

Physics and the Beginning of Time

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Since antiquity the notion of time has been and still attracting an ever growing interest in different areas of science and philosophy. Philosophers, physicists, logicians, and even theologians, have devoted so much of time and effort to come to grip on the fundamental concept of time. What is time? How and when the universe began? Was there time before creation? How deep is the bounds between time and space? How would our thought about the passage of time be viewed? Are physical processes taking place within our space-time adequate to elucidate truly the objective concept of time, or one needs to satisfy one's self with a psychological and ontological connotation? This article sheds some light on answers to the aforementioned questions and tries to establish firm grounds to the notion of time from what is available of philosophical heritage in the light of modern science and cosmology. Most importantly, it comes essentially as a clarification to the inherited misleading idea that time has been running prior to creation. The latter is made clear via examining Leibniz's conundrum to Clarke[1], "Why Did God Not Create the World Sooner?". The logical premises to answering this question and following Ghazali's superb explanations, render us accepting the fact that time originated the moment the universe had been created from *ex nihilo*.

In order to reach a truthful judgment about time, we have first to distinguish between the views science undertakes to explain physical time, and those conceptions underlined by philosophy on the epistemological and ontological notions about the so-called objective time, which includes physical time. The age-old philosophers like Aristotle, spoke of "Nature" in his Organon as being the collective Existence, that is relevant to matter and subdued to motion. He considered two types of motion; the first is the alteration of forms and shapes in the same substance. The second type of motion he called "the sensible transposition", which as he pointed out, needs space and time to occur. A moving body of any mass had to be in contact with a "mover", something which caused its motion. Thus space is a prerequisite for the occurrence of movement, and time is a necessity for the measurement of this motion. According to him, space is infinitely extending, and so is time in his view; infinitely everlasting in the past and future, and the universe is dynamically infinite. He also advocated other antiquity philosophers' vision in considering the eternity of the cosmos, as well as rejecting the creation of the world in time. This notion has been rebutted centuries after by Al-Ghazali, who also confuted Avicenna and Averroes' Aristotelian upholding views about denial of creation in time, when philosophy, mathematics and astronomy flourished in the Arab World during the golden era before the Renaissance. The idea of a universe existed in infinite time and will exist perpetually, has also been denied by the Catholic church and Christian philosophy. Aristotle's recipes of motion; space and time were later included in Newton's classical mechanics, within which they were considered absolute until the advent of Einstein's relativity. Contrary to the idealist's upholding view about the non-existence of space and time outside the mind, space and time are in reality there, and one performs spatial measurements to quantify how far apart objects are, and temporal measurements to quantitatively compare duration of events. Despite the abstract concept of time alone without measurement, we cannot deny ontologically its existence like numbers. Although mathematics in general and numbers in particular are discovered and developed by the human thinking, they surely existed independently of man as Plato asserted. Man explores and discover the objective reality about it, exactly like other laws of nature are discovered, as many of eminent mathematicians and physicists believe such as Gödel and Penrose[2-3]. On the other hand, time is a fundamental quantity that cannot be defined via other quantities, it is only the intervals of time that are defined physically via measurements. In addition time can be combined with other quantities like space and mass to produce new concepts like velocity, energy and fields.

As a general definition we can say that, time is the process of comparing a renascent with another renascent in order to measure the unknown with the known. The cosmological reference point to such comparison

measurement has to be taken intuitively as the moment of creation, at which time has already started up billion years ago. In this sense, we consider here the time related to the motion of heavenly orbits, and not the philosophical meaning of it, since the latter is quite an illusion and is merely a propounded scale to the motion of existing objects. Further, one has to broadly accept the fact that in essence, there is no privilege to one instance of time over another and that they are indiscernible as regards their priorities. Different days or nights in other words, have one unique value from the temporal self-quintessence, i.e., their temporal content is the same. What makes one time discernible from another is the type of event that is associated with it and what the Creator has attributed to it.

Let's examine, before proceeding and relying on science statements, what "science" means. In its broadest definition, science is the art of discovering and perceiving things as they are in reality. This perception entails gaining knowledge of objects and entities around us whether directly seen or unseen, using experiments, theories, constructing or analysing via inductive or deductive syllogistic methods. The latter process most importantly, ought to be carried out in the end with a proof or evident fact. Therefore, in this concise definition, the perceptions whether sensible or not, are the domain of science. Regrettably, modern science and namely physics is only practiced materially, and the above definition of science is not adhered to by materialists, who deal with reality as merely materialistic dropping the non-material aspect of some sides of the actual existence. In doing so, they turn their backs to the conspicuous fact that to not find an object here or there cannot promote as a proof to its non-existence. In saying that we do not mean to promote science to a religion, but only to generalise the conceptual content of it. Concurrently, science such as physics may go far beyond its actual domain of applicability, and indulge in metaphysical and lengthy explanations about the creation and cosmos without the faintest piece of a clue, which is needed according to the above definition. In other words, the natural science has limits and boundaries that cannot be overpassed, and one needs other sources of information in search for the ultimate like theology and revelations. In this regard, I share W. Babin's point of view that "philosophical statements about the universe are made unconsciously within the context of physics"[4]. Philosophical interpretations about natural phenomena laid ontologically by scientists, have to be thus scrutinised and not taken for granted.

This argument is advanced in order to demonstrate the extremes at which science works, and which led some physicists and cosmologists to ignore the creation of the universe at one particular instance of time, who also imagined that time ran before creation. The notion of eternal existence of the world has been strongly defended by the philosophy of materialism following ancient Greeks. Kant himself was an adamant proponent of materialism, and always asserted that the universe existed infinitely. His followers later established that the universe had no beginning, leading to philosophers and scientists accepting this idea in the 20th century up to now. Embracing the concept of infinite universe suits very well with dialectical materialism and atheism, since the start of the universe requires a Creator, an issue that can be overcome by positing the eternal existence instead. Eminent physicists also like Hawking adamantly argued against the start of the universe, despite the observational evidence the Big Bang theory provides in modern cosmology, although it fails in telling us in detail about the ultimate beginning of the universe.[5]. However, the theory says that the whole universe was created from something has zero volume tantamount to saying that it is "nothing", and it had a start[6]. Hawking's objection to the creation via the Big Bang runs as follows: if one schematically represents the stage of the evolution of the universe by a circle, then the expansion process means that the size of the circle increases and shrinks forwards and backwards in time respectively. The chronological order of expanding and contracting circles defines a cone, the bottom of which at the earliest instances of time is viewed as a very sharp corner. The single point represents the start of the universe for those who believe in the Divine Creation through the Big Bang. However, Hawking insists via his calculations that this point is not infinitely abrupt corner, so that it is smeared or rounded in an imaginary space-time. Therefore, a round and smooth corner is part of a circle and has no beginning, similarly to a circle which has no beginning either. B. Masud brilliantly invalidates Hawking's argument, demonstrating that despite the logic Hawking sets forth by repeating several times that the Big Bang theory imposes limits on the scientific knowledge of the start and creation of the universe, he points out that it would be wrong else to think that Hawking's objection has any serious implications for astrophysics and theology[7]. Accordingly replacing the commencement of the universe (sharp corner) with a rounded corner in imaginary time has no practical meaning in the first place. Secondly, the roundedness at the start of the universe is so much small that it does not do more than producing a quantum uncertainty of an order of $1/10^{36}$ part of a second in the scientific knowledge of the precise timing of the beginning of the universe. But Hawking prefers to argue that the universe did not have a start at the Big Bang moment, merely because the scientific knowledge of its timing has such a tiny uncertainty. Using geometrical terms, one can derive the argument against Hawking by showing that we cannot know the start of a circle, but we can know much more about it, like how big it is? Where its center is? Or is it real or imaginary?

Interestingly, before Hubble's discovery centuries ago and prior to establishing the Big Bang, a long debate between Ghazali and Averroes about the possibility of an expanding universe took place during the golden era of science and philosophy in the Arab World. Ghazali speculated that the universe could be larger or smaller than it is, whilst Averroes' stance was to deny such possibility, arguing that a statement as such would mean an infinitely inflating universe, and that could not be attainable.[8]. Ghazali was the first to propose such cosmological phenomenon using pure logic and reason, and was ahead of his contemporary counterparts. This occurred while objection to the Big Bang creation was taking place amongst the scientific community in the 20th century after the advent of the theory. To see the precedence of Ghazali's ideas we quote P. Coles and F. Lucchin in their book "Cosmology" [9] admitting how difficult it was to change the scientists' view about a steady-state universe, "The cosmological principle, according to which the universe is homogeneous and isotropic on large scale, is sufficient to ensure that a Newtonian universe cannot be static, but must be either expanding or contracting. A philosophical predisposition in western societies towards an unchanging, regular cosmos apparently prevented scientists from drawing this conclusion until it was faced upon them by 20th century observations".

Another issue of important implications demonstrated the brilliance of Ghazali, that was when he illustrated how age-old philosophers got astray when they thought of a period of time existing prior to creation. He pointed out neatly that to think of time passing before creation is a mere psychological illusion, resulting from the incompetence of man's intellect to figure out the void or emptiness with no space and time. His debate in retrospect, was founded on the Devine Will; an attribute of the Creator in which the reason logically necessitates. He directed the argument against the Devine philosophers, who believed in a Creator but considered an infinite eternal universe. Ghazali explained that creation from *ex nihilo* cannot be fulfilled solely with Might and Power, but needs also the Will, which substantiates creation over nihilism. He adds, "Why do you not accept that the universe originated via the "old" Will, that ordained its existence at the time it had been existed?" And "Why do you deny nothingness to last until the state it reached, before existence started, and that the creation prior to that stage was not willed, so did not take place?" [10]. In this context, Leibniz's intriguing question to Clarke, "Why did God not create the world sooner?" had been answered centuries ago by Ghazali using the attribute of Devine Will.

Newton's views held that prior to the start of the universe, there existed an infinite duration devoid of all physical events, a beginningless time in which at some point a finite time ago the world was created. However, Ghazali marvelously demonstrated that no duration whatever finite or infinite was there prior to the universe came to being. The reason is that if one states that the duration sans creation is finite, this would mean the finitude of the prime existence of the Creator in time. Also, if one proposes that it is infinite in time, then how did the creation of the universe ensue?. Thus there is no meaning to presume that the Creator's relation to the beginning of time is, that He is timeless sans the universe and temporal with the universe, but rather He is ever timeless and is the creator of time. Time had no existence before the world came to being, and the reality of its existence (time) cannot be imagined prior to creation. Time but is the idea we maintain in our minds, consisting of the succession of events in the physical world. How would we envision time without any existing world or events taking place within which?. Ghazali's response to those who were perplexed by his definition of the duration sans creation, and whether finite or infinite ran as follows:

Time is absolutely created and occurred once the universe incepted. There exists no time prior to this "time", it is the mere incapability of our illusion to imagine the existence of time before creation, since the illusion fails in apprehending the beginning without "before" associated with it. That "before", which the chimera persists to think that it is always existing and attainable, is time. Our illusion also mistakenly envisions that, beyond the world there is the void, since the emptiness is a dimension of no end. The void itself is not apprehensible, as the distance is a function of the object. If the object is finite, then its distance will be so, hence there is no emptiness nor filled space, and the chimera refrains from accepting this fact. As the illusion fails in perceiving the spatial dimension, it can also get astray in correctly recognising the temporal dimension, which is a function of the motion. Since time is a parameter of the motion, and as it is evident that the finitude of the dimension of an object rendered us accepting no existing dimension beyond it, the possibility of a finite movement cancels out any probability of figuring out any temporal dimension beyond it.

Time thus cannot be perceived without the alteration and movement of objects, and that the process of creation albeit eternal, it includes the Will, within which lies the determination of the instant of time the Creator wished to be the moment the world came to being.

- [1] *Leibniz-Clarke Correspondence*, edited with an Introduction and Notes by H.G. Alexander, Manchester University Press, 1956.
- [2] Bayram Yenikaya, *Mathematics is real: why and how?*, The Fountain July-Sep. 1997 No. 19.
- [3] Roger Penrose, *The Emperor's New Mind*, Oxford University Press, 1989.
- [4] Walter Babin, *Truth and Physics: A Critique*, The General Journal of Science.
- [5] Stephen Hawking, *A Brief History of Time*, New York: Bantam Books, 1988.
- [6] W.B. Drees, *Beyond the Big Bang: Quantum Cosmologies and God*, La Salle, IL: Open Court 1990.
- [7] Bilal Masud, *The Big Bang and Creation of the Universe in Religious Perspective*, Science-Religion Dialogue, Spring 2003.
- [8] M.B. Altaie, *The Expansion of the Universe between Ghazali and Averroes*, The Horizons of Culture and Heritage Journal, U.A.E., Arabic Translation.
- [9] P. Coles and F. Lucchin, *Cosmology*, John Wiley & Sons, Ltd. 2002.
- [10] Ghazali, in *Tahafut*; N. Al Jisr in *The Story of Faith*, Arabic Translation.