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Jocaxian's time definition

Abstract

Time has always been a mystery of philosophy and physics since its beginnings. We propose a new definition of time that, in addition to being objective, promotes a better understanding of this very important concept.

Keywords: time, universe, events, clock, observer

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Introduction

There is nothing so misunderstood in physics and philosophy as the concept of time. Time is a widely used concept, not only in Physics, but practically in all areas of science and philosophy, and even so, it is very poorly defined and understood. Several authors disagree about the existence or not of time and countless philosophers and scientists have already discussed the subject.[1,2]

We will show that time can be defined in a simple and objective way and, from this definition, all the mysteries of this concept can be solved. Before proceeding, it is useful to note some definitions. From the Dictionary[3] we have about "Time":

sm (lat tempu)

1. Measure of duration of beings subject to changes in their substance or to accidental and successive changes in their nature, appreciable by the organic senses.
2. An epoch, a future or past period of time.
3. The current era.
4. Age, seniority, a long span of years.
5. Human existences considered over the years.
6. Determined time when an event occurred or a character existed (with reference to an hour, a day, a month or any other period).
7. Proper occasion for a certain act; occasion, circumstance, opportunity.
8. Mec Quantity of movement of a body or system of bodies, measured by the movement of another body, assuming that the two movements are proportional.

These definitions are not good at all, mainly because many of them are circular, i.e., time referencing time itself in its definition. Others fail to tie time too much to human beings and their cultural particularities.

Wikipedia has better definitions, from which we copied:[4]

"The common sense notion of time is inherent to human beings, since we are all, in principle, capable of recognizing and ordering the occurrence of events perceived by our senses. However, science has shown several times that our senses and perceptions are masters in deceiving us.....

Literature review

Time in the broad sense

What is time?

This question has intrigued scholars, mathematicians, physicists, philosophers and curious people throughout human history. However, it will be difficult to reach a consensus on the absolute and definitive definition of time because it is, for human beings, in common sense, just a psychological event, just a sensation derived from the transition of a movement. Time, despite being linked to events external to the individual, will always be defined in an idiosyncratic way, so much so that renowned scholars have dared to sentence:

"It's nature's way of not letting everything happen at once." (John Wheeler)

"An illusion. The distinction between past, present and future is nothing more than a firm and persistent illusion." (Albert Einstein)

"Based on human perception, the common conception of time is indicated by intervals or periods of duration. It can be said that an event occurs after another event. Furthermore, one can measure how much one event occurs after another. .. The work carried out by humanity to increase knowledge of nature and the measurements of time, through work aimed at perfecting calendars and clocks, was an important engine of scientific discoveries.

In other words, time is a component of the measurement system used to sequence events, to compare the durations of events, their intervals, and to quantify the motion of objects. Time has been one of the biggest topics in religion, philosophy and science, but defining it in a non-controversial way for all - in a way that can be applied to all fields simultaneously has eluded the greatest connoisseurs Ref. 3...

In physics and other sciences, time is considered one of the few essential quantities Ref. 4 . Time is used to define other quantities - such as speed - and defining time in terms of those quantities would result in a redundant definition Ref. 5. Influenced by the theory of relativity devised by the physicist Albert Einstein, time has been considered as a fourth dimension of the space-time continuum of the Universe, which has three spatial dimensions and one temporal.

Time is a physical quantity present not only in everyday life but also in all areas and scientific disciplines.

A definition of it in a scientific context is therefore not only essential but also, in fact, a fundamental requirement. However, this

does not mean that science holds the absolute definition of time: it will be seen that time, in science, is something very relative, not only in a chronological context - after all, scientific theories evolve - but also in an internal context to the own currently valid scientific paradigm Note 2 ...

In Physics, time is the physical quantity directly associated with the correct sequencing, according to the order of occurrence, of natural events; established according to simultaneous spatial and temporal coincidences between such events and the indications of one or more clocks properly positioned, synchronized and properly linked to the origin and coordinate axes of the referential for which time is defined Note 3 Ref. 7

Defined in this way, time seems simple, but several certainly non-trivial considerations and implications derive from it, showing once again that this inseparable companion of our day-to-day is more mysterious and subtle than one can imagine.... "

We see that the physical definitions of time, such as those copied here, from Wikipedia, linked to clocks leave much to be desired, we cannot say that time would not exist if it did not exist, because clocks are constructs.

Newton's time

Many, like Isaac Newton, understood and understand time as something absolute, which never stops or stopped, perhaps because they imagine a kind of absolute uninterrupted clock (like a God) so that time would not stop either. In the words of Isaac Newton:

"Absolute, true and mathematical time, by itself and by its very nature, flows uniformly, without relation to anything external, and is also called duration"[1]

In addition to being independent of external things, according to Newton, time would also be infinite in the past and future:

"Isaac Newton, in 1687, affirmed that time and space constituted a background in which events took place, but which were not affected by them. Time and space were different for him. Time was like a straight line, infinite in both directions, i.e. eternal, without a beginning or end."[5]

This ancient Newtonian concept of time, in addition to having been superseded by the theory of relativity,[2] also violates 'Kalam's theorem'.[6] So that, even in current physics, this concept of absolute time is no longer used, and is restricted to the most nostalgic philosophers and thinkers.

It is interesting to observe that even before the theory of relativity, the concept of time was thought and discussed a lot.[7] McTaggart even claimed that time was unreal.[8]

Jocaxian's time

The first thing we should notice is that time is a relation between changes of state:

a) If there is no change of state then there is no time either and vice versa.

b) There is time only if something changes. That is, if an event occurs.

c) If nothing changes in the universe, time does not exist.

We can define Time as: "Time is the amount of events that have occurred in the Universe."

With this definition we can conclude that:

Without events, time does not flow. If a zillion events have occurred so far and no more events have occurred since then, then time has stopped at the one zillion marks. If nothing else happened in the universe, time would stand still, without flowing.

Time will be the sum of the number of discrete and continuous events.

Methods

Discreet events

a) A discrete event is a change of state of some point in the Universe and is counted in time as a unit.

b) Each event receive a number, i.e. the amount of event happened before plus one. This is the definition of the time of that event.

c) As each event receive a different number, in a strict way, there is no concept of real simultaneity, and yes, the concept of "near simultaneous" events.

d) Two events are "nearly simultaneous" when there is no other event in the Universe that has occurred between their occurrences (the time of one is the other plus one). In the practice we can say they are "simultaneous".

e) The more events that can be counted, the more accurate the time measurement will be.

Continuous events

a) The count for continuous events is the measure of its variation, of its change in continuity (distance, angle, etc.)

b) For example, If a particle moves in space, its contribution to the total time will be the measurement number of the space traveled to that position.

c) The more precise the measurement, the more accurate the time measurement will be.

The time in practice

a) In practice, we cannot count all events in the whole universe, not even those that occur close to us. However, we can replace this time by measuring the event count of a given little sub-space that we named "Clock". Thus, for practical purposes, the tick-tock of the clock can be used as a measure of time.

The time and the observer

We must realize that the amount of events that occur in the universe, in practice, is a concept that depends on how the Universe is observed. Therefore it depends on the observer's point of view. That is, we do not enter into the merits of *how* the events that occur in the Universe would be computed and how this would depend on the observer or be influenced by its movement or not. If the computation of the count of events, for example, depends on the velocity of the gravitational field or another physical aspect of the observer, then the time, for that observer, would also be relative to these causes. Otherwise, No. For example, if the number of events that occurred in the universe until any given event did not depend on the observer, then time would be absolute.

Function of time

The main function of time is to relate the order of precedence of

events [relative to an observer]. So we say that: An event 'A' precedes an event 'B', with respect to an observer, if there are more occurrences of changes of state (events) in the UNIVERSE until the appearance of event 'B' than occurrences in the appearance of the event 'A'. That is, if there are a greater number of state changes (of events in the universe) up to the moment of observation of event 'B' than the number of occurrences of events up to the observation of event 'A', we say that event 'A' preceded event 'B'. For example, in the very particular case of only two events in the universe.

Time in practice: the clock

As it is practically *impossible* to count all the events in the universe, a watch is usually used. The clock is a system (a kind of 'micro universe') that is always changing its state. Each change of state in the clock is called a 'tic-tac'. Thus, the number of 'tic-tacs' on the clock could, in practice, in some cases, play the role of counting events in the universe.

Perhaps it is possible to prove that, using a clock, and if it marks a greater count of 'tic-tacs' until the moment of an observation 'B' than of 'tic-tacs' in relation to the other observation 'A ', If this implies that there will necessarily also be more events in the universe that have occurred up to the time of observation of 'B' than have occurred up to the time of observation of 'A', then the clock can perfectly be used to make precedence relations between events according to the observer using this watch.

Simultaneity in the practice

Consider two events 'A' and 'B'. When we use a clock to measure them, we say that they are simultaneous if both happen at the 'same moment'. But how can we know whether or not they happen at the same time?

The only way, in practice, to determine the time of each event is to mark that time through a clock and check whether or not they are simultaneous. But what does it mean to have the same time on the clock?

It means that the events were marked to occur in the same minimum interval as the accuracy of the clock. For example, if a clock has an accuracy of one second (1s) and if both events occurred after 12:00:01 but before 12:00:02, that is, in the same time interval of 1s, we can say that are simultaneous. But are they?

Impossible to say, in the practice, whether or not they are simultaneous. Even on the most accurate clock ever built, as per the article: "Physicists at the National Institute of Standards and Technology have developed two atomic clocks, based on ytterbium atoms that have proven to be the most stable clocks on the planet. This measurement is based on how precisely the duration of each tick matches that of any other clock, in this case the ticks of the clock are stable within a two-part scaling of a quintillion that is a 1 followed by 18 zeros."[9] No matter how accurate the clock is, there will always be a time interval between two 'tic-tacs' of the clock in which, any two or more events within this interval, it will not be possible to know which one occurred first or if they are really simultaneous. This means that if two or more winds occur within this time interval they can be considered, in practice, as being simultaneous, since it is not even possible to determine the *exact* time of their manifestations. And this result is theoretical, it does not depend on the clock because, however much we increase the precision of the clock, it could not be infinite since that would violate the Heisenberg uncertainty principle.[10] Therefore exact simultaneity is impossible to verify.

Transitivity

An unusual corollary of this impossibility of measuring perfect simultaneity is that simultaneity is not necessarily transitive! This means that if an event 'A' is 'simultaneous' with another event 'B' and event 'B' is 'simultaneous' with event 'C' then, *not* necessarily events 'A' and 'C' are simultaneous![11]

For example, suppose that three consecutive events 'A', 'B' and 'C' occur in a period longer than one 'tic-tac' and less than two 'tic-tacs'. Some observers with clocks of the same accuracy would measure 'A' and 'B' occurring at the same 'tic-tac', i.e., simultaneously, and the event 'C' at the next 'tic-tac'. Other observers might observe 'A' occurring on the first 'tic-tac' and 'B' and 'C' as simultaneous events, occurring on the second 'tic-tac'. And no one could claim that his measurement was better than anyone else's, as all watches would have the exact same accuracy.[12] A similar effect occurs in 'Jocaxian-time': If three events 'A', 'B', and 'C' occur in sequence, and no other events in the universe occur during these three events, then event 'A' is, by definition 'simultaneous' to 'B' and event 'B' is by definition 'simultaneous' to 'C'. However 'A' and 'C' could never be simultaneous, as there is event 'B' between them. It is important to note that in our current Universe it is practically impossible for two events to be 'simultaneous', as there are countless events happening between any two events in nature, such as, for example, the creation and annihilation of virtual particles in a vacuum.[13]

Time travel

We can also conclude that travel to the past is impossible since the amount of past events never decreases.[14]

Results

If the number of events in a clock ('tic-tacs') is an increasing function of the number of events in the universe, it can be used, in the practice, as proportional a counter of events of universe, that is, the clock can serve to order events in this universe.

Conclusion

We can conclude that the 'relationship' of events (changes of state) that defines time is nothing more than the amount of events that existed in the universe between the occurrences of these events.

The time between two moments, event 'A' and event 'B', is the number of universe events that occurred between events 'A' and 'B'.

The most important: The mysteries of time vanish.

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Conflicts of interest

The authors declare that there is no conflict of interest.

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