REVEALING THE PLACE OF GOD IN THE NATURALISTIC WORLDVIEWS OF LEIBNIZ AND NEWTON USING CONTENT ANALYSIS

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INTRODUCTION
The relationship between science and religion in the early modern period tends to be regarded one-sidedly, with the Church as an oppressor and persecutor of science. To prove this view, scholars usually cite the execution of Giordano Bruno and the trial of Galileo, and the Index Librorum Prohibitorum that included the works of Copernicus, Kepler, Galileo, Descartes and others. At the same time, the so-called “true science” is regarded as immanently disassociating itself from religion. Yet, first, one should not confuse the influence of the Church as a social institution with religion as the worldview framework for scientific creativity, while the Church can be an obstacle to scientific research, religion can be a stimulus for it. Second, it should be noted that the concept of God has played the role of a scientific hypothesis; therefore, the “God hypothesis” may be fairly regarded as a specific methodological tool. Third, it may prove useful to identify the methodological functions that such a hypothesis is able to perform based on the works of two scientific rivals, Leibniz and Newton.

MATERIALS AND METHODS
The content analysis method that is adopted in this work to study the texts of the two thinkers allowed us to identify ideas related to the specific functions of God within the naturalistic-scientific worldview. The comparative analysis helped identify similar aspects in the perspectives of Newton and Leibniz. The method of generalization, together with the results of the author’s previous studies (OTYUTSKIY, 2017; OTYUTSKIY, 2019), was used to single out the methodological functions of the God hypothesis in the 17th century naturalistic worldviews.

Hundreds of scholarly papers are devoted to the scientific rivalry between Newton and Leibniz (SHAROV, 2018; BARDI, 2006; BERTOLONI, 1993; CHRISTIANSON, 2005; FEINGOLD, 1993; HALL, 1980), and their works are studied both from the perspectives of natural science and philosophy (ACKROYD, 2011; AKHIYEZER, BELOZYOROV, FILONENKO, 1998; VAVILOV, 1989; GERVE, 2008; GUARDEÑO, 2015; DMITRIYEV, 1999; KARTSEV, 1987; KUZNETSOV, 2009; NEWTON, 2013; REALE; ANTISEMI, 1996a; REALE; ANTISEMI, 1996b; ROSENFELD, 1968; SAVREY, 2017; SANTONJA, 2015; SOKOLOV, 1982; SHAROV, 2018; EINSTEIN, 1967; ADAMS, 1994; ANTOGNAZZA, 2007; ARTHUR, 2014; CHRISTIANON, 2005; HUBER, 2014; LISKE, 2000; BROOKE; OSLER; van der MEER, 2001; SMITH, 2011). Certain scholars present the generalized picture of 17th to 18th century natural science in its connection with philosophy (BELL, 1979; GAYDENKO, 2012; LEGA, 2017; REALE; ANTISEMI, 1996a; BROOKE; OSLER; van der MEER, 2001; TEICHMAN; EVANS, 2019).

As a rule, the following aspects of the works of Leibniz and Newton are analyzed: 1) the mutual influence of their philosophical worldviews and natural scientific ideas and 2) the interrelation of the theological and philosophical aspects of their worldviews. The relations between the scientists’ theological conceptions and the formation of their naturalistic worldviews often remain on the periphery of scientific analysis (DMITRIYEV, 1999; LEGA, 2017; NEYFAKH, 2005; SAVREY, 2017; GOD AND MATH, 2012; BROOKE; OSLER; van der MEER, 2001). Thy current paper dwells precisely on these interrelations.

RESULTS
The differences between Leibniz and Newton are profound. Newton never left England, whereas Leibniz visited many countries. Newton advocated the absolute nature of space and time, but Leibniz saw these as relative. Newton was buried in Westminster Abbey after a magnificent funeral, while only the secretary and closest relatives accompanied Leibniz’s coffin.
to his grave. However, both of them had an unparalleled capacity for work, and their names had been inscribed into the history of mathematics due to the discovery of the analysis of infinitesimals. In the scientific worldviews of both great men an important place is occupied by God. This had been a matter of discussion between them as well. In fact, there is a preserved correspondence between Leibniz and the Newtonian Samuel Clarke, who demonstrated in detail the role of God in Newton’s worldview (LEIBNIZ, 1982b).

**God in the Leibnizian worldview**

Gottfried Wilhelm Leibniz (1646–1716) can be considered one of the last outstanding polymaths. Many pages in his writings are filled with thoughts on the problem of God. Yet, he was sometimes in conflict with the Church, particularly with the Hanoverian clergy, because he considered it necessary to unite the Catholic and Protestant churches to encourage the political unification of Germany. In his *Theodicy*, Leibniz put forward the idea that God is a mind that created the world in accordance with mathematical laws. He presented the functions of God in the system of the created world through the concept of monads, which are simple indivisible substances endowed in varying degrees with the beginnings of consciousness and appear as peculiar clots of energy and power. The most primal monad is God: “God alone is the primitive unity, or original simple substance, which produces all created or derivative monads” (LEIBNIZ, 1982a, p. 421).

The inner state of the monads is not changed by any other cause than God: “it is that the ultimate reason of things must lie in a necessary substance, in which the intricate detail of changes exist only eminently, in the source as it were, and this is what we call God” (LEIBNIZ, 1982a, p. 419). While the substance is “a sufficient reason for all this intricate detail, which is also interconnected throughout, there is only one God, and this God is sufficient” (LEIBNIZ, 1982a, p. 419).

Leibniz puts forward the concept of the “pre-established harmony” as a way of precisely harmonizing the movements of the soul and the movements of the body, so that they may act in concert by virtue of their own nature (REALE; ANTISERI, 1996a, p. 288). The author of this paper seeks to characterize the role that God plays in the naturalistic scientific worldview of the two 17th century great men. The question is reasonable, whether a worldview, which includes a supernatural element (God) as a necessary one, can be called naturalistic? Does it not then become “super-naturalistic”? Leibniz answers this question directly, criticizing atheists who tried not to take God into account and then declared that they cannot explain either God or immortality of soul in a natural way (LEIBNIZ, 1982c, p. 78). He himself is convinced that corporeal phenomena cannot be explained without a non-corporeal origin, i.e., God (LEIBNIZ, 1982c, p. 78).

Yet, according to Leibniz, the supernatural exists “only in the beginning of things, in respect of the first formation of animals or in respect of the original constitution of pre-established harmony between the soul and the body” (LEIBNIZ, 1989, p. 67). After the act of divine creation, the world develops according to the natural laws. Since the order established in the act of Creation does not change, it can be studied, comprehended, and predicted. That’s why one mustn’t enmesh God into the questions unworthy of His partaking, as “nothing will be easier than to account for anything by bringing in the Deity, Deum ex Machina, without minding the Natures of Things” (LEIBNIZ, 1982b, p. 497). Consequently, everything, as far as possible, should be deduced from the nature of the body and its primary properties of size, shape, and motion (LEIBNIZ, 1982c, p. 79). Science, in the case of the correct identification of divine designs, reveals precisely those laws of motion that God created. According to Leibniz, “God has chosen the best of all possible worlds” (LEIBNIZ, 1989, p. 244).

Leibniz’s leading method is that of “ultimate causes,” which are the purposes of God. This allows avoiding “bad infinity” in identifying the ultimate cause: “Why this incorporeal Being has chosen such and not other size, shape and motion can only be explained if it is intelligent, wise in view of the beauty of things and all-powerful in view of their obedience to Its will. Such an incorporeal Being would be the Mind (Mens) that governs the whole world (Mundus), i.e., God” (LEIBNIZ, 1982c, p. 83).
Leibniz identified three divine qualities that define the quality of the world: 1) “power, which is the source of everything”, 2) “knowledge, which contains the detail of ideas”, 3) “will, which brings about changes and products in accordance with the principle of the best” (LEIBNIZ, 1982a, p. 421). God is endowed with a number of other functions, without which Leibniz’s worldview would lack consistency: a) God is the source of the perfection of his own creations: “created things owe their perfections to the influence of God” (LEIBNIZ, 1982a, p. 421), b) God has no limits, so his “perfection is absolutely infinite” (LEIBNIZ, 1982a, p. 421); c) God is the source and cause of all that is realized from existing possibilities: “without him there would be nothing real in possibilities, and not only nothing existent, but also nothing possible” (LEIBNIZ, 1982a, p. 421).

**Theological aspects of the Newton’s worldview**

Isaac Newton (1643-1727) is considered one of the greatest minds in the history of humanity. After his extensive handwritten body of work was published in 1962 (DMITRIYEV, 1989, p. 5-17) it became clear that his scientific interests were as varied as Leibniz’s, while his engineering talent was as remarkable as his scientific talent (he made a refracting telescope and was an outstanding experimentalist). He was also a prominent theologian, used astronomical calculations to study the Bible and biblical prophecies (GUIRDENO, 2015, p. 117).

Newton was the leader of the scientific revolution of the 17th century. Its pinnacle was the publication of his *Mathematical Principles of Natural Philosophy* in 1687. Newton shattered the dogmas that asserted the fundamental difference between mechanics and astronomy, proved the identity of gravity on Earth and gravitational force, and theoretically substantiated Kepler’s laws. Newtonian mechanics is one of the most fruitful research programs in the history of scientific inquiry.

Newton created a method that was the opposite of Leibniz’s method of ultimate causes. This method relies on experience, is limited to facts and does not claim to know all ultimate causes; experiments form a basis for inductively establishing the basic laws of science and their corresponding concepts, which, thanks to their mathematical expression, are reduced to a scientific system. The deductive unfolding of the original principles forms a scientific theory.

Famous Newton’s hypotheses *non fingo* was spearheaded against scholastic speculations about the “ultimate causes”. After explaining some properties of gravity, Newton says: “I have not as yet been able to discover the reason for these properties of gravity from phenomena, and I do not feign hypotheses” (NEWTON, 1989, p. 662). However, his hypotheses of ether, long-range action, universal mechanical causality, the corpuscular nature of light are well known. According to the witty remark of V.P. Kartsev, Newton’s work on the nature of light is “a feast of hypotheses with the main character... time and again proclaiming himself an ascetic and teetotaler” (KARTSEV, 1987, p. 183).

In Soviet scholarly literature, Newton’s “appeal to the ideas of creation” was often justified by “the inadequacy of the mechanistic explanation of nature felt by Newton himself” (NEWTON, 1983, p. 433). However, to deny the religious nature of Newton’s worldview is impossible, so for a long time the scholars sought to oppose Newton-the-physicist to Newton-the-theologian-and-the-alchemist. In any case, for a long time it was believed established that Newton did not need the “God hypothesis” to build his worldview.

However, Einstein had another opinion: “Newton was a very religious man. It is from this deep feeling he undoubtedly drew those superhuman forces that were necessary for the accomplishment of his life’s work” (EINSTEIN, 1967, p. 93). Newton’s understanding of God is set forth both in his theological works and in his major natural science works, *Mathematical Principles* (which is concluded with the *Scholium on God*) and *Opticks*.

Newton’s world system is a great mechanism with the laws that can be discovered by the researcher by induction through observation and experiment. But how did this ordered system arise? “This most beautiful system of the sun, planets, and comets, could only proceed from the counsel and dominion of an intelligent and powerful Being....

This Being governs all things, not as the soul of the world, but as Lord over all; and on account of his dominion he is wont to be called Lord God παντοκράτωρ, or Universal Ruler...” (NEWTON, 1989, p. 659). Thus, Newton’s God is the cause of all natural forces, of all that happens and...
exists; the actual physical world is the temple of God, in which the power, authority, and wisdom of the Creator are manifested in their totality (DMITRIYEV, 1999, p. 509).

The Divine Project proves that God is a skilled mathematician, as he had to compare the quantities of matter of the Sun and planets, the forces of gravitation, and the velocities of the planets. As Newton wrote to Richard Bentley, “to compare & adjust all these things together in so great a variety of bodies argues that cause to be not blind & fortuitous, but very well skilled in Mechanicks and Geometry” (KLYN, 1984, p. 73).

Newton insists that God must be praised not so much for his essence as for his actions, for the creation, preservation, and management of all things in harmony with his good will and desire (DMITRIYEV, 1999, p. 550). Here we see God playing not only the role of Creator, but also of the force that governs the world after the act of Creation. Why did Newton, who had paved the way for deism, remain a theist?

Clarke, who clarifies Newton’s position, states that “the Wisdom of God consists, in framing Originally the perfect and complete Idea of a Work, which begun and continues, according to that Original perfect Idea, by the Continual Uninterrupted Exercise of his Power and Government” (LEIBNIZ, 1982b, p. 439). Why does Newton’s God need to continually govern the world, since he created the laws of nature, which Leibniz believed were sufficient to keep the world constant?

Firstly, the particles of matter are passive: “It seems to, that these Particles have not only a Vis inertiæ, accompanied with such passive Laws of Motion as naturally result from the Force, but also that they are moved by certain active Principles, such as is that of Gravity, and that which causes Fermentation, and the Cohesion of Bodies” (NEWTON, 1954, p. 304).

Secondly, there is the problem of the beginning of gravitation, which Newton associated with the divine will. As a result, he came to the idea that gravitation is a manifestation not only of regular, but also of direct divine action. According to the Swiss mathematician Nicolas Fatio de Duillie, sir Isaac seemed to have often been inclined to think that gravitation has only the free will of God as its basis (DMITRIYEV, 1999, p. 412).

Thirdly, Newton tries to find out the mechanism of the laws of conservation, which, at first sight, contradict the mechanical picture of the world, because “the variety of Motion, which we find in the World is always decreasing, there is a necessity of conserving and recruiting it by active Principles... And if it were not for these Principles the Bodies of the Earth, Planets, Comets, Sun, and all things in them would grow cold and freeze, and become inactive Masses; and all Putrefaction, Generation, Vegetation and Life would cease, and the Planets and Comets would not remain in their Orbs” (NEWTON, 1954, p. 302-303).

Thus, according to Newton, God’s intervention cannot be one-time, because from time to time he has to repeat the initial impetus. It follows from the law of gravitation that in the end the orbits of heavenly bodies will change and a new intervention of God will be required to restore the heavenly order (KUZNETSOV, 2009, p. 135).

For Newton, God is materially present at every point in the universe, while space acts as God’s “sensorium.” Newton demonstrates the close connection between the absolute space and time and God hypothesis: “He is not eternity or infinity, but eternal and infinite; he is not duration or space, but he endures and is present. He endures forever, and is everywhere present” (NEWTON, 1989, p. 660).

DISCUSSION

Leibniz’s God, Newton’s God, as well as the Gods of Kepler and Descartes (OTYUTSKIY, 2017; OTYUTSKIY, 2019) differ in their functions within the naturalistic scientific worldview of each of these thinkers, but the final result is the same that is the “completion” of the natural scientific picture of the world, its systematic representation. The so called “God Hypothesis” became the most important methodological tool, as its use led to significant scientific discoveries in the 17th century.
Similar functions of God were present in 17th century natural science.

1. The function of creation of the natural and social world. According to Leibniz, the God-monad creates other monads in accordance with his own plan. According to Newton, Creation is not one-act, since God has to intervene from time to time in the world order.

2. The function of the structural arrangement of the world. For Leibniz, God acts as the foundation of all the foundations of the arrangement of the world as a system. For Newton, such foundations are the principles he discovered which served as God’s basis for constructing the world and the act of Creation.

3. The function of the mathematical arrangement of the world. For both Leibniz and Newton, God is the ultimate mathematician and geometer. This is largely due to the fact that both thinkers were themselves outstanding mathematicians, and Newton created mathematical analysis primarily as a tool to adequately describe a systemic picture of the world.

4. The function of establishing *harmonia mundi* (the harmony of the world). Leibniz sought to substantiate the idea of the harmony of the world as a characteristic of the best of all possible worlds. According to Newton, the harmony of the world is occasionally disturbed, so divine intervention is required to restore it. For Leibniz, this mechanism works without winding or periodic repair.

5. The function of the source of power and might. For Leibniz, God is omnipotent because natural things obey him. For Newton, God is omnipotent because he is the Lord of the Universe and acts as the Lord God Almighty.

6. The epistemological function of God is his role in enabling the cognitive process. According to Leibniz, God has placed in man the capacity for cognition: the mind of God is the realm of eternal truths that can be cognized by man. According to Newton, the function of omniscience belongs to God alone, while human cognition is limited.

7. The function of ensuring the immutability of the laws of nature. Leibniz points out that the ways of the monad-God are the simplest and most uniform, and this uniformity underlies the invariability of the laws. For Newton, this function is more complex. On the one hand, God is “one and the same God” always and everywhere. On the other hand, the natural world created by Him, subject to laws created by Himself, is not quite perfect, and divine intervention is sometimes required to ensure the immutability of the laws of nature.

8. The function of the prime mover of motion. Here the views of both thinkers coincide. Leibniz holds that God acts as the ultimate cause of things. According to Newton, gravitation and fermentation are the causes of motion, which, in turn, are divine in nature. God created the things of the world “according to place and time,” but the act of creation is not simultaneous, since every variety of things comes from God’s “thought and will.”

**CONCLUSION**

The example of Leibniz and Newton testifies that the systemic character of the naturalistic scientific worldview of the 17th century was provided by the fact that they were not fully naturalistic, as God played an important role in these theoretical visions. In situations where science does not yet have adequate means of solving actual problems, the “God hypothesis” helps to fill in the missing forces, sources, and causes of world dynamics.

In most cases, we can identify the following functions of God within the worldview: 1) creation of the world; 2) its structural arrangement; 3) harmonization of the universe; 4) power and omnipotence; 5) providing prerequisites for the cognitive process; 6) ensuring the invariability of the laws of nature; 7) the root cause of motion and its conservation, etc.
The further development of science and the discovery of new laws of nature gradually freed God from the functions “entrusted” to him by the naturalists of the 17th century. Already in the Newton’s classical naturalistic worldview, God had virtually no place, although Newton himself was a deeply religious man.

In the quantum relativistic picture of the world of the late 19th and early 20th centuries, the hypothesis of God has lost the status of a methodological tool that explains the specific features of many natural phenomena. However, this does not mean that the very concept of God can be eliminated from the sphere of human culture. In the culture of almost all countries and peoples God has been and will remain both an object of belief, devotion, veneration, discussion, admiration, and a possible object of negation.

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Revealing the place of God in the naturalistic worldviews of Leibniz and Newton using content analysis

Resumo
O objetivo do estudo é usar exemplos de obras leibnizianas e newtonianas para demonstrar a noção de que, sob certas condições, o conceito de Deus pode funcionar como uma ferramenta metodológica para a construção de uma cosmovisão integral. Uma análise de conteúdo dos textos de Leibniz e Newton foi realizada para identificar o papel de Deus. A análise comparativa permitiu ao autor revelar aspectos semelhantes nessas visões. As diferenças entre Leibniz e Newton são profundas, mas o que os une é a diversidade de seus interesses e seus papéis marcantes na descoberta da análise dos infinitesimais. Problemas de ciências naturais que não podiam ser resolvidos no século 17 por métodos exclusivamente científicos geraram lacunas na visão completa do mundo. O conceito de Deus não só possibilitou preencher tais lacunas, mas também serviu de instrumento de pesquisa.


Abstract
The aim is to use examples of Leibnizian and Newtonian works to demonstrate the notion that, under certain conditions, the concept of God can function as a methodological tool for constructing an integral worldview. A content analysis of the texts of Leibniz and Newton was conducted to identify the role of God. The comparative analysis allowed the author to reveal similar aspects in these visions. The differences between Leibniz and Newton are profound, but what unites them is the diversity of their interests and their outstanding roles in the discovery of the analysis of infinitesimals. Natural science problems that could not be solved in the 17th century by exclusively scientific methods led to gaps in the complete view of the world. The concept of God not only made it possible to fill in such gaps, but also served as an instrument of research itself.

Keywords: Leibniz. Newton. Naturalistic worldview. God. Creation.

Resumen
El objetivo es utilizar ejemplos de trabajos leibnizianos y newtonianos para demostrar la noción de que, bajo ciertas condiciones, el concepto de Dios puede funcionar como una herramienta metodológica para construir una cosmovisión integral. Se realizó un análisis de contenido de los textos de Leibniz y Newton para identificar el papel de Dios. El análisis comparativo permitió al autor revelar aspectos similares en estas visiones. Las diferencias entre Leibniz y Newton son profundas, pero lo que los une es la diversidad de sus intereses y sus papeles destacados en el descubrimiento del análisis de infinitesimales. Los problemas de las ciencias naturales que no pudieron resolverse en el siglo XVII con métodos exclusivamente científicos llevaron a lagunas en la visión completa del mundo. El concepto de Dios no solo permitió colmar esos vacíos, sino que también sirvió como instrumento de investigación en sí mismo.