Time Travel

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Time travel

Time travel involves traveling in a time different from the present, in the past or in the future, basically without a space move with reference to a local coordinate system. Time travel can be made by a material body that may or may not be a living being, and for which a special device called the time machine is usually used.

Time travel is a recognized concept in philosophy and science, but whose scope is highly disputed, giving rise to numerous paradoxes in both philosophy and science. Time travel is considered by some accepted both in general relativity and quantum mechanics, but there is a

unanimous consensus that it is not feasible with current technology. (Hawkins 2010) The raised issues are different for the time travel in the past compared to the time travel in the future.

Note that the following aspects are not considered to be time travel: sleep, cryogenic freezing, virtual reality simulator, crystal ball predictions, isolation, time zone change, etc.

The most well-known definition of time travel is given by Lewis: (Lewis 1976, 145–46)

> "What is time travel? Inevitably, it involves a discrepancy between time and time. Any traveller departs and then arrives at his destination; the time elapsed from departure to arrival…is the duration of the journey. But if he is a time traveller, the separation in time between departure and arrival does not equal the duration of his journey.…How can it be that the same two events, his departure and his arrival, are separated by two unequal amounts of time?…I reply by distinguishing time itself, external time as I shall also call it, from the personal time of a particular time traveller: roughly, that which is measured by his wristwatch. His journey takes an hour of his personal time, let us say…But the arrival is more than an hour after the departure in external time, if he travels toward the future; or the arrival is before the departure in external time…if he travels toward the past."

Another definition of time travel (Arntzenius 2006) (Smeenk and Wüthrich 2011) equates it with the existence of the closed timelike curves (CTC), a Lorentzian manifold of a material particle in spacetime returning to its starting point.

Some authors accept the existence of two temporal dimensions, (Meiland 1974) and others consider scenarios with multiple "parallel" universes, each with its own four-dimensional spacetime. (Deutsch and Lockwood 1994) But the question is whether a travel in another temporal dimension or into another parallel universe is indeed a travel in time or a virtual one.

Examining the possibility of returning back in time in a hypothetical universe described by a Gödel metric, led Kurt Gödel to assert that time could be a kind of illusion, (Yourgrau 2005) just another dimension as space, resulting in a 4-dimensional "block".

History

Egyptian thinker Ptahhotep (2650-2600 BC) said: " Follow your desire as long as you live, and do not perform more than is ordered, do not lessen the time of following desire, for the wasting of time is an abomination to the spirit... " (Bartlett 2014)

The Incas regarded space and time as one concept called *pacha*. (Atuq Eusebio Manga Qespi 1994)

Ancient philosophy has had two different time-related concepts: the followers of the Greek philosopher Heraclit think that the world is a continuous stream, whereas those of the Parmenid's metaphysics claim that truth and reality are stable and eternal. Based on these metaphysical concepts, McTaggart developed an argument for the non-reality of time that has become a common starting point for discussion of his nature. (Lewis 1976) Only the Parmenian philosophy, according to which the past, present and future are as real as the present, can accept journeys in time. (Grey 1999)

Aristotle argued that changing the past surpasses even the power of God. For this reason, "no one thinks of the past, but of what is future and can be different." (Aristotle 1941)

In Hindu mythology, *Mahabharata*, there is the story of King Raivata Kakudmi, who travels to heaven to meet the creator of Brahma, and is surprised to find out when he returns to Earth for many centuries.

The Buddhist Pāli Canon states that Payasi Sutta says of one of Buddha's disciples, Kumara Kassapa, that he told him that "in the Heaven of Thirty-Three Devas, time passes at a different pace, and people live much longer. 'In our century; one hundred years, only one day, twenty-four hours would have passed for them.'" (Chattopadhyaya 1964)

Medieval philosophers and theologians have developed the concept of a universe with a finite past with a beginning, now known as temporal finiteism. (Craig 1979)

General relativity suggests that a proper space-time geometry or certain types of movement in space can allow time travel if these geometries or movements are possible. (Thorne, Braginsky, and Ginzburg 1994) The possibility of time-closed curves (worldines that form loops enclosed in space), such as Gödel space-time, for which there are solutions to general relativity equations, would allow the travel in the past, but the plausibility of solutions is uncertain.

For time travel, it is necessary to travel faster than the speed of light, as in the case of cosmic strings, wormholes, and Alcubier metrics. (Gott 2002) Hawking formulated the chronological protection conjecture, suggesting that the fundamental laws of nature do not allow the time travel, (S. W. Hawking 1992) but a clear decision can only be taken in a completely unified theory of quantum gravity. (Stephen W. Hawking et al. 2003)

Wormholes are a hypothetically curved space-time, allowed by Einstein's field relativity equations. (Visser 1996) Time travel is possible in this case if one end of the wormhole is accelerated to a significant fraction of the speed of light and then brought back to the point of origin. Alternatively, a single wormhole entry can be used to move it in the gravitational field of an object that has a higher gravity than the other input and then returns to a position near the other input. In both cases, the dilation of the time determines that the end of the wormhole that has been moved is less than the stationary end.

The construction of a traversable wormhole would require the existence of a negative energy substance, and a distribution of energy that violates different energy conditions, but time travel would still be possible due to the Casimir effect in quantum physics. (Visser, Kar, and Dadhich 2003)

In the case of a signal with a speed less than or equal to the speed of light, the transmission occurred prior to reception. If the speed is higher than the speed of the light, the signal is received

before it is sent. (Jarrell 2006) It can be said that the signal has shifted back in time (tachyon anti-phone). (Kowalczyński 1984)

In quantum mechanics there are phenomena such as quantum teleportation, the Einstein-Podolsky-Rosen paradox, or quantum inseparability that could allow time travel. Bohm's interpretation assumes that some information is instantly exchanged between the particles to keep the correlations between them, (Goldstein 2017) effect called Einstein's "spooky action at a distance." But modern theories do not allow time travel due to the conservation of causality.

Everett's multiple worlds in quantum mechanics provide a solution to the paradox of the grandfather, involving the traveler's idea of time arriving in a universe different from the one he comes from; but in such a case, this is not a "real-time" journey. (Arntzenius and Maudlin 2013)The accepted interpretation of multiple worlds suggests that all possible quantum events can appear in mutually exclusive histories. (Arntzenius and Maudlin 2013) Stephen Hawking argues that every traveler should experience only one self-consistent history, so that time travelers stay in their own world rather than travel to another. (S. Hawking 1999)

Daniel Greenberger and Karl Svozil proposed a quantum model for the timeless paradox: (Greenberger and Svozil 2005) the past observed today is deterministic (only one possible state), but the present observed in the past has many possible states until the actions (inevitable) cause them to collapse into one state.

The travel in the future presupposes the expansion of time, a direct consequence of the inversion of the speed of light, (Ferraro 2007) by moving at relativistic speeds or by the effects of gravity. (Serway, Beichner, and Jewett 2000)

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