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Y a-t-il encore de la place en bas ?

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Nietzsche for Physicists

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Résumé: L'un des philosophes les plus importants de l'histoire, Friedrich Nietzsche, est presque ignoré par les physiciens. L'auteur qui a déclaré la mort de Dieu au XIX^e siècle était enthousiasmé par la science, principalement durant la deuxième partie de son œuvre. À l'aide de la notion physique de force, Nietzsche a créé son concept de volonté de puissance. En pensant à la conservation de l'énergie, le philosophe allemand a eu une certaine inspiration pour créer son concept de l'éternel retour. Dans cet article, on souligne certaines influences de la physique sur Nietzsche et on discute de l'actualité de sa position épistémologique—le perspectivisme. À partir du concept de volonté de puissance, je propose que le perspectivisme conduise à l'interprétation où la physique et la science en général sont considérées comme un jeu.

Abstract: One of the most important philosophers in history, the German Friedrich Nietzsche, is almost ignored by physicists. This author who declared the death of God in the 19th century was a science enthusiast, especially in the second period of his work. With the aid of the physical concept of force, Nietzsche created his concept of will to power. After thinking about energy conservation, the German philosopher had some inspiration for creating his concept of eternal recurrence. In this article, some influences of physics on Nietzsche are pointed out, and the topicality of his epistemological position—the perspectivism—is discussed. Considering the concept of will to power, I propose that the perspectivism leads to an interpretation where physics and science in general are viewed as a game.

1 Introduction: an obscure philosopher?

The man who said “God is dead” [GS § 108]¹ is a popular philosopher, well-regarded worldwide. Nietzsche is a strong reference in philosophy, psychology, sociology and the arts. But the question is whether Nietzsche had any influence on the natural sciences, especially physics? Among physicists and scientists in general, the thinker who created a philosophy that argues against Platonism is known as an obscure or irrationalist philosopher. However, contrary to common ideas, although Nietzsche was critical about absolute rationalism, he was not an irrationalist. He criticized the hubris of reason (the Socratic rationalism)² the belief that mankind could be guided by reason alone. I.e., the German philosopher was a strong critic of Enlightenment³ [or *Aufklärung* in German]; to him, the idea of salvation and redemption by reason was an equivocal one. Nietzsche accused the hubris of reason,⁴ but this philosopher did not deny the use of reason itself. As we shall see, this is clear from Nietzsche’s education [*Bildung*]. Among his references, there are several natural philosophers and/or scientists. Nietzsche read Charles Darwin (or at least the Darwinian ideas), Hermann von Helmholtz, Roger Boscovich, and other authors. He tried to keep up-to-date with scientific debate during the 19th century. Therefore, this philosopher who is also considered a poet (*Thus Spoke Zarathustra* is poetry as well) never denied the importance of science. Of course, his scientific view was different from common sense, and Nietzsche thought about science from another point of view—by using his perspectivism.⁵

According to research in the Nietzschean philosophy, the author’s works are didactically divided into three periods. In the first, an approximation with Romanticism, Schopenhauer, and the German musician Richard Wagner

1. Nietzsche’s works are indicated by initials, with the corresponding sections or aphorisms established by the critical edition of a complete work edited by Colli & Montinari [Nietzsche 1978]. The *Birth of Tragedy* [Nietzsche 2007a] is known as BT, *Human, all too Human* [Nietzsche 2005a] is HH, *Gay Science* [Nietzsche 2001] is GS, *Beyond Good and Evil* [Nietzsche 2002] is BGE, *Ecce Homo* [Nietzsche 2005b] is EH, *Twilight of the Idols* [Nietzsche 2005b] is TI, *On the Genealogy of Morality* [Nietzsche 2007b] is GM, *On Truth and Lying in a Non-Moral Sense* [Nietzsche 2007a] is TL, and the posthumous fragments (or notebooks) are PF, indicated by numbers and years.

2. According to Nietzsche, Socrates is “the archetype of the theoretical optimist”. He had “the imperturbable belief that thought, as it follows the thread of causality, reaches down into the deepest abysses of being, and is capable not simply of understanding existence, but even of *correcting* it” [BT § 15].

3. The philosopher suggests a new Enlightenment in several texts. See, for example, fragments 25 [296], 26 [298], 27 [79] and 27 [80] from 1884.

4. In *On the Genealogy of Morality*, one reads: “*Hubris* today characterizes our whole attitude towards nature, our rape of nature with the help of machines and the completely unscrupulous inventiveness of technicians and engineers” [GM III § 9].

5. I will discuss this cardinal concept in Nietzschean philosophy in Section 4.

exists. In the second, Nietzsche breaks off his friendship with Wagner and stays away from Romanticism and Schopenhauer's influence. The third is the period where the Nietzschean philosophy acquires its "full identity" and originality. Science's influence on Nietzsche is present in all these periods. However, from the second period onward, this influence is more evident. In a book from this period, *Human, all too Human*, Nietzsche states: "Optimism, for the purpose of restoration" [HH II, Preface, 5]. That is, Nietzsche identifies science with optimism (an idea originally proposed in his very first book, *The Birth of Tragedy*, where he criticized Socratism) and emphasizes the beginning of a process of a cure. The philosopher recovered his health with the assistance of science. His illness was blamed on Schopenhauer's pessimism and Wagner.

In *On the Genealogy of Morality*, Nietzsche defined the purpose of science in our time, modernity:

All sciences must, from now on, prepare the way for the future work of the philosopher. Thus, this work is understood to mean that the philosopher has to solve the problem of values and that he has to decide on the rank order of values. [GMI §17]

Therefore, as we can observe, the importance of science in Nietzschean philosophy transcends the scientific realm.

We have already seen that the multifaceted Roger Boscovich is among Nietzsche's influences. In the next section, we shall discover how important the concept of force from physics (due to Boscovich) was in developing Nietzsche's concept of will to power [*Wille zur Macht*]. From that concept, Nietzsche built his cosmological view: the eternal recurrence of the same, as we shall see in section 3. His epistemological position, perspectivism, is presented in section 4 with an application to two problems in modern physics: wave-particle duality and the gravitational phenomenon. In section 5, I use the concepts of will to power and perspectivism to interpret physics—and science in general—as a game.

2 Physics in Nietzsche's main concepts

The Croatian thinker Roger Boscovich (physicist, mathematician, philosopher, etc.) was a decisive reference for Nietzsche's philosophy. Nietzsche's reading of Boscovich's concept of force was an essential ingredient for the construction of his famous concept of will to power. In the 18th century, Boscovich studied body collisions. From his research, the Croatian concluded that matter is a manifestation of forces. According to the physicist and historian of physics Max Jammer [Jammer 1999, 178], for Boscovich "impenetrability and extension [...] are merely spatial expressions of forces, 'force' is consequently more fundamental than 'matter' [...]". Nietzsche confirms that idea and wrote in *Beyond Good and Evil*:

Boscovich taught us to renounce belief in the last bit of earth that *did* ‘stand still’, the belief in ‘matter’, in ‘material’, [...]”.
[BGE § 12]

Along with Boscovich, Nietzsche emphasized the concept of force [*Kraft*] to the detriment of matter [*Materie*]. The material world is a manifestation of forces, which, in the Nietzschean case are translated into wills to power, as we shall see.

For Nietzsche, the physical concept of force was important even though such a concept was an empty word. In a posthumous fragment, with a touch of irony, this is clear:

The triumphant concept of “force”, with which our physicists excluded God from the world, needs supplementing. It must be ascribed to an inner world which I call “will to power” [...]. [PF 36 [31] of 1885]⁶

In another fragment, the idea is stressed: “a force we cannot imagine (like the allegedly purely mechanical forces of attraction and repulsion) is an empty phrase and must be refused the rights of citizenship in *science*” [PF 2 [88] of 1885]. The will to power, according to Nietzsche’s thought, completes the concept of force.

A will to power is a quantum of power. It is “characterized by the effect it exerts and the effect it resists [...]. The quantum of power is essentially a will to violate and to defend oneself against being violated. Not self-preservation” [PF 14 [79] of 1888], said the philosopher. In this sense, becoming is considered to be a result of the intention to increase power; it is not considered a result of intentions of “self-preservation”.⁷ Above all, Nietzsche wrote, “everything that happens out of intentions can be reduced to the *intention of increasing power*” [PF 2 [88] of 1885]. Therefore, will to power means that everything, whether organic or inorganic, “wants” to increase its power. Such a quantum of power is neither a metaphysical concept nor a substance, it cannot be confused with a being. “The will to power not a being, not a becoming, but a *pathos*, is the most elementary fact, and becoming, effecting, is only a result of this...”.⁸ [PF 14 [79] of 1888].

By using the concept of force, in a famous fragment, Nietzsche wrote what the world is:

And do you know what “the world” is to me? [...]. This world:
a monster of force, without beginning, without end, a fixed, iron

6. According to *Nietzsche Source* (<http://www.nietzschesource.org>), the passage translated in [Nietzsche 2003, 26], “our physicists have created God and the world”, is not correct.

7. This is the point where Nietzsche finds his disagreement over Darwinian theory.

8. We must be careful about the use of “fact” in that fragment. As we shall see, Nietzsche denies any fact defended by positivism. The Greek word *pathos* may be translated into affect as well.

quantity of force which grows neither larger nor smaller, [...] a play of forces and force-waves simultaneously one and “many” [...]—*This world is the will to power—and nothing besides!* [PF 38 [12] of 1885].

The world as will to power can be viewed as forces struggling for more power. A fragment similar to 2[88] of 1885 has been found, but in this case it indicates the concept of force: “all that happens, all movement, all becoming as a determining of relations of degree and force, as a *struggle*”. [PF 9 [91] of 1887]. There is no goal for all events, “for all that happens”, then Nietzsche denied any shadow of teleology as we can see in fragment 36 [15] of 1885:

If the world had a goal, it could not fail to have been reached by now. If it had an unintended final state, this too could not fail to have been reached. If it were capable at all of standing still and remaining frozen, of “being”, if for just one second in all its becoming it had this capacity for “being”, then in turn all becoming would long since be over and done with, and so would all thinking, all “mind”. The fact of “mind” *as a becoming* proves that the world has no goal and no final state and is incapable of being.

The fragment above shows Nietzsche’s refusal to accept an ultimate goal, and this is the reason for rejecting the idea of heat death of the Universe (including the second law of thermodynamics), which was already being debated during his lifetime.

The world as will to power may be read both in the singular or plural forms.⁹ In the singular, the world is will to power. There is nothing beyond or “nothing besides!” There is no metaphysical world. Nietzsche denies a metaphysical world and, like Spinoza,¹⁰ considers nature and mankind as the same thing. Nietzsche, in a sense, naturalizes man. Will to power in the plural means a finiteness of forces. The natural and human worlds are manifestations of forces or wills to power.

The importance of the concept of force in Nietzsche, besides the concept of will to power, is essential to his cosmological view, and Nietzschean cosmology is the so-called eternal recurrence of the same.

3 The eternal recurrence of the same

Somehow the eternal recurrence of the same [*die ewige Wiederkehr des Gleichen*] is one of the most intriguing concepts in Nietzschean philosophy.

9. See also [Müller-Lauter & Griffin 1992] for an abundant discussion on these two forms of facing the will to power.

10. In [Spinoza 2002, part III] the philosopher criticizes those that have considered “man in Nature as a kingdom within a kingdom”.

In published works, it appeared for the first time in *Gay Science*, a book of 1882, in the section, or aphorism, called “The heaviest weight”:

What if some day or night a demon were to steal into your loneliest loneliness and say to you: “This life as you now live it and have lived it, you will have to live once again and innumerable times again; and there will be nothing new in it, but every pain and every joy and every thought and sigh and everything unspeakably small or great in your life must return to you, all in the same succession and sequence [...]. The eternal hourglass of existence is turned over again and again, and you with it, speck of dust!” Would you not throw yourself down and gnash your teeth and curse the demon who spoke thus? Or have you once experienced a tremendous moment when you would have answered him: “You are a god, and never have I heard anything more divine”. If this thought gained power over you, as you are, it would transform and possibly crush you; the question in each and every thing, “Do you want this again and innumerable times again?”, would lie on your actions as the heaviest weight! [...] [GS § 341].

In this view, the eternal recurrence appears to be an ethical thought or a challenge. That is, Nietzsche points out a life experience where each singular moment or “every thing” must be approved. In life each moment—approving it and confirming it—is necessary to accept the possibility of the repetition of the whole life an infinite number of times, “all in the same succession and sequence”. For an affirmative person, each moment is accepted as it is. This is the supreme “yes” to existence, according to Nietzsche. In *Ecce Homo* the philosopher stresses that eternal recurrence is the “highest possible formula of affirmation” [EH, *Thus Spoke Zarathustra*, § 1]. On the other hand, the nihilist, who denies the sensible world or the single world,¹¹ is not able to say “yes” and confirm the existence. Then the eternal recurrence, in this view, is a necessary condition to overcome nihilism.¹²

11. Plato, according to Nietzsche, is considered nihilist because he created the ideal world, the word “where” the Ideas live. Rejecting the sensible world, Plato formulated the True World against the illusory world (the sensible world). In the same way, Nietzsche accuses Christianity because “Christianity is Platonism for the ‘people’” [BGE, Preface]. In *Twilight of the Idols* it is written: “the true world is gone: which world is left? The illusory one, perhaps?... But no! *We got rid of the illusory world along with the true one!*” [TI, *How the true world finally became a fable*, § 6]. In a sense, Nietzsche assumes only one world, this world. Then his philosophy is immanent.

12. Nihilism, the “uncanniest of guests”, presents several consequences. In fragment 2 [127] of 1885, the philosopher shows its consequences on science, politics and arts.

3.1 A cosmological interpretation

From another point of view, eternal recurrence is a cosmology or a cosmological interpretation.¹³ The Nietzschean ingredients for this cosmological points of view are: (1) both finite and conserved forces and (2) infinite time. Translating into the language of physics, the first one is indicated by the finiteness of energy in the observable Universe. Moreover, Nietzsche considers force a conserved quantity.¹⁴ To him, this is confirmed by the first law of thermodynamics.¹⁵ The philosopher wrote about this law and its relation to eternal recurrence: “the principle of the conservation of energy demands *eternal recurrence*” [PF 5 [54] of 1886]. The second one is the eternity of the world. For Nietzsche, the recurrence of “all in the same succession and sequence” is possible with eternity and both conserved and finite forces. All force configurations, within eternity, according to Nietzsche, would repeat their states. In a sense, Nietzsche works in the same direction as Poincaré,¹⁶ who stated the “eternal recurrence theorem” years after the German philosopher began his first thoughts on the physicality of his concept.

Contrary to the ethical version, the eternal recurrence of the same, as a scientific thought, appears mainly in the posthumous fragments. One of the most important is fragment 14 [188] of 1888, called *The new world-conception*, where Nietzsche wrote:¹⁷

if the world may be thought of as a certain quantity of forces and as a certain number of centers of force—and every other representation remains indefinite and therefore unusable—thus it follows that in the great dice game of existence it must pass through a calculable number of combinations. In infinite time, every possible combination would be sometime reached once; even more, it would be reached an infinite number of times.

As we can see, the two ingredients are present. The first is indicated by “a certain quantity of forces”, and the second can be read directly.

The attempts to “prove” the eternal recurrence by using scientific concepts can be viewed, according to the arguments in [Neves 2013], as an expedient

13. See also [Krueger 1978], [Nehamas 1980], [Marton 1990] and [D’Iorio 2011] for discussions on the cosmological meaning of this Nietzschean concept. In [Neves 2013, 2015], this discussion is presented from our state of the art in cosmology. [Neves 2013] discusses the possibility of eternal recurrence by means of the scientific knowledge today. Nietzsche himself said that the eternal recurrence “is the most scientific of all possible hypotheses” [PF 5 [71] of 1886].

14. Indeed, a mechanical system described only by conservative forces has its mechanical energy conserved.

15. As we have already seen, the philosopher was a critic of the second law of thermodynamics, but the first law was welcomed by him.

16. A historical description of the Nietzschean eternal recurrence and its similarity to Poincaré’s theorem is found in [Brush 1976, vol. II, 628]. This similarity is stressed in [D’Iorio 2011] as well.

17. I translated this fragment directly from the critical edition of [Nietzsche 1978].

used by the philosopher to attract readers. A scientific form for the eternal recurrence is more acceptable to people immersed in a scientific culture.

3.2 The possibility of an eternal universe

Today, cosmology is typically Einsteinian. From solutions of Einstein or Einstein-type equations, cosmological models have been constructed. One of the most important features in these cosmological solutions is the problem of the initial singularity. In the standard cosmological model (Λ -CDM model),¹⁸ the initial singularity is called the Big Bang. It is interpreted as the initial state of the Universe, a singular state where physical quantities like matter energy density, and geometrical quantities like space-time curvature, diverge. These are unbounded at the initial singularity. A common belief that the Big Bang is a breakdown of Einstein's equations exists, and a complete quantum theory of gravity would solve this problem. However, there are possible solutions of this problem without invoking the complete quantum theory of gravity. Bouncing cosmologies¹⁹ appear today as a possibility to avoid the initial singularity within current physics. If we presume violations of energy conditions, regular or nonsingular solutions come from Einsteinian gravitation. This is provided these violations are acceptable, which should be the case given the observation of cosmic accelerated expansion. The energy conditions link pressure and energy densities of the cosmological fluid, and the fluid description is a good "approximation" to describe the matter content of the Universe. Such conditions are necessary hypotheses in the singularity theorems. Presuming the energy and geometrical conditions, the singularity theorems show that space-time curvature possesses a singularity or a singular state. That is, in cosmology, for example, it is possible to show that the matter satisfying the energy conditions leads to the Big Bang or the initial singularity. Then, with energy condition violations, the singularity theorems are not valid, and it is possible to avoid the Big Bang.²⁰ In this perspective, the singularity is replaced by a regular transition—a bounce—between a contraction phase and an expansion phase (where we live today). The possibility of constructing cyclic cosmologies exists in such contexts, where the Universe passes through successive phases of contraction and expansion.

The ekpyrotic cosmology [Lehners 2008], whose name is inspired by Stoicism, presents a cyclic cosmology. Moreover, this cosmology provides solutions to the typical problems of the standard model (flatness, isotropy,

18. CDM means Cold Dark Matter, which is a type of non-relativistic matter able to interact only by means of the gravitational interaction. *Lambda* is the cosmological constant developed by Einstein. Today the cosmological constant is the "source" of the cosmic acceleration, according to several models.

19. See, for example, [Neves 2017] and the major review of [Novello & Perez Bergliaffa 2008].

20. A detailed study on singularity theorems (so-called Hawking-Penrose theorems) is found in [Wald 1984, chap. 9].

homogeneity and horizon problems), without the inflationary mechanism from the Λ -CDM model.²¹ I.e., the inflationary mechanism and its qualities that appeared during exponential expansion when the universe was young, are replaced by the ekpyrotic phase, a slow cosmic contraction phase that precedes our current expansion phase. This contraction phase defines the ekpyrotic cosmology. During the contraction phase, besides the solved problems of standard cosmology, a generation of quantum fluctuations exists that is responsible for structure formation (structures such as galaxies). In the Λ -CDM model, this achievement is due to inflation. Then the initial singularity problem, or the Big Bang problem, as well as typical standard model problems and structure formation, may be solved by adopting an alternative cosmological model.²²

Contrary to the critics and some Nietzschean scholars, a cyclic cosmological model is possible today even in Einsteinian theory (the ekpyrotic cosmology, whose origin is in the extra dimension context, may be thought of as an effective theory in four dimensions, described by general relativity). The door is open to a “new” point of view,²³ where the cosmos is viewed as uncreated, i.e., it is immanent and eternal. The strange death of God, emphasized by Nietzsche, has several meanings: one of the most important is related to the question of the cosmos’ eternity. The modern rationality may refuse the Creator or the Demiurge of the Universe, forbidding the Big Bang as an instant of creation, because, above all that instant may be viewed as a shadow of the dead God.²⁴

The question of the possibility of recurrence of the *same* remains an open issue because the knowledge of the structure formation (such as galaxies and galaxy clusters), the black hole evaporation in the contraction phase, and the thermodynamic problem (entropy would increase in each expansion phase) are not totally solved within our science at the current time. As Nietzsche points out in his *Gedankenexperiment*, his idea of eternal recurrence as a thought

21. The inflationary mechanism assumes a quantum field—the inflaton—able to expand exponentially the space-time fabric in the initial phase of the cosmos [see Linde 2007, for a review] and to solve the standard model problems.

22. In black hole physics it is possible to solve the problem of singularities within the Einsteinian context as well [see Neves & Saa 2014]. In particular, the singularity inside black holes is removed by energy violations.

23. A cyclic view of the cosmos is an old idea. Even Nietzsche writes that “The doctrine of the ‘eternal return’, which is to say the unconditional and infinitely repeated cycle of all things —is Zarathustra’s doctrine, but ultimately it is nothing Heraclitus couldn’t have said also. At least the Stoics have traces of it, and they inherited almost all of their fundamental ideas from Heraclitus” [EH, *The Birth of the Tragedy*, § 3].

24. See the aphorism 108 from *Gay Science*, where the philosopher writes: “God is dead; but given the nature of people, there may still be for millennia caves wherein they show his shadow.—And we—we must still defeat his shadow as well!” The thesis that the Big Bang may be interpreted as God’s shadow is supported in [Neves 2013].

experiment assumes the eternal repetition of the same states for generating ethical consequences, “all in the same succession and sequence”.²⁵

4 Perspectivism as an epistemological position

Nietzschean perspectivism,²⁶ or his epistemological position, is indicated in a frequently cited posthumous fragment of 1886:

Against positivism, which halts at phenomena—“There are only facts”—I would say: no, facts are just what there aren’t, there are only interpretations. We cannot determine any fact “in itself”: perhaps it’s nonsensical to want to do such a thing. “Everything is subjective”, you say: but that in itself is an *interpretation*, for the “subject” is not something given but a fiction added on, tucked behind.—Is it even necessary to posit the interpreter behind the interpretation? Even that is fiction, hypothesis.

Inasmuch as the word “knowledge” has any meaning, the world is knowable: but it is variously *interpretable*. It has no meaning behind it, but countless meanings. “Perspectivism” [PF 7 [60] of 1886].

Denying the thing-in-itself,²⁷ the fact (or positivism belief), the final truth (because there is no “being” and becoming has no goal) and any truth behind or beyond the sensible world (there is no metaphysical world), Nietzsche claims perspectivism. Knowledge is perspectivistic, it is something *human*, *all too human*. In a sense, Nietzsche follows Kant and points out the dependence of the human conditions (body structure in the Nietzschean case) for the generation of knowledge. According to Zarathustra’s author, even physics is a perspective or an interpretation, as we can read in *Beyond Good and Evil*:

Now it is beginning to dawn on maybe five or six brains that physics also is only an interpretation and arrangement of the world (according to ourselves, if I may say so) and *not* an explanation of the world. [BGE § 14]

25. A debate exists concerning recurrence: is it the recurrence of the same or of the different? I agree with [Krueger 1978] because only recurrence of the same would have an impact on ethical issues.

26. There is an intense debate on Nietzschean perspectivism. See, for example, [Anderson 1998] on truth and objectivity in Nietzsche’s perspectivism and the book organized by Babich, which possesses several works on the topicality of this philosophical position [Babich 1999].

27. “The ‘thing-in-itself’ is absurd. If I think away all the relationships, all the ‘qualities’, all the ‘activities’ of a thing, then the thing does *not* remain behind” [PF 10 [202] of 1887].

The world with its “ambiguous character” [see GS § 373] has become infinite, according to the aphorism *Our new “infinity”*: “the world has once again become infinite to us: insofar as we cannot reject the possibility *that it includes infinite interpretations*” [GS § 374]. Above all, interpretations do not reveal any fact or something behind or beyond the sensible world.

In a provocative form, Nietzsche, as a philologist by trade, criticizes the physicists and their notion of law of nature:

You must forgive an old philologist like me who cannot help maliciously putting his finger on bad tricks of interpretation: but this “conformity of nature to law”, which you physicists are so proud of, just as if—exists only because of your interpretation and bad “philology”. It is not a matter of fact, not a “text”, but instead only a naive humanitarian correction and a distortion of meaning that you use to comfortably accommodate the democratic instincts of the modern soul! “Everywhere, equality before the law,—in this respect, nature is no different and no better off than we are” [...]. But, as I have written, this is interpretation, not text [...]. [BGE § 22].

The old philologist shows the historical and temporal features of knowledge. Our “fixation” on the laws of nature, according to Nietzsche, is a feature of modernity. Knowledge is created today by assuming concepts, like the concept of isonomia or equality before the law, which are values for us. Once again, it is emphasized in the quotation above that scientific knowledge does not reveal a fact or a “text”.

Let us use the Nietzschean perspectivism to look at two questions of modern physics, the wave-particle duality and the gravitational phenomenon. We can enrich our discussion on this philosophical concept.

4.1 Wave or particle?

Returning to modern physics, Nietzschean perspectivism may help us. With the aid of Nietzsche, dichotomies are banned. For example, the wave-particle duality in quantum mechanics. What is the true reality of matter in the quantum mechanics realm? Wave or particle? For the Nietzschean philosophy, both or neither! Both, because wave and particle are working interpretations, scientific perspectives of the sensible world (and we shall see what the meaning of “working interpretations is”). Neither, because these interpretations do not show facts or the thing-in-itself. That is, for Nietzsche, there is no perfect correspondence between mind and “reality”. Because the “reality” such as we know it, the “reality” given by concepts is not a thing-in-itself, it is a product of human interpretations.²⁸ Nietzsche rejected naive

28. It must be emphasized that Nietzsche was not a solipsism enthusiast.

realism. Moreover, the philosopher rejects Platonic idealism and the possibility of existing mathematical entities. We find this rejection in a posthumous fragment:

Mathematics contains descriptions (definitions) and conclusions from definitions. Its objects do not exist. The truth from its conclusions depends on the correctness of logical thought. [PF 25 [307] of 1884]²⁹

Mathematics is grounded in error, i.e., “the invention of the laws of numbers was made on the basis of the error, dominant even from the earliest times, that there are identical things” [HHI § 19]. Denying identity,³⁰ such as Heraclitus, and the basis of the classical logic, Nietzsche indicated that even mathematics is a human creation. Hence, for example Nietzschean philosophy “solves” the debate on the reality of the wave function in quantum mechanics. The wave function is only a tool to interpret (in itself it is an interpretation!).

4.2 Force or space-time curvature?

Another problem in modern physics is: What is the true nature of gravity? Is gravity expressed by force or space-time curvature? Is the Einsteinian theory (or something else in the future) the true or final answer to the gravitational problem? According to Nietzsche, the final answer is only an illusion. Nietzsche denies final knowledge or a final truth (and even his point of view is an interpretation, a provisional perspective).³¹ An absolute point of view is absurd and contains a contradiction in terms [see BGE § 16] because every perspective is provisional, temporary. In this sense, both gravitational theories (Newtonian and Einsteinian) are true during some period of time. Within Nietzschean philosophy, truth, in general, has a polemical definition given by an early text of 1873, *On Truth and Lying in a Non-Moral Sense*. The philosopher asked *what is truth?* and answered:

[Truth is] a mobile army of metaphors, metonymies, anthropomorphisms, in short a sum of human relations which have been subjected to poetic and rhetorical intensification, translation, and decoration, and which, after they have been in use for a long time, strike a people as firmly established, canonical, and binding; truths are illusions of which we have forgotten that they are illusions, metaphors which have become worn by frequent use and have lost all sensuous vigour, coins which, having lost their stamp, are now regarded as metal and no longer as coins [TL § 1].

29. I translated this fragment directly from the critical edition of [Nietzsche 1978].

30. “The predominant disposition, however, to treat the similar as being identical—is an illogical disposition, for there is nothing identical as such—is what first supplied all the foundations for logic” [GS § 111].

31. “Granted, this is only an interpretation as well—and will you be eager enough to make this objection?—well then, so much the better” [BGE § 22].

The classical philologist (a young philologist when he wrote that text) indicated in the above quotation, truth as “human relations” or as a perspective, as it would be related many years later. Specifically, in Nietzschean philosophy, the scientific truth only means that it works for the purposes of subsistence of the type (the scientist is one of several types) and obeys specific rules, which, in the case of physics, are both mathematical and empirical. Both rules are interpretations. We have already seen the first one. The second is stressed in modernity, because both the divine and the metaphysical criteria of truth are rejected. Above all, the empirical obligation (and the scientificity) is motivated by the will to truth [*Wille zur Wahrheit*]. According to Nietzsche, the will to truth is grounded on morality, because the scientist, assuming the empirical obligation says: “I will not deceive, not even myself” [GS § 344]. Even without God (because “God is dead” in modernity) and the metaphysical world (the True World is a fable), the will to truth remains a dominant impulse that seeks stability, identity. In our scientific time it appears directly related to the sensible world, i.e., the will to truth seeks to obtain what it wants in our single world: the truth as something that does not change.³² It is an error, according to Nietzsche, because identity, or something such as the metaphysical world that does not suffer corruption, was rejected. In a sense, by using the Nietzschean philosophy, scientific work should assume another position: it should look at the truths with new eyes, considering them as interpretations, something temporary. Above all, as something *human, all too human*.

Lastly, the purpose of subsistence of the type due to knowledge is similar to “food” to Nietzsche. A kind of food for the spirit [*Geist*, without any metaphysical sense], which is metaphorically comparable to a stomach: “[...] ‘spirit’ resembles a stomach more than anything” [BGE § 230]. After all, the scientific type uses science as food to increase his power.

The possibility of several interpretations or perspectives is welcomed in Nietzschean philosophy. In *On the Genealogy of Morality*, Nietzsche said: “[...] the *more* eyes, various eyes we are able to use for the same thing, the more complete will be our ‘concept’ of the thing, our ‘objectivity’” [GM III § 12]. In this sense, “objectivity” in Nietzschean philosophy, means to have several perspectives on the same thing. Each perspective is a manifestation of impulses or wills to power. During the historical period, mankind lived with/within several perspectives or “truths”. The Einsteinian and Newtonian theories are “true”. Of course, the Einsteinian theory contains further elements and is more sophisticated than the Newtonian one. Then, it is more “objective” (e.g., the dual aspect of the matter in quantum mechanics brings us a more

32. Plato, in *The Republic* (VI, 485b), presents the philosopher’s nature and his love of truth. Truth is indicated “as reality which always is, and which is not driven this way and that by becoming and ceasing to be”. This is a common position even today, and, accordingly, truth is revealed by science because true scientific theories work independently of time. However, the geocentric model functioned during past centuries but it is now ruled out.

“objective” look). However, as well as any theory, it is still an interpretation and presents an increase of power to the men who created/supported it. In the Nietzschean philosophy, each perspective reflects the plurality of the human body. That is to say, “our body is, after all, only a society constructed out of many souls” [BGE §19]. In his immanent philosophy, a soul means impulses or wills to power. Nietzsche has a plural vision, a perspectivistic view on “reality”.

5 Physics or science as a game

The world as a game may be read in several parts of Nietzsche’s works. As early as 1872, the young philosopher wrote the text *Homer’s Contest*. The text indicates an aspect that remained unaltered in his mature works: the concept of *agon*. The Greek concept of *agon* indicates a contest, dispute, or struggle. For the mature Nietzsche, both becoming and the *agon* are subsumed under the concept of will to power. Furthermore, the world as will to power means the world as a game or play as well, as we can read in the cited fragment 38 [12] of 1885: the world “as a play of forces and force-waves [...]”. These are the ingredients of his Dionysian world view. Nietzsche saw company in Heraclitus, a thinker who claimed a similar point of view.

The affirmation of passing away *and destruction* that is crucial for a Dionysian philosophy, saying yes to opposition and war, *becoming* along with a radical rejection of the very concept of “being”—all these are more closely related to me than anything else people have thought so far. [EH, *The Birth of the Tragedy*, § 3]

Becoming as a game, Nietzsche and Heraclitus are in agreement.³³ In a sense, this is a view that may be indicated even today, using our cosmology. In [Neves 2015], one shows that Nietzsche’s idea of Dionysian cosmology, with the concepts of becoming and struggle, may be approximated to the notions of the cosmological eras, or eras of domination. In cosmology, the space-time fabric and its dynamics, i.e., its expansion, contraction or staticity is determined by Friedmann’s equations. Such equations provide the dominant term, which drives the space-time dynamics for a specific time period. Each term is a cosmic fluid component in the equations. First, when the Universe was young, radiation dominated expansion, then matter. In our current time, dark energy begins to dominate cosmic expansion. Somehow, this picture indicates a game or struggle among the matter-energy forms (radiation, matter and dark energy). In each era, an energy-matter form dominates. In cyclic

33. In a fragment attributed to Heraclitus one reads: “Lifetime is a child at play, moving pieces in a game. Kingship belongs to the child” [Kahn 1979, 71].

cosmology, the eras of domination alternate, the sequence radiation-matter-dark energy is repeated, and the *agon* is suggested. The world as a game is a good metaphor from this cosmological perspective.

As part of the Dionysian world, science is also a result of contests. The *agon* or contest between scientific perspectives is determinant to scientific development. As we have seen, science, in particular physics, obeys rules. Then, as part of the Dionysian world, science may be viewed as a game. This conclusion comes from the concepts of will to power and perspectivism: the scientific interpretations struggle for dominance. Science as a game means the most influential game today. From the beginning of modern times, science is the most dominant game. Then, the scientist is a type of player (someone who obtains in science the subsistence of the type) who is immersed in such a sophisticated game and, in general, does not realize that he/she is playing it.

6 Final comments

Contrary to common belief, Nietzsche was neither obscure nor an irrationalist thinker. Maybe the reason for this opinion is found in his work. Using aphorisms, Nietzsche created his work differently from the scientific model. Denying all powers to reason, the philosopher pointed out the limitations of the latter. However, in his published work and posthumous fragments the German philosopher exhibited admiration for science and its rationality. With the aid of natural sciences [*Naturwissenschaften*] his concepts were created. In particular, relying on physics Nietzsche developed the concept of will to power. With the Boscovichean concept of force being more fundamental than the concept of matter, the German philosopher thought about the entire world in terms of forces in struggle.

His position on the nature of reality is more than relevant today. A philosophy without facts denies a world in itself, or a thing-in-itself. The Nietzschean perspectivism is an epistemological option. “There are no facts, only interpretations” is the “fundamental truth” in Nietzschean philosophy. Nietzsche stressed the perspectivistic view of knowledge because “this world is will to power”, i.e., this world is plural, as are the interpretations in physics today.

“*Long live physics!*”,³⁴ wrote the philosopher in *Gay Science*. There is no doubt about the influence of physics on the Nietzschean main concepts. Will to power and eternal recurrence depend on the physical concept of force to appear. But the contrary is not true. There is a lack of Nietzsche’s influence on physics and physicists. However, in our point of view (a perspective), the Nietzschean perspectivism is a good option to interpret the modern results in physics to ban false dichotomies or the improbable final truth.

34. See [GS § 335], where Nietzsche describes the importance of the physicist’s honesty.

From the important concepts of will to power and perspectivism, I derived an interpretation where science is viewed as a game. The Dionysian view reveals the world as a contest, a game among wills to power. The multiplicity of perspectives in science obey imposed rules and present science as a game and the scientific activity as *agon*.

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