and highly debated question, I will only reaffirm some distinctions.²⁴ The *device* used to describe the progressive formation of the world from the application of the laws of motion to matter does not claim to be the truth: the world has been readily created with as much perfection as it has, and not little by little, as it would be the case with seeds. The *laws of nature*, according to which matter is set in motion, are absolutely certain. In the second part of the *Principles* they are deduced from God's perfection and metaphysically established. The *causes* proposed by Descartes, which he also calls *principles*, through which one can account for everything in the world, have at least moral certainty, and a number of them even have absolute certainty. Admittedly, Descartes does not explicitly decide upon which causes are absolutely certain and which causes are only morally certain. However, he proposes a discrimination principle: the more general is the cause, the more we are satisfied with its certainty.²⁵ Anyway, it is important not to confuse the more or less strong certainty of the causes, and the fictional character of the device which permits to bring them to light. If Descartes, in the articles 45-47 of the third part of the *Principles*, tells us that, by imagining how the world could have been created little by little from the application of the laws of motion to matter, he makes suppositions, and that these suppositions are false, "the falsity of these suppositions does not prevent the consequences deduced from them being true and certain" (according to the very title of *Principles* III 47).

Thus, as in Gassendi's, Descartes' fiction is not only a mere exposition strategy: it is used to concretely consider a hypothesis. Admittedly, in *The World*,

Descartes describes it as a “fable.” And admittedly, in *The Principles*, the *falsity* of a progressive formation of the world is opposed to the *truth* of its immediate creation, but the causes of phenomena brought to light are nonetheless the real causes of things, at least according to a moral certainty²⁶. The device is therefore a way not only to set forth, but also to know the causes of the phenomena.

Descartes’ attempt to build the world by imagining its possible formation, demonstrates certain boldness. The boldness is particularly evident in comparison with Gassendi’s denial that it is possible for human reasoning to establish how the world was ordered. For Gassendi the structure of the world cannot be known by analogy with any machine that human understanding is capable of conceiving. Even if Descartes, like Gassendi, recognizes the disproportion between human and divine understandings, and recognizes the human incapacity to know God’s designs, he is still far from drawing the same conclusions.

Conclusion

Gassendi and Descartes both imagine that the world would not be such as it presently is (that it would not be *anymore*, or *yet*, an ordered whole) in order to examine what can be known of it. The formation of the world cannot be experienced, but compensating for experience by imagination does not mean inventing anything as one pleases. The narratives of the formation or the re-formation of the world are considered as hypotheses compatible with what we know of matter, motion and their properties. The narrative is not an end in itself, but a tool in service of a demonstration.

Yet, beyond similarities, the two devices have, in fact, different functions. In the case of Gassendi, the fable permits to determine the status of an already formed hypothesis –the epicurean cosmogony. In the case of Descartes, the device is part of the process of discovery itself, as a way to investigate the functioning of the world.

Besides, Gassendi’s and Descartes’ fictions differ also in respect to the place they give to the idea of *laws of nature*, in a point involving their insertion into two different streams of physics. For Gassendi, the world is (re)organized by the properties of matter and, ultimately, it does not matter by which process. For Descartes, it is organized by the laws of nature, and, ultimately, it does not matter from which materials. Now, only the latter is compatible with the mathematization of physics.

Finally, the relations of Gassendi and Descartes to the Epicurean conception of the formation of the world have also been examined. Gassendi does not hesitate to claim proximity to the Epicurean hypothesis and establishes a certain number of restrictions and transformations required for its validation– a hypothesis which, besides, would never be more than probable. For his part, Descartes is committed to generally breaking away from atomism.²⁷ However, we can consider, as Daniel Garber has emphasized in *Descartes’ metaphysical physics*,²⁸ that Descartes agrees with Lucretius in saying that the current state of the world has evolved from an initial

state – which is even, in *The World*, a chaos – in a purely natural way. Furthermore, if “matter must [and not only *can*] successively assume all the forms of which it is capable,”²⁹ then we can say that Descartes maintains, as Lucretius does, that all the possible configurations of matter are born at some point or another (even if Descartes’ specificity consists in saying that because of *the laws of nature* matter must successively take all the forms it is capable of taking). This double relation could therefore be more complicated than one can first assume.

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- ¹¹ De Exortu partium praecipuarum Mundi.
- ¹² For an interesting analysis of Descartes’ use of a *fable* as a writing strategy against the scholastic conception of the world, and of the differences between the modal status of the narratives of *The World* and of the *Principles of Philosophy*, see Fichant, M., “La ‘Fable du monde’ et la signification métaphysique de la science cartésienne”, *Narcisse* 17 (1997).
- ¹³ Descartes, R., *Œuvres de Descartes*, eds. Ch. Adam & P. Tannery, (Paris: J. Vrin, 1964-1974), 11 vols., AT hereafter. English translations were taken, where available, from *The Philosophical Writings of Descartes*, trans. J. Cottingham, R. Stoothoff, and D. Murdoch, (Cambridge: Cambridge University Press, 1984), 2 vols., (hereafter CSM). If no English edition is indicated, the translation is mine. See *Le Monde*, AT XI, 34-35; *The World*, CSM I, 91.
- ¹⁴ Descartes, R., *Discourse on the Method*, V, AT VI, 45; CSM I, 133.
- ¹⁵ Descartes, R., *Discourse on the Method*, V, AT VI, 45; CSM I, 133-134.
- ¹⁶ Descartes, R., *Discourse on the Method*, V, AT VI, 45; CSM I, 134.

¹⁷ Descartes, R., *Discourse on the Method*, V, AT VI, 43; CSM I, 132.

¹⁸ Descartes, R., *Principles of Philosophy*, III 45, AT VIII-1, 99-100; CSM I, 256.

¹⁹ Descartes, R., *Principles of Philosophy*, III 45, AT VIII-1, 99-100; CSM I, 256.

²⁰ Descartes, R., *Discourse on the Method*, V, AT VI 45; CSM I, 133.

²¹ “In fact it makes very little difference what initial suppositions are made, since all subsequent change must occur in accordance with the laws of nature. And there is scarcely any supposition that does not allow the same effects (albeit more laboriously) to be deduced in accordance with the same laws of nature.” Descartes, R., *Principles of Philosophy*, III 47, AT VIII-1, 103; CSM I, 257-258.

²² Descartes, R., *Principles of Philosophy*, III 47, AT VIII-1, 103; CSM I, 258. For a study of the metaphysical stakes of this assertion, and of the sources of *Principles* III 47, see Carraud, V., “La matière assume successivement toutes les formes’. Note sur le concept d’ordre et sur une proposition thomiste de la cosmogonie cartésienne”, in *Conceptions de la science: hier, aujourd’hui, demain. Hommage à Marjorie Grene*, eds. J. Gayon & R. M. Burian (Bruxelles: Ousia, 2007), 115-146.

²³ For an analysis of the irreducibility of Descartes’ postulate to a rewriting of the Ancient Atomists’ model – an analysis showing that the role of the laws of nature gives it a specific modern mechanist meaning, see Charrak, A., “Descartes au principe des cosmogènes matérialistes”, *Corpus, revue de philosophie* 61 (2011): 15-20.

²⁴ For a deeper analysis, one can refer for instance to Beyssade, J. M., “Toute-puissance de Dieu et nécessité des principes physiques”, in *Études sur Descartes. L’histoire d’un esprit*, ed. J. M. Beyssade (Paris: Seuil, 2001), 53-79.

²⁵ This absolute certainty “extends to all the things that can be demonstrated, about these material things, by the principles of mathematics or by as evident and certain ones; among which it seems to me that the things I wrote in this treatise should be received, *at least the main and most general ones*.” and then “I think that one also has to recognize that I proved by mathematical demonstration all the things that I wrote, *at least the most general ones* concerning the making of the universe and the earth, and in the way I wrote them” [my emphasis]. Descartes, R., *Principles of Philosophy*, IV 206, AT IX-2, 324-325 [*i.e.* French version].

²⁶ To explore the question of moral certainty, one could refer to Ariew, R., “The New Matter Theory and Its Epistemology: Descartes (and Late Scholastics) on Hypotheses and Moral Certainty”, in *Vanishing Matter and the Laws of Nature: Descartes and Beyond*, eds. D. Jalobeanu & P. Anstey (London: Routledge, 2010), 31-46.

²⁷ Descartes, R., *Principles of Philosophy*, IV 202, AT VIII-1, 325.

²⁸ Garber, D., *Descartes’ metaphysical physics* (Chicago and London: The University of Chicago Press, 1992), 118-119.

²⁹ Descartes, R., *Principles of Philosophy*, III 47, AT VIII-1, 103, CSM I, 258.