OPEN ACCESS

PUCRS | ESCOLA DE HUMANIDADES

VERITAS (PORTO ALEGRE)
Revista de Filosofia da PUCRS

Veritas, Porto Alegre, v. 71, n. 1, p. 1-9, jan.-dez. 2026
e-ISSN: 1984-6746 | ISSN-L: 0042-3955

EPISTEMOLOGIA, LÓGICA E FILOSOFIA DA LINGUAGEM

Dogmas in science? Ideological barriers to paradigms shifting in the post-modern era

Dogmas na ciência? Barreiras ideológicas à mudança de paradigmas na era pós-moderna

Dogmas en ciencia? Barreras ideológicas al cambio de paradigmas en la era posmoderna

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Recebido em: 08 ago. 2025.
Aprovado em: 04 nov. 2025.
Publicado em: 26 fev. 2026.

Abstract: Scientific knowledge evolves by the substitution of older hypothesis and theories when they are proved wrong or incomplete. However sometimes the consequences of accepting alternative theories can shake the worldview and convictions of some scientists. We discuss that, sometimes, scientists cling to their ideas in the same way they accuse religious people to embrace their dogmatic principles and that is contradictory to the philosophy of science and prevents science from advancing. Two emblematic cases in natural sciences are used as examples.

Keywords: science; scientific method; theories; dogmas; reason.

Resumo: O conhecimento científico evolui pela substituição de hipóteses e teorias mais antigas quando estas se mostram erradas ou incompletas. No entanto, às vezes, as consequências da aceitação de teorias alternativas podem abalar a visão de mundo e as convicções de alguns cientistas. Discutimos que, às vezes, os cientistas se apegam às suas ideias da mesma forma que acusam religiosos de abraçar seus princípios dogmáticos, o que é contraditório à filosofia da ciência e freia o avanço científico. Dois casos emblemáticos nas ciências naturais são usados como exemplos.

Palavras-chave: ciência; método científico; teorias; dogmas; razão.

Resumen: El conocimiento científico evoluciona mediante la sustitución de hipótesis y teorías antiguas cuando se demuestra que son erróneas o incompletas. Sin embargo, a veces, las consecuencias de aceptar teorías alternativas pueden sacudir la cosmovisión y las convicciones de algunos científicos. Analizamos que, en ocasiones, los científicos se aferran a sus ideas de la misma manera que acusan a las personas religiosas de abrazar sus principios dogmáticos, lo cual contradice la filosofía de la ciencia y frena el avanzo científico. Dos casos emblemáticos en las ciencias naturales son usados como ejemplos.

Palabras clave: ciencia; método científico; teorías; dogmas; razón.

1 Introduction

Science can be defined as the rational systematic way of obtaining the knowledge about how our universe and everything in it (we may call this "nature") is composed and works from evidences, commonly called material proofs (Lennox, 2009, 2021; Velasco, 2025; Volpato, 2013). The Britannica Encyclopedia (2025) defines science as:

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> [...] any system of knowledge that is concerned with the physical world and its phenomena and that entails unbiased observations and systematic experimentation. In general, a science involves a pursuit of knowledge covering general truths or the operations of fundamental laws.

Moreover, Thomas Kuhn describes the regular process of doing science ("normal science" according to him) as puzzle-solving (Kuhn, 2007). It can be divided into exact (mathematics), natural (physics, chemistry, astronomy, biology, etc.) and human (philosophy, history, psychology, sociology, theology, etc.) sciences. In many of the different disciplines inside these three categories, the ideas, hypotheses of the what is and how do things and the whole universe work are checked against material evidence collected in a planned way in nature or developed in laboratory-controlled experiments, and in the human sciences many evidences are historical, cultural, intellectual but, perhaps, not material (Ford, 2000; Lennox, 2021; López, 2014; Velasco, 2025; Volpato, 2013).

The word "truth" appears in the description, above, and in the mind of scientists. Its definition goes far beyond the present article, but we can say that true things are in accordance, objectively, with observed facts. Moreover, we can argue, philosophically and etymologically, that differently to present times post-modern ideas, the truth about a determined subject is only one. There can be different views and personal opinions, but not different truths. Either the Earth revolves around the Sun or the Sun does around the Earth. The great medieval philosopher Thomas Aquinas, in his *Summa Theologiae* - Question 16 (see Brito; Oliveira; Matos, 2018; Knight, 2017) discusses several aspects, affirming that truth is only one, "is what it is", and cites also another great philosopher, Augustine of Hippo, on saying that "truth and mind do not rank as equals, otherwise truth would be mutable, as the mind is", even though is our human yet powerful mind that unravels the truth through reasoning.

The field of science uses a method to search for the correct answer for questions about our universe, a method developed since the dawn of philosophy and other sciences in ancient Greece (around the 7th century BC) and subsequent steps up to the Discourse on the Method by René Descartes in the year 1637 AD (Descartes, 2006; López, 2014; Velasco, 2025). Furthermore, Karl Popper clarified that scientific knowledge is provisional, that when we believe something to be true is because we have not proved it to be false, yet. Is the so-called "falsification principle or falsifiability" (Koche, 2007; Rampazzo, 2010; Velasco, 2025). This is a very important aspect of science, and it is what most differentiates science from other views of reality. Authors like Thomas S. Kuhn, above-mentioned, and Paul K. Feyerabend had some disagreements with Popper's philosophy regarding the analysis of the world around us, Kuhn having a vision of the scientific development as centered on the historicity of paradigms and the community dynamics of science and Feyerabend proposing the abandonment of paradigms and an epistemological anarchy (Feyerabend, 1993; Kuhn, 2007; López, 2014; Rabolini, 2024; Russell, 2017). These last views will not be discussed here, however.

On the other hand, and in different worldviews, there are the so-called "dogmas". These can be defined as "belief, system of beliefs, put forward by some authority... to be accepted without question" (Hornby, 1974). They are quite common in the various religions since it is assumed that, once revealed some truth by God, or assessed by some authority of the religious group or nation, such knowledge is indisputable. They are not to be confused with the concept of paradigm (*i.e.* a set of theories, methods, and standards that define legitimate, regular work within a scientific field) by Kuhn (2007) and others.

Problem

In the last century and a half, and as a posterior fruit of the French Revolution and Positivism, the scientific thinking has been experiencing a drastic change. On one hand, the exact and natural sciences (some call them "hard sciences") have been separated from the human and social sciences (likewise called "soft sciences") and the latter treated with disdain, even. An alrea-

dy emblematic affirmation by the late Stephen Hawking in his 2010 book with Leonard Mlodinow, entitled "The grand design" (Hawking; Mlodinow, 2010, p. 5), states, right in its beginning, that "[...] philosophy is dead. Philosophy has not kept up with modern developments in science [...]". On the other hand, the opinion that only science can bring answers to our questions and unravel the truth, a way of thinking that some authors call "scientism", seems to dominate the scientists' ecosystem (Eastbrook, 1997; Garros, 2016; Lennox, 2009, 2021). This second view targets not only the above-mentioned soft sciences but, mainly, religions. Science and religion, reason and faith, are put firmly on opposite sides, in the present day's culture by many laymen and scientists as well. Their main criticisms against religions are, notably, the existence of dogmas and what they believe to be lack of reasoning for, with "blind faith", people can believe anything (Dawkins, 2007; Lennox, 2021).

Nevertheless, we did observe and can say that in the scientific realm there are some contradictory ideas and principles that resemble very much dogmas and this is, by definition, non-scientific. Kuhn (2007), Lennox (2009), Russell (2017) and other authors explain that changes in theories and paradigms could be difficult and slow sometimes but, when well processed, according to the scientific, rational method, do lead inevitably to new, revolutionary ones. What the present article aims to show is another situation that we consider inadequate according to the best scientific practices.

Development and arguments

As stated by the Irish mathematician John Carson Lennox (2009, 2020, 2021), many brilliant scientists have said phases that are non-scientific but, rather, personal beliefs, unprovable by science. For instance, astronomer Carl Sagan have said in his television series and in his book *Cosmos* (Sagan, 1982) "The cosmos is all that is, was or ever shall be". But, by no means astronomy or physics can test or sample anything outside our universe, before or after its existence, for natural sciences are a way to analyze the natural (existing) world. Another example is the biologist Richard Dawkins, in his books (Dawkins, 1979, 2007) and elsewhere that, when facing difficulties explaining the highly improbable existence of extremely complex biological structures and the origin of life itself states that it was "just inevitable" for them to be (Lennox, 2009, 2021).

Two great subjects, as examples

Among the possible controversial topics that have raised several questions, doubts, debate, and caused heated arguing and quarrels among different scientists, we can bring to the present discussion two of them, indeed huge subjects: I) the origin of the universe and II) the origin of life.

I) The origin of the universe has been a question in the mind of scientists, perhaps all thinkers in the history of humankind, from ancient times to this day. Since we are here, we do exist (remember the "*Cogito ergo sum*" of René Descartes – Cohen, 2015; Russel, 2017; Warburton, 2012), we ask many questions like: Why are we here? Where do we come from and where are we going? How and when did the natural world come to be? Why is there something rather than nothing? Why are things the way they are? Is there an order and purpose for life?... and other similar, deep questions (Ferry, 2006; Hawking; Mlodinow, 2010; John Paul II, 1998; Lennox, 2009, 2021; Velasco, 2025). Many centuries ago, each civilization had its own legend and myths about the origin of the universe, mainly involving some kind of deity. From the 4th century BC onward the reigning idea was the one defended by the Greek scientist Aristotle that the universe was eternal (Lennox, 2009, 2021; Sagan, 1982). Such idea persisted until the 13th century when Christian philosophers, notably Thomas Aquinas argued that the inspired sacred texts talked about a beginning, so that old theory must be erroneous, even though he had an enormous respect and studied carefully Aristotle's thoughts. In fact, along with Averroes, Aquinas was responsible for bringing Aristotle back to the philosophical and scientific culture, in his time (Russell, 2017; Velasco, 2025). However, it was just

in the 1900's that some scientists like Alexander Friedmann, Georges Lemaître and Edwin Hubble raised the hypothesis of a dynamic and expanding universe contrasting the steady-state eternal one that was still reigning, even for top scientists like Albert Einstein (Britannica Encyclopedia, 2025; Lemaître, 1927; Lennox, 2009; 2021; Luminet, 2015). In science, one theory gives way to another, as soon as hypotheses for the new one are tested and found to be true. It can be in the form of small changes or real revolutionary ones (Kuhn, 2007; López, 2014; Velasco, 2025). But in this case, the resistance came from a worldview point, hence a dogmatic posture. The Belgian astronomer Georges Lemaître presented his ideas in 1927 (the original article in french was reprinted in English in 1931) but he faced some subjective critics from other scientists. Besides the opposite idea, *i.e.* that the universe had no beginning, there were some non-scientific concerns. Sir Arthur Eddington, another physicist said, literally, that "philosophically, the notion of a beginning of the present order of nature is repugnant to me" (Eddington, 1931). John Maddox, a former editor of the prestigious journal Nature said that the idea of a beginning was thoroughly unacceptable and raised concerns about what some creationists[2] may say, since the idea of a beginning could be used to prove the Bible's narrative about creation (Lennox, 2009; Maddox, 1989). In an answer to the first, still in 1931, Lemaître, a Catholic priest besides a physicist, mathematician and cosmologist, argued in pure scientific terms and theorized about the primeval particle that would have generated everything else in the universe in a process of expansion (Lemaître, 1931).

Many authors state that Lemaître's ideas were resisted and not recognized for some time. For instance, another great scientist of that time, Fred Hoyle, said ironically and pejoratively, that the hypothetical primeval particle exploded in a "big bang" and the universe was expanding ever since (Krag, 2024). The name stuck up to the present day, but not in the negative sense Hoyle once intended. It was only after Edwin Hubble observed in 1929 with his telescopes that the radiation emitted by the galaxies showed that they were getting farther away from ours, *i.e.* the universe was, indeed, expanding and, latter, in 1963 when Arno Penzias and Robert Wilson discovered the cosmic microwave background, predicted by Lemaître, that his ideas were more seriously taken and, today, it is the most accepted theory for the origin of the universe (Lennox, 2009, 2021; Luminet, 2015; Sagan, 1982). Einstein himself, having talked to Hubble in person, acknowledged Lemaitre was right. Yet, some scientists still resist for scientific and philosophical reasons (and, I date to say, prejudice). For example, the above cited Maddox (1989) article that is entitled "Down with the Big Bang", states that "In all respect save that of convenience, this view of the origin of the Universe is thoroughly unsatisfactory". On an extra side note, it is very curious that Carl Sagan, a notorious atheist, in his famous book *Cosmos* (1982) does not mention Lemaître at all when describing the Big Bang Theory, or anywhere else in his book, but only Edwin Hubble.

Of course, in science, there is always room for competing hypotheses that can be tested and compared to find out which one has more and better answers for our questions, explain more precisely the things we see or measure in our universe. For example, some scientists think that the universe passes through a series of expanding and contracting very long phases, called eons. This is the so-called "Conformal Cyclic Cosmological Model", defended by the British mathematical physicist and Nobel Prize laureate Roger Penrose and others (Penrose, 2006). And there are other hypothetical models being discussed in the field of astrophysics and the interested reader could find better material elsewhere[3]. However, the choosing of a winning model should be according to the data that proves the model to be true, and not the one that fits

[2] Creationists are the people that believe that the universe was created by God. There are different kinds of creationists. Readers should check this subject elsewhere, since this is not the scope of the present article.

[3] See, for example, https://www.space.com/24781-big-bang-theory-alternatives-infographic.html.

with our philosophical or religious thoughts. For some astrophysicists, however, it seems that any answer is better than anything that might point towards an all-powerful and eternal creator. Even the hypothetical existence of an infinite number of different, eternal universes (the so-called "multiverse"; *e.g.* Ellis, 2011; Vilenkin; Tegmark, 2011) sound more plausible for some of them than only one eternal, infinitely powerful and wise God.

II) The origin of life on Earth is another huge topic, still poorly answered by science. Regarding the first forms of life, there is no paleontological evidence on the billion years between the formation of the Earth and the older fossils found (Curtis, 1977) and there is "still much to be understood about the origin of life" (Sagan, 1982). Nevertheless, the diversity of life we observe in the present day is commonly believed to be a consequence of evolutionary processes (genetic random mutations, reproduction, natural selection, survival or extinction of different living beings' forms). Such theory became the main biological one after the publication of the book "On the origin of species by means of natural selection, or the preservation of favoured races in the struggle for life" by Charles Darwin on November 24th, 1859, a second version in 1861 and others, latter (Curtis, 1977; Darwin, 1861; Dawkins, 1979). On that date the scientific and philosophical worlds were shaken. Justice be made, Alfred Russel Wallace, a contemporary naturalist to Darwin's, was also working on such ideas, but Darwin published them first. Even though the hypotheses and theories (based on his observations) written down by Darwin try to account for the eventual evolution of all successive forms, up to the present species's diversity, from a universal common ancestry, some scientists believe (wrongly) it could also be used to explain the very origin of life itself (Lennox, 2009, 2021). Fierce defenders of Darwin's theory like the nowadays famous biologist Richard Dawkins even state that such theory (evolution) is "the truth" about why and how we are here (Dawkins, 1979). The idea of survival of the fittest and evolution was not totally original, since some scientists from ancient Greece like Anaximander, Empedocles and others had some hypotheses like that (Russel, 2017; Sagan, 1982; Velasco, 2025). However, Darwin and Wallace presented many observations and updated ideas on the matter that let them conclude evolution by natural selection was a fact and was the answer to the mystery of life's diversity and even existence.

Darwin himself was aware that his theory had some problems still to be solved in the future (Darwin, 1861; Meyer, 2014; Wells, 2014). For example, if his theory was right, the fossil record must have shown a gradual change in forms, a continuum of species along the millions of years registered in the successive geological layers. But there were some layers that showed different features, like the eras where the quantity of new forms had increased way over the expected, for example the so-called "Cambrian explosion", and other previous layers where there were missing common ancestors' forms. Those problems were questioned then by some respectable scientists like Louis Agassiz, the top paleontologist of Harvard University at the time (Lennox, 2021; Meyer, 2014). There were other discussions, less elegant and full of prejudices in those days, particularly between materialistic scientists that stated that the new theory of evolution finally disproved the existence of a creator God, on one hand, and theists arguing that by no means they were descendants of a monkey like they interpreted that Darwin's book suggested, on the other hand. But let's set aside those extremist and blindfolded ideas, for our present argumentation.

In recent times, new data have presented new challenges to Darwin's theory. The discovery of how characteristics are passed down from ancestors to the descendants, namely the genetic material encoded in the deoxyribonucleic acid or DNA, by Watson and Crick in 1953 (Curtis, 1977) and the underlying biochemical and mathematical constraints to mutations (the source of variation), for instance, are critic. The present-day information on biomolecules' synthesis, precise arrangement, complexity and refined cellular processes' control, as well as the notion that mutations are: 1) rare, and 2) mostly deleterious, posed a huge

challenge for the original theory (Lennox, 2009, 2021; Meyer, 2014; Tour; Parker; Jeynes, 2025). In the year 1966, many scientists like engineers, mathematicians, biologists and others, gathered at the Wistar Institute in Philadelphia - USA for a conference with the title "Mathematical challenges to the Neo-Darwinian theory of evolution" (Lennox, 2009, 2021; Moorhead; Kaplan, 1967; Rosenhouse, 2016). Some deep discussions took place in which, on one side, mathematicians argued that the probabilities of successful mutations (*i.e.* that could generate an evolutionary advantage of any kind) are absolutely too little to account for the present theory, no matter how much time has passed (geological eras) and, on the other hand, some biologists defending that it was possible, if one thinks about random mutations, and they stated that mathematicians did not understand well the process and so their critics were unsuccessful (Rosenhouse, 2016).

At the same time, biochemical studies have revealed that some large molecules, such as hemoglobin, enzymes, DNA itself, and others, are too complex to have been built in a step-by-step or one (advantageous) mutation at a time manner. The same with very complex biological structures. American biochemist Michael Behe call this phenomena "irreducible complexity" meaning that unless any such structure had appeared all at once, the Darwinian mechanism (accumulation of small changes over time in a given species) is not able to answer the question of how it did appear at all, and Darwin himself stated that such cases would break his theory down (Behe, 1996, 2007; Darwin, 1861; Lennox, 2009, 2021).

A third hard critique came from genetics and information theory. The DNA molecule is extremely long. For example, in the case of the simple bacteria *Escherichia coli* it has around 4.5 thousand and that of human beings has, approximately, 3.5 billion nucleotide bases long (Curtis, 1977; Lennox, 2021; Trevors, 1996). Each triplet (*i.e.* sequence of three nucleotide bases in the DNA sequence) codifies for a certain and specific amino acid, and several amino acids linked afterwards would form a specific protein. Such bases are arranged in a precise way. Changes in the sequence can signify errors in transcription (that is the intracellular process of reading the DNA sequence and ensambling proteins from it) and, thus, no protein synthesis at all (Curtis, 1977; De Robertis; Hibs, 2006; Lennox, 2021). This means that such sequence carries information. If one thinks about the bases as letters, DNA can be seen as an extremely long word, text or code. The famous programmer Bill Gates says in a book that "DNA is like a computer program but far, far more advanced than any software ever created" (Gates, 1995, p. 188; Lennox, 2009, 2021). The appearance of information in these molecules is also a huge challenge for the present-day theory of evolution.

Because of all the above-mentioned problems, it is evident that Darwin's theory must be either improved or substituted with a new theory. Objectively thinking, that would be the normal course of action in science. However, many evolutionist scientists take a dogmatic stand against any critics. The sole mention of any criticism against the theory of evolution seems to press some nerve and any opposing idea is labeled as obscurantist by them. Two examples should prove this point. One is the opinion of the Chinese paleontologist, expert on the Cambrian explosion, Jun-Yuan Chen, who gave a talk in the University of Washington in 1999 organized by molecular biologist Jonathan Wells (2014). After talking about new and better findings of Cambrian records in China and in Canada, he argued that the confirmed abrupt appearance of many new forms of animals and plants in the early Cambrian was still a big problem for the Darwinian theory. However, the scientific audience seemed to have ignored that part of the lecture during the discussion session. Afterwards, Dr. Chen commented with Dr. Wells about this issue and concluded that "in China we can criticize Darwin, but not the government; in America, you can criticize the government, but not Darwin" (Wells, 2014). A second, more peculiar case, was a publication by Stephen Meyer, a geophysicist and philosopher of science, in the peer-reviewed journal Proceedings of the

Biological Society of Washington in August 2004 where he used data and sound scientific arguments against the Darwinist view and in favor of the Intelligent Design Theory (Meyer, 2004). The article was approved by three referees and the editor, Richard M. Sternberg (an evolutionary biologist himself) and published. However, due to great criticism from other scientist, the editor was reprimanded by his superior and substituted, months later. Such controversy was documented in many newspapers, blogs, Wikipedia, and scientific journals and still criticized by pro-Darwinist *status quo*'s scientists and influencers (see, for instance, https://stephencmeyer.org/about/; Giles, 2004). Even though Meyer and others are proposing an alternative theory, using the same scientific tools and data, still their theory is totally rejected and called pseudo-scientific and unsubstantiated.

Conclusion

As sometimes in poetry, our findings in science take us from the end back to the beginning. Scientific theories could and will fall when new and more complete data is found and the conclusions of the technical analysis points to the falsification (*sensu* Popper) of the original one. It took humankind a lot of time, centuries and even millennia, to find some clues, evidences and gain knowledge of natural phenomena. From time to time some major pillar of knowledge must be torn down to erect another, more appropriate and accurate. This path is not intellectually painless but, latter, the result justify the process (Koche, 2007; Kuhn, 2007; Lennox, 2021; López, 2014; Rampazzo, 2010; Sagan, 1982; Velasco, 2025; Volpato, 2013). However, one must recognize as a scientist that, sometimes, it is not fear of the process but of the result that prevents some scientists from accepting that their theory was incomplete or wrong. If they attach themselves only to theories that support their worldviews, their personal beliefs, they are dogmatic and non-scientific at all. The principle should be the same Plato stated in his work: "follow the evidence wherever it leads", as said by the famous philosopher Anthony Flew in an interview[4] (Lennox, 2009, 2021).

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[4] See also https://www.allaboutphilosophy.org/antony-flew.htm.

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Como citar este artigo

Velasco, G. Dogmas na ciência? Barreiras ideológicas à mudança de paradigmas na era pós-moderna . Veritas (Porto Alegre). https://doi.org/10.15448/1984-6746.2026.1.48659

Os textos deste artigo foram normatizados por Araceli Pimentel Godinho e submetidos para validação do autor antes da publicação.