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Zuraya Monroy-Nasr

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Cartesian Forces in a Soulless Physics

Zuraya Monroy-Nasr

National Autonomous University of Mexico (Mexico)

Résumé : Le dualisme métaphysique de Descartes a des conséquences importantes pour la physique qu'il a développée. Descartes cherchait à établir une connaissance quantitative et certaine du monde physique, et son dualisme en a retiré toute forme d'esprit ou de force. Néanmoins, « les forces » ne semblent pas totalement absentes de sa philosophie naturelle. Quelques auteurs contemporains estiment que Descartes, dans certains passages du *Monde*, et des *Principes de la Philosophie*, s'exprime comme si les forces décrites étaient des propriétés « réelles » des corps. Par conséquent, dans cet article, je vais donner des arguments en faveur de la cohérence du dualisme cartésien, en utilisant une notion peu connue de « force » proposée par Descartes.

Abstract: Descartes' metaphysical dualism has important consequences for his physics. He intended to establish a certain and quantitative knowledge about the physical world, and his dualism drove away all kind of spirits or forces from it. Nevertheless, "forces" do not seem completely absent in his natural philosophy. Some contemporary scholars think that Descartes, in some passages of *The World* and the *Principles of Philosophy*, expresses himself as if the forces described were "real" properties of the bodies. Therefore, in this paper I will argue in favor of Cartesian dualism's coherence, making use of a little-known notion of force proposed by Descartes.

1 Introduction

Rene Descartes' radical dualism within the domain of metaphysics has fundamental consequences for his physics. Descartes intended to establish a certain and quantitative knowledge about the physical world. For this purpose, with his ontological dualism he drove souls, spirits or forces away from the material

world. From his dualist conception, Descartes was able to construct an explanation on the physical world where its laws had to be expressed in terms of behaviors of material bodies, as mechanical regularities. Descartes was seeking to eliminate substantial forms, as well as final causes, both of which were deeply rooted in scholastic philosophy.

Descartes used the term “force” as a clear and differentiated concept, moving away from mentalist speculation or occult qualities that surrounded this concept. Nevertheless, some contemporary scholars have considered that Descartes, in some passages of *The World* and *the Principles of Philosophy*, expressed himself as if the forces described were “real” properties of the bodies. Against these interpretations, I will argue in this paper in favor of Cartesian dualism’s coherence, making use of a little-known notion of force proposed by Descartes.

2 Mechanics and forces in Cartesian physics

In October 1637, Descartes wrote a brief treatise on mechanics, due to the express request of his friend Huygens. In the introductory letter of the treatise, Descartes confesses to the solicitor that he has never felt less willing to write than in that moment. He complains about the lack of time, in part caused by the preparation of the *Discourse*’s publication and he says:

White hairs are rapidly appearing on my head, which brings it home to me that the only thing I should be devoting myself to is ways of slowing down their growth.¹ That is what I am now doing. I am trying energetically to make up for my lack of observational data.² This task takes up so much of my time that I have resolved to concentrate on this alone; I have even laid aside all work on my *World*, so that I shall not be tempted to put the finishing touches to it. For all that, I am sending you the lines you requested, seeing especially that you only asked for three sheets [...] [AT I 434; CSM-K III 66].³

Next, Descartes presents “An account of the machines by means of which a small force can be used to lift heavy weights” or *Traité de la Mécanique*.⁴

1. Alquié understands this as the assertion that in the future he would only dedicate to medical studies.

2. “Experiences” is translated into English as “observational data” [CSM-K III 66].

3. The editions of Descartes’ works used here are: *Œuvres Philosophiques*, edited by Ferdinand Alquié [A], following the standard notation from Adam & Tannery [AT]; *The Philosophical Writings of Descartes*, translated by John Cottingham, Robert Stoothoff and Dugald Murdoch [CSM]; with A. Kenny’s correspondence anthology incorporated [CSM-K] in Vol. III.

4. “A copy of the ‘Account’ was found among Descartes’ papers after his death, and a copy was published by Nicolas Poisson in 1668” [CSM-K III 66–67].

There, he speaks about how the invention of machines is based solely upon the principle that the same force that can lift any given weight, say a 200-pound weight lifted to a foot's height, may lift 400 pounds to half a foot's height, and so on. [AT I 435–436; CSM-K III 66–67].

The principle Descartes is describing anticipates a term that does not exist yet: the physical notion of “work”. It's important to emphasize that Descartes not only speaks of force but of the “*required action needed [...] to produce an effect*” cf. [AI 802, note 1]. Certainly, Descartes says that this principle must be accepted when it is considered that,

the effect must always be proportional to the action which is necessary to produce it. Thus, if in order to lift a certain weight to a height of one foot we are required to employ a force which can raise a 100-pound weight to a height of two feet, then the said weight must be 200 pounds. [AT I 436; CSM-K III 67]

In the *Treatise*, Descartes presents some examples of machines like the pulley, the inclined plane, the wedge, the cog-wheel, the screw, and the lever; describing how they act in order to achieve the desired effect. In all these cases, the author continually uses the term “force” when referring to the *action* needed in order to sustain the weights under consideration.

I will not try to describe the mechanisms detailed by Descartes. What interests me is the examination of the senses in which the word “force” is used. I say senses in plural because as we will see, this term is equivocal. Henri Bouasse noted two meanings to the word force that “do not alternatively effort and work” [Bouasse 1895, 34].⁵ It should be mentioned that in the “Account” that Descartes sent to Huygens, he does not distinguish clearly the characteristics of either effort or work in the term “force”. “Effort” is a term that does not include the idea of displacement in space, while work implies the notion of displacement, cf. [AI 805, note 1]. For Bouasse, this may apparently obscure the meaning of “force”. Nonetheless, this author thinks that Descartes expresses more clearly “the fact that work is measured by the product of a force times a displacement in space” [AI 805, note 1]. In contemporary terms [Tippens 2002, 173], Cartesian force would correspond to the notion of work, where:

Work = force $\times$ displacement.

The distinction between “effort” and “work” may not be expressed through the proper terminology by Descartes. However, he did see the difference between both concepts. A few months later, in 1638, in a letter to Mersenne, Descartes exemplifies this distinction when referring to “the force that serves to elevate a weight to a determined height and the force that a nail needs to sustain a 100-pound weight”.

5. Quoted by Alquié [AI 802–803].

3 Forced criticism

Within Descartes' "Account" we observe that although there may be more than one sense to the term "force", its use stands away from mentalist speculations or occult qualities that enveloped the concept in ancient and medieval traditions.

If incorporeal forces were present in the Cartesian matter, this would mean that there is no substantial distinction. In other works, I have procured the demonstration of how Cartesian dualism justifies the knowledge of the physical world by means of two aspects: 1) epistemologically, the incorporeality of the mind is necessary to establish certainty and truth in our knowledge and 2) ontologically, the radical distinction between thought and matter is indispensable in order to conceive Cartesian physics' proper object: matter whose essence is extension, cf. [Monroy Nasr 2002].

For Max Jammer, at Descartes' time there were two possibilities, either conceive force as the cause of change of motion, or to abolish the notion of force altogether. According to Jammer, Descartes chose the latter: he rejected the existence of force [Jammer 1957]. The main reason for this rejection would be that Cartesian dualism could not coexist with the traditional notion of force:

His absolute dichotomy of existence into pure matter and pure spirit seemed to him incompatible with the assumption of force in matter or exerted by matter, since force, in his view, is still a somewhat psychic notion. Matter has to be divested of all spiritual constituents, of all inherent forms or tendencies. Only extension and external motion are its characteristics. [Jammer 1957, 103]

Jammer illustrates Descartes' explanation of the physical process of free fall without any reference to attractive forces, with a letter that Descartes wrote to Mersenne in November 13, 1629 [AT I 71, CSM-K III 9] quoted by [Jammer 1957, 104]. Examples like these lead Jammer to the conclusion that

The concept of force in Descartes' view had no place in his physics, which was to employ exclusively mathematical conceptions. [Jammer 1957, 105]⁶

This author recognizes the importance of Descartes' affirmation in the *Principles*, Part II, § 64, where Descartes says that

The only principles which I accept, or require, in physics are those of geometry and pure mathematics; these principles explain all natural phenomena, and enable us to provide quite certain demonstrations regarding them. [AT IX-2 101–102; CSM I 247]

6. Jammer does not quote AT. He refers to Selections of R. M. Eatem, Scribner, NY 1927, xxiii.

In turn, Edward Slowik points out some passages where Descartes “spoke out against the strange marriage of soul and matter” [Slowik 2002]. Slowik recognizes that Descartes clearly and succinctly affirms that the scholastic hypothesis regarding this is unintelligible and inadequate as a methodological approach to an explanation of natural phenomena. In Descartes’ words from *The World*:

If you find it strange that in explaining these elements I do not use the qualities called “heat”, “cold”, “moisture” and “dryness”—as the philosophers do—I shall say to you that these qualities themselves seem to me to need explanation. Indeed, unless I am mistaken, not only these four qualities but all the others as well, including even the forms of inanimate bodies, can be explained without the need to suppose anything in their matter other than the motion, size, shape, and arrangement of its parts. [AT XI 25–26; CSM I 89]

Nevertheless, says Slowik, the exhaustive studies of *The World* “reveal a curious and intractable qualitative bent” [Slowik 2002, 53]. Slowik exemplifies this with few early affirmations where it seems that Descartes understands force as a “power” that an individual, material object possesses. However, Slowik recognizes that Cartesian language is “far removed from the overt mind-influenced speculation of the scholastics”, which Slowik exemplifies with the impetus theory [Slowik 2002, 54].

The main problem is found in the Second Part of the *Principles* §39, in the second law of nature where Descartes says that “all motion is in itself rectilinear; and hence any body moving in a circle always tends to move away from the center of the circle which it describes” [AT IX-285; CSM I 241]. Based on this principle and following the examination of centrifuge movement, Slowik mentions that movements and trajectories are described with expressions such as “the body desires to follow a straight line away from the center of its circular trajectory”, “the tendency of the object to continue along its circular path” and “there can be strivings toward diverse movements in the same body [...]” [Slowik 2002, 54].⁷ This author considers that these expressions may be vestiges of a former scholastic formation.

A brief digression may allow us to better comprehend how Descartes conceives the motion of bodies. Let us remember that in Chapter VII of *The World*, Descartes enunciated three laws of nature:

1. Each individual part of matter continues always to be in the same state so long as collision with others does not force it to change that state. [AT XI 37; CSM I 93]
2. When one body pushes another it cannot give the other any motion unless it loses as much of its own motion at the same time; nor can it

7. In CSM the translation is: “the body is tending or striving to move in different directions [...]” [Pr III 57; CSM I 259].

take away any of the other's motion unless its own is increased by as much. [AT XI 41; CSM I 94].

3. When a body is moving it tends always to continue moving along a straight line. [AT XI 43–44; CSM I 96].⁸

These fundamental laws are considered as true *a priori* principles, based on God's own immutability. God's immutability, aside from its fundamental role in the derivation of movement laws, has one very interesting consequence, which is shown by Dennis Des Chene. In the *Principles*, Part II § 36, Descartes tells us that God's perfection

involves not only being immutable in himself, but also his operating in a manner that is always utterly constant and immutable. There are some changes whose occurrence is guaranteed either by our plain experience or by divine revelation. [AT IX-2 61; CSM I 240]

For Des Chene, when Descartes says in the first law, in § 37, that a simple and undivided thing “never changes except as a result of external causes”, this follows from § 36 where he maintains that plain or “evident experience” does not require us to postulate any internal principles of change in bodies” [Des Chene 1996, 316]. The only thing experience requires us to suppose is that “body is *res extensa*, and extension contains no principle of change. We then have no reason to suppose that God's action will change” [Des Chene 1996, 316]. God's immutability is the reason for supposing it will not.

Now, although the first law is applied to every state of matter, for the topic that is of our interest the third law carries more weight. Let us remember that in the *Principles* there is a different order to the presentation of its laws of nature. In Part II, § 39, this law appears in a newly formulated way and as second (not third) law. Here, it reads that: “all motion is in itself rectilinear; and hence any body moving in a circle always tends to move away from the centre of the circle which it describes” [AT IX-2 85; CSM I 241].

Ferdinand Alquié clarifies what he considers a frequent confusion regarding the laws of movement due to the aforementioned change in their presentation. Because the first two laws enunciated in the *Principles* constitute the so-called “Principle of inertia”, these are often confounded. This is because when it is said that a body is incapable of putting itself in motion or modifying itself, we understand that neither its speed nor direction can be altered. Alquié says that Descartes, on the contrary, separates quantity of movement and its direction, which leads him to enunciate two laws. However, modern physics mashes them into one and Descartes' third law (§ 40) is not accepted. So, for Descartes, the effective movement of each material particle depends upon: 1) the ensemble of forces that determine it, forces that in their majority belong to neighbor particles, and not to the particle under consideration and

8. Descartes is referring to the normal trajectory of bodies while in motion, which is different of their always circular movement.

2) the force strictly pertaining to the considered particle; in this case and according to the effect of this force, movement is always rectilinear, but external forces can derail it from its essential direction, cf. [A III 187–188, note 3]. After this clarification, we must yet see if in *the particle's own force* Descartes signals something that may be considered as the “desire”, the “power”, the “tendency” or the “real quality” that moves the part, according to expressions mentioned by Slowik.

Daniel Garber considers that in order to comprehend the *Principle's* second law on rectilinear movement, there must first be full comprehension on what Descartes means by “tendency” or “inclination”. First, Garber refers us to a passage from *The World* where Descartes asserts that:

When I say that a body tends in some direction, I don't want anyone to imagine on account of that it has in itself a thought or a volition that pushes it there, but only that it is disposed to move in that direction, whether it really moves or whether some other body prevents it from moving [AT XI 84]⁹

Garber also reminds us that the same is expressed in Part III of Principles, in § 56, where Descartes is referring to certain parts that have the inclination or “strive” to stay away from the centres around which they revolve and explicitly clarifies that “it should not be thought that I am implying that they have some thought from which this striving proceeds. I mean merely that they are positioned and pushed into motion in such a way that they will in fact travel in that direction, unless they are prevented by some other cause” [AT IX-2 131; CSM I 259].

For Garber, Descartes chose to express the second law in terms of tendencies rather than more directly in terms “of a state of body that persists conditional on a lack of interference” [Garber 1992, 220], given that in the Cartesian plenum the condition of noninterference “can never be met” [Garber 1992, 220]. In effect, for Descartes the void does not exist, everything is full and all bodies or parts of a body, in order to move, must push another. The space that one leaves is occupied by other and therefore all movements must be circular [AT IX-2 81; CSM I 237].

Lastly, I would like to briefly mention Alan Gabbey's interpretation. He has also considered that Descartes expresses himself in some passages of *The World* and *The Principles* as if the forces to which he refers to were “real properties” pertaining to the bodies.¹⁰ For example, Gabbey mentions that on *The Principles*, Part II, § 43, Descartes speaks of “the nature of the power which all bodies have to act on, or resist, other bodies” [AT IX-2 88–89; CSM I 243–244].

9. This quotation does not appear in CSM. I take the quotation from [Garber 1992, 219].

10. [Gabbey 1980, 236–238]; cf. too [Gueroult 1980], and [Hoffman 2009].

In this principle's explanation Descartes insists on emphasizing that this force consists of the fact that everything persists in the same state, as was established in the first law. This way, what is joined to one thing has the power of resisting separation from it; and that which is separated has the power to remain separated. Also, what is at rest has the power to remain at rest and as a consequence resists to anything that may make it change. Gabbey interprets these expressions of resistance or persistence as an attribution of real properties to bodies.

This last principle contains several elements that are worth highlighting, but for the brevity of this exposition I will only mention that here we find the new idea that movement and rest are two states of matter that follow the same legality. In this principle, Descartes provides elements that explain the cohesion between bodies. This cohesion arises from the idea that every part of a body possesses a force of rest, not as an occult or immaterial quality, but as the property of staying in that state until an exterior force, by action of an external body, separates the parts that are joint, cf. [A III 194, note 1].

4 Conclusion

In spite of the textual evidences about Descartes' exclusion of terms such as "souls", "spirits" and other incorporeal entities hidden in matter, there is a certain persistence of interpretations by specialists that find expressions that indicate the presence of powers or non material forces in Cartesian physics.

Therefore, it is important to make sure that incorporeal forces are absent in the nature of matter, because their presence would undo the Cartesian dualist metaphysics. Ontologically, this would mean that there is no substantial or radical distinction which is indispensable to Descartes in order to conceive physics proper quantitative object: the matter whose essence is the extension and whose properties are geometric and mechanic, cf. [Monroy Nasr 2002].

I will not go into a discussion on the interpretations of Gabbey or Martial Gueroult before him. Daniel Garber has done this and Edward Slowik gives us convincing arguments about why he himself is inclined towards Garber's position [Garber 1992, 298], [Slowik 2002, 58–59]. But, besides mentioning the metaphysical problem entailed in the interpretation that finds forces within matter, I wish to underline the absence of the examination of forces regarding the Cartesian study of mechanics in the debate held by all of these authors.

The Cartesian "Account" or *Treatise on Mechanics* is not even mentioned, despite it being a specialized presentation where Descartes employs the term "force" in innumerable occasions, applying it in relation to notions of action and physical movement. I find that it is very important to recognize the sense of the Cartesian "force", "the action required to [...] produce an effect", as

an early concept of today's physical notion of work.¹¹ Being so, the *force* in Descartes' conception does not go against the coherence between the radical dualism that he institutes and his resulting soulless physics.

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11. Throughout the “Account”, as Alquié points out, Descartes mentions some other forces that in fact intervene but that he has left aside, i.e., the force necessary to move the machine or in the case of the inclined plane, the force needed to move horizontally the body to be displaced. Descartes found certain differences between the trajectories traced and those rigorously demanded. Anyway, among the “other forces” neglected by Descartes, we find no indication that they may be thought inherent to matter. Perhaps, in the “Account” Descartes' description showed what we nowadays consider the discrepancy between empirical regularities and theoretical laws. According to Alquié, Descartes asked only to take into account only the clarified principle and the conception that modern use would replace with the notion of “work”, this means “the action required to [...] produce an effect” cf. [A I 813, note 1].

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