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Timemachine: An Illusion or A Gift?

Wu Xinzhong
Associate Professor, School of History and Culture of Science
Shanghai Jiao Tong University, Shanghai, China

Abstract: *The time machine was originally a science fiction, but in general relativity and quantum field theory, wormholes and closed time-like lines appear, suggesting that a future civilization world can give us a time machine as gift. However, discussions about closed time-like lines and negative energy matter happen to take place within different theoretical frameworks. Prior to the emergence of unified quantum gravity theory, the possibility of a time machine predicted from one physical theory would become meaningless or lead to contradictory conclusions when it comes to another physical theory that is incompatible with it. The inherent causal anomaly in the time machine is a theoretical proof of the inconsistency between the conventional understanding of closed time-like lines in general relativity and the thermodynamics that embodies common sense. Through the analysis of thermal and quantum phenomena in gravitational fields, it can be found that in general relativity, closed time-like lines originate from mirror effects of various event horizons. In quantum theory or quantum field theory, closed time-like lines originate from a self-organizing mechanism similar to negative feedback, where the confusion between the intrinsic clock variables of quantum fluctuations and the external time as coordinates, as pointed out by de Broglie, leads to the seemingly existence of closed time-like lines that conform to the principle of self consistency. Only by re-understanding the anomalous features of relativity or quantum theory from the perspective of thermodynamic constraints, and discussing the causal anomalies of time machines, they can be excluded from physics research as interesting science fiction or self contradictory nonsense.*

Keywords: *time machine, closed time-like lines, causal anomaly*

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I. Introduction

The time machine was originally a science fiction, but in general relativity and quantum field theory, wormholes and closed time-like lines appear, suggesting that a future civilization world can give us a time machine as gift. However, discussions about closed time-like lines and negative energy matter happen to take place within different theoretical frameworks. Prior to the emergence of unified quantum gravity theory, the possibility of a time machine predicted from one physical theory would become meaningless or lead to contradictory conclusions when it comes to another physical theory that is incompatible with it. The inherent causal anomaly in the time machine is a theoretical proof of the inconsistency between the conventional understanding of closed time-like lines in general relativity and the thermodynamics that embodies common sense.

1.Time Machine: From Fantasy Novels to Scientific Discussions

The time machine that can freely travel to the past and the future first appeared in the novel ‘The Time Machine’ by British author H.G.Wells. The virtual time travel between the future and the past in fantasy novels can temporarily ignore the issue of causal anomalies, but in reality, the causal anomalies of time travel were conceived in the later fantasy movie ‘Back to the Future’, such as how to avoid the contradictory situation of parents being unable to get married and yourself being unable to be born due to time travel back to the past. Another paradox caused by time machines is that the events they contain have no beginning. For example, let's imagine a poor but hardworking inventor who is trying to create the world's first time machine in his messy basement. At this moment, a wealthy elderly gentleman suddenly appeared, who provided the inventor with a large sum of money and some complex equation systems, indirectly helping the inventor create a time machine.

Subsequently, inventors became wealthy through the knowledge of time travel. Decades later, he returned to the past in time to fulfill his mission as he grew increasingly wealthy and elderly. He met himself ----- a young man working in his basement who told him the secrets of time travel and gave him money to use. The question is, where did the idea of time travel come from?[1]

Introducing virtual history or virtual future in the interpretation of multiple worlds seems to avoid the paradox of causal anomalies, but in this way, an objective real world that we can communicate together inevitably becomes a product of the evolution of virtual history, and our reliable memories will be forced to constantly distort and differentiate into conflicting virtual historical experiences. Although the dilemma of time travel has been exposed at the level of fantasy novels, the cutting-edge scientific discussions of general relativity and quantum theory continue to suggest the possibility of time machines.

Firstly, general relativity predicted the existence of spacetime singularities during the Big Bang and black hole processes. The existence of spacetime singularities makes it possible for four-dimensional spacetime to have non trivial topological structures. An infinite plane and an infinite torus are both unbounded and have zero curvature everywhere. Any circle on the plane can always contract to a point, while a torus is multi connected, and circles around it cannot contract to a point. The real three-dimensional space may be multi-connected, and the metric of some black holes indicates the existence of wormhole objects in spacetime; In a two-dimensional model, a wormhole is equivalent to a thin tube connecting two large surfaces. However, the event horizon of the Schwarzschild black hole hinders two-ways travel through a wormhole (known as the Einstein-Rosen Bridge), and due to its rapidly contracting throat, even one-way travel is impossible. Even if it is possible to pass through this wormhole, it must be an object moving at superluminal speeds. The geometric metric of charged or rotating black holes connect countless past and future universes, making spacetime interconnected and even providing the possibility of a time machine that can enter the past or the future at will.

However, there are some physical reasons to deny this type of time machine. Firstly, in the vicinity of such wormholes, the gravitational field is extremely strong and may damage spacecraft. Moreover, time slows down in the wormhole and tends to completely stop in the central area, requiring space travelers to spend an infinite amount of time traversing the wormhole. Secondly, the Penrose diagram describing the black hole metric is too idealized, and stellar matter, black hole Hawking radiation, and the instability effects of white holes will block the vast majority of the Penrose diagram, thereby eliminating any possibility of time machines or space travel to other universes.

Other scholars believe that if a certain energy condition is attached to the throat of a wormhole, and matter follows the principle of self consistency when it passing through a time machine and prohibiting to changes the past explicitly, then the wormhole and time machine may still exist. For example, in 1985, Kip S.Thorne proposed the idea of using negative energy materials to disrupt the average weak energy condition and creating short distance, passable wormholes with low gravitational field strength and considerable stability that would not block the space-time through strong electric fields. This type of wormhole conforms to Einstein's equations and enables us to generate an extraordinary spacetime configuration, in which time is bent into a loop, forming a closed time-like curve. This closed time-like timeline appears to be able to fill the past, rather than altering the past and causing a temporal paradox of causal confusion. In fact, the closed time-like lines inside rotating or charged black holes are also related to the presence of negative energy regions. In order for time travel to succeed, energy must temporarily become negative . However, negative energy has always been opposed by relativity experts in the past. They believe that negative energy will make anti gravity and many other phenomena possible that have never been observed in experiments. In fact, the positive energy theorem proved by Shing-Tung Yau and others is the theoretical basis for denying negative energy matter.

However, Thorne quickly pointed out that there is a way to obtain negative energy, which is through the Casimir effect in quantum theory. One method of creating the Casimir effect is to place two large conductive parallel plates at the entrance of each wormhole, thereby generating negative energy at each end of the wormhole. The entrance to the wormhole will be closed by the gravitational force of material aggregation and the gravitational force formed by singularities. The quantum effects related to the Casimir effect may be able to generate quantum anti-gravity, which can counteract the gravitational force of mass. Anti-gravity counteracts the effect of gravity inside the wormhole, thus keeping it open. However, as summarized by Thorne and his colleagues, the results may indicate that ‘the average weak energy condition can never be violated. In this case, there can be no such thing as a traversable wormhole, time travel, or causal failure. It is too early to pass through a bridge before you reach it’.

In 1985, under the influence of Sagan, Thorne attempted to find a wormhole that (1) satisfies Einstein's equations and has no strong gravitational field; (2) itis stable; (3) the travel time of the wormhole is short enough. Based on these conditions, Thorne sought the help of negative energy materials generated by the Casimir effect to construct time machines in weak fieldsthat can be traversed.

At present, there is no consensus on the evaluation of Thorne's time machine. Everyone acknowledges that the determining factor is the need for a fully quantized theory of gravity to solve problems thoroughly at all times. Hawking held a reserved view on Thorne's wormhole. Hawking believed that nature abhors time machines; He expressed this disgust as a well ordered conjecture that can maintain the order of time, which points out that physical laws do not allow time machines. If nature allowed the existence of time machines, extraterrestrial beings who are more advanced than us may have already given us time machines as gifts from the future.

One reason why Hawking opposed the Thorne's time machine is that the radiation emitted from the entrance of the wormhole is quite large, and it will be fed back into the mass-energy content contained in Einstein's equations. This kind of feedback according to Einstein's equations will cause distortion at the entrance of the wormhole, and may even permanently close it. However, Thorne disagreed with the idea that the radiation will be strong enough to close the entrance to the wormhole.

Another reason why Hawking opposed the time machine is based on speculation that nature strengthens the maintenance of time order through the growth of vacuum fluctuation beams: when we want to make a time machine, no matter what kind of thing we use (such as wormholes, rotating columns, 'cosmic strings' or anything else), before it becomes a time machine, there will always be a beam of vacuum fluctuations passing through it and destroying it. Thorne believes that even if Hawking is right, it is still far from clear whether the vacuum fluctuation beam will destroy the wormhole - to find a definite result, we need to understand what quantum gravity will do in the 10^{-95} second interval near the time machine was formed. Simply put, quantum gravity hides the answer to whether wormholes can become time machines. Thorne believes that until physicists have a profound understanding of the law of quantum gravity, no one can be certain.[2]

2. Closed time-like curves in different contexts

The scientific discussion of time machines actually involves the question of whether closed time-like curves exist in different physical theories, and if they exist, what are their significance.The discussion between Hawking and Thorne on time machines involves the question of whether the concept of closed time-like curves is the same in the incompatible theoretical frameworks of general relativity and quantum mechanics. This is similar to discussing the geodesic in general relativity and quantum mechanics on the same level: a particle that moves freely in a gravitational field, moves along the geodesic in general relativity, has a unique trajectory, and time is unidirectional. In quantum mechanics, it becomes a quantum wave packet propagating under the action of gravitational potential, and its world line is a probability amplitude linearly superimposed along different paths. If the quantum wave packet of a particle is described in the curved spacetime of general relativity, time will become Multi-directional. Obviously, it is difficult to maintain the same meaning and referent of the same physical concept in different theoretical texts.

Closed time-like curves appear in both general relativity and quantum theory, but when the possibility of allowing the existence of closed time-like lines in one theory is extended to another incompatible theory for discussion: the paradoxical possibility of time travel is seriously discussed, completely ignoring the fact that closed time-like lines and negative energy matter have changed their meaning and reference in different texts. The possibility of negative energy matter in quantum theory appears in the hypothesis of Dirac electron vacuum ocean. Dirac regarded vacuum as an ocean completely filled with negative energy electrons, and when holes in negative energy electrons appear, they appear as antiparticles of electrons - positrons. In the context of quantum theory, negative energy matter is assumed to have a Minkowski inertial spacetime that conforms to the Lorentz transformation. Positive energy matter and negative energy matter are mirror symmetric with respect to the flat spacetime of vacuum, just like the mirror image of an object in a flat mirror is highly symmetric with respect to the object. In general relativity, the negative energy matter is assumed to have a Riemann curved spacetime with general covariance. In the new transformation of positive and negative energy matter in the curved spacetime, whether mirror symmetry is established is an unresolved problem, just like how the mirror image of an object in a distorting mirror is difficult to establish mirror symmetry with the object. When negative energy matter in flat spacetime is directly transformed into the stage of curved spacetime to play a physical role, the false possibility of time travel is staged as an absurd play of theoretical physics.

The existence of closed time-likecurves in general relativity was first proposed in Gödel's rotating universe model in 1949. The starting point of Gödel's theory is that its universe is rotating, and its matter is also rotating. According to this conjecture, a light cone with a limited time curve range is tilted in the direction of rotation by the rotating universe, resulting in a deformation where the future light cone of a certain region overlaps with the past light cone of an adjacent region. If the distance between the rotation axes is large enough, then when the light cones are tilted, the future parts and past parts of every two adjacent light cones will interact with each other. In the Gödel universe, time travelers can depart from a certain point in spacetime, surround the entire universe in a closed time orbit, and finally return to their starting place and startingmoment..

In 1963, Newman, Unti, and Tamburino discovered an Einstein field equation solution similar to a black hole. Like the Gödel universe solution, the NUT universe also allows for the emergence of closed timelines and time travel. The NUT universe is like a spiral staircase. After walking around a black hole for 360^0, you do not return to your original starting moment, but instead turn to another part of this universe.

In 1974, physicist Tipler published a paper titled ‘The possibility of a rotating cylinder and a complete violation of causality’, where 'complete violation of causality' refers to time travel. He envisioned a rotating, exposed singularity, together with its closed time-like orbit , forming a natural time machine. With the help of Tipler's time machine, people can not only travel to the future, but also go back to the past, but they cannot go back beyond the point where the time machine was made and return to the world before this[3].Tipler actually had shown that if one had an *infinitely long, very dense* cylinder rotating with a surface speed of at least half the speed of light, then this would allow a closed time-like path to connect many otherwise unconnectable event in space-time [4]. The closed time-likecurves in general relativity seem to bring hope for creating time machines. But in reality, closed time-like curves are often surrounded by some kinds of horizons. Rotation is a type of variable acceleration motion, and the gravitational field of black holes or naked singularities can also be simulated using variable acceleration motion based on the equivalence principle. A mirror with variable acceleration can send reflected light back to the vicinity of the light source within a certain range of motion. However, as the acceleration of the mirror increases and the distance from the light source increases, the mirror itself will disappear at a certain distance and leave a residual radiation image. This is equivalent to the Hawking radiation or Unrul effect of the event horizon generated by a strong gravitational field or a rotating inertial force field. Once we realize that the horizon has the property of a moving mirror, we can speculate that the closed time-likecurves in general relativity are likely multiple mirror images of the moving object's worldlines near the horizon mirror. In a Kerr black hole, closed time-like lines appear in the negative energy region between the inner and outer event horizons; Since an object can produce an infinite number of mirror images between two parallel mirrors, it is also imaginable for a particle's chaotic motion between its inner and outer horizons to produce an infinite number of mirror images. It is precisely because the worldlines of the particle's mirror images are interwoven with the worldlines of the particle itself that closed time-like curves and various time series chaos will occur. If we use psychological process analogy, we find that in chaotic thoughts or dreams, events in memory can also exhibit sequential chaos, which is similar to the multiple image effects caused by too many information reflection links. In order to understand the closed time-like lines of Gödel's rotating universe, we also need to consider whether non-inertial movements such as rotation would produce event horizon effects similar to black holes or the universe. Once this explanation holds, the time machine in general relativity will become a mirror illusion related to the Unrul-Hawking effect of various horizons. In addition, due to the failure of the weak equivalence principle in quantum theory, as long as we consider that any motion orbit in the Gödel universe will differentiate into different trajectories due to the different masses of the particles it represents, the closed time-likecurves will naturally be undid due to the failure of the weak equivalence principle.

The closed time-like curves in quantum theory are related to the selfconsistency principle proposed by Novikov. The principle of self consistency states that events on a closed time-like curve must be self consistent, and each event on the curve must be self-adjusting, in a cyclic self-consistent form, influencing each other around the closed time-like curve. The requirement of self consistency imposes certain constraints on the possible forms of future events compared to past events. The law of causality is not simply about the past determining the future, it also includes the future's reactions to the present and the past, but these reactions occur in a self consistent manner. A simple method to introduce the principle of self consistency in quantum mechanics may be Feynman's path integration, also known as the historical summation scheme. In these sums, we include all of those, and only those self consistent histories [5]. As Hawking pointed out, Feynman's sum of histories not only includes the history of particles traveling faster than light, but even the history of particles traveling back in time, as well as closed loops in space-time, automatically including closed time-like curves. However, people cannot use particle detectors to directly observe particles that are in a closed loop history. Hawking pointed out that particles moving along a closed loop in a given spacetime background, or particles remaining stationary, result in local bending spacetime due to quantum fluctuations in space and time at the microscopic level. Due to Hawking's adherence to the positivist stance, he regarded the Feynman diagram as a fictional and convenient tool introduced for computation, and therefore did not care about how to explain closed time-likecurves [6].

However, as early as 1959, Canadian physicist and philosopher of science Mario Bunge believed that we need to seek a real self-organizing interaction mechanism to replace the teleological mechanism, in which the closed spacetime loop that breaks causality may be naturally eliminated. Bunge pointed out that the interaction mechanism between Feynman's ‘future’and ‘past’ may be as follows. In a series of similar events, such as continuous scattering of particles of the same class in a given scatterer, the result is a reaction to the cause; The result is not caused by the same reason (unless instantaneous action at a distance effects are allowed) - for example, the effect caused by a particle reaching the scattering region. Therefore, if a beam of electrons hits the target, the field generated in the scattering region will in turn correct the field of the electron gun. So, after the initial transition phase is completed, the entire process will manifest as a feedback system, in which the result (scattered electrons) corrects the initial conditions, forming a stationary system in this way. In this case, the variable t cannot be simply seen as a definition of anything closely connected to the individual event process: just as in quantum theory, time t is a c number, as a coordinate, and does not belong to the quantum system involved, unlike spatial coordinates corresponding to a Hermitian operator in Hilbert space [7].

We find that it is the unclear energy-time uncertainty relationship in quantum theory and the issue of whether there is an operator for time t that triggers the teleological interaction between the ‘past’ and ‘future’ in the Feynman diagrams of quantum field theory. In Feynman's words, it replaces obtaining a static picture of ‘the entire history of space-time lying still in it’. What we can infer from our understanding of this lattice is that microscopic spacetime loops are individual particle parameters that cannot be confused with macroscopic spacetime coordinates. They correspond to the internal motion state variables of particles, which are likely hidden variables introduced by de Broglie - the internal periodic clock of quantum fluctuations. According to R. M. Wald's ‘No Perfect Clock Theorem’proved in 1989, this internal quantum clock may even reverse with a certain probability [8]. The background time coordinates in the Feynman diagram are established with reference to clock variables outside the quantum system, of course, different from the bending time related to quantum fluctuations of microscopic particles.Dirac introduced multiple levels of time concepts in quantum electrodynamics in order to adhere to the covariance of relativity. In 1946, Shinichiro Asanaga further developed Dirac's multiple levels’ time theory by introducing an infinite number of time variables into quantum field theory, which Wheeler referred to as ‘multi directional time’ and involved a multi worlds interpretation of quantum cosmology.The time in the Feynman diagram is a single time arrow formed by the thermodynamic relaxation process of a large number of time variables of particles through quantum measurement, just like in thermodynamics, a large number of molecules’ movement with different velocities to form a temperature consistent with the average translational velocity of the molecules.Feynman diagram breaks the multi-levels time in quantum electrodynamics through statistical reduction, creating a false possibility of time travel in the multi world interpretation, which is a logical loophole that goes against Dirac’s position, Dirac introduced three concepts of time in ‘On Quantum Electrodynamics’(1927): ‘In addition to the common time T and the field time t, individual times $t_s=t_1$, t_2,..., t_n are introduced for each particle.’[9] There is only the field t in Feynman diagram, and the common laboratory time T, as a Newtonian approximation of the time of the relativistic field, becomes the time of the static absorber; the individual time $t_s$for each particle has disappeared in the Feynman diagram, leaves only the reversal time variable of the marked antiparticle, and forms a world line of time reversal through statistical averaging projection. This is equivalent to the relaxation process of particle ensembles with different velocity distributions, i.e. different temperature distributions, to form a thermal equilibrium state. The time travel illusion of the Feynman diagram is caused by extrapolating the space-time diagram of the thermal equilibrium state particle ensemble to the non-equilibrium state particle ensemble. The strangeness of the Feynman diagram lies in its use of the inherent asymmetry between the emitter and absorber to replace the difficult measurement problems in non relativistic quantum mechanics. Feynman's cancellation of the multiple time of Dirac and Shinichiro Tomonaga is similar to Heisenberg’s matrix mechanics lacking the phase factor of the Schrödinger wave function. Therefore, the explanation of the Feynman diagram is more positivism and anti realism, and the anomalous causal world lines in it have no real physical meaning.

The time inversion in physics cannot provide a scientific principle for establishing a time machine that goes back to the past, the inversion process and the reverse process are two fundamentally different concepts, and the process of inversion may not necessarily be the reverse process. Firstly, since the inversion process and the original process generally belong to spontaneous motion of different orbits, the inversion state from the final state can only return to the inversion state of the initial state and cannot return to the initial state. Therefore, the inversion process does not constitute the reverse process of the original process. The invariance of time inversion does not imply the existence of an inverse process of a process, and the proof of time inversion invariance cannot be used as proof of the reversibility of a dynamical system; Prigogine also noticed that the ultra weak interaction that causes K meson decay violates time reversal invariance, but it does not lead to the second law, as it can still be incorporated into Hamiltonian modes or unitary dynamical systems. Secondly, time inversion is equivalent to transitioning from a motion state to a motion state that is completely opposite to all its motion direction vectors, which requires the environment to exert a precise effect on the system and simultaneously cause external changes. Therefore, the two processes that are mutually inverted in dynamics cannot spontaneously transform. Again, both the dynamic process and its inversion process are dynamic deterministic processes, and the dynamic spontaneous process is not necessarily a homogenization process of certain physical quantities (i.e. not necessarily an equilibrium process). Similarly, the dynamic inversion process does not necessarily mean a thermodynamic non-equilibrium process. So, the process of dynamic inversion and the reverse process of thermodynamics have different meanings, and the dynamic process and its inversion process are not necessarily related to the homogenization equilibrium process and its non-uniform reverse equilibrium process in thermodynamics. This is like a stock falling from 10 yuan to 9 yuan, and then rebounding to 10 yuan through an inversion process. The future trend when rebounding to 10 yuan is likely to be very different from the initial 10 yuan trend. Tsung Dao Lee pointed out in ‘Symmetry and Asymmetry’ that there is a fundamental difference between the microscopic reversibility related to time inversion and the macroscopic reversibility similar to thermodynamic reversibility processes: just like there are planes flying back and forth between Chengde and Beijing, but there is only one possibility to fly from Chengde to Beijing, while there are various possibilities to fly from Beijing to other cities, so the possibility of returning to Chengde becomes very small; Microscopic reversibility cannot guarantee macroscopic reversibility, as the microscopic information that ensures macroscopic reversibility is dissipated in random collisions [10].

3.Time travel: An open question?

There are many literature discussing various paradoxes of time travel, Ryan Wasserman considers the possibility of time travel from four perspectives in his ‘paradoxes of time travel’[11]. Let's examine the four possibilities of time travel from a new perspective.

Firstly, Is time travel logically possible? The answer,pretty clearly, is *yes*. To say that time travel is logically possible is to say that the statement *time travel occurs* is consistent with all the laws of logic. Although traveling back in time may lead to various paradoxes, introducing principles such as self -consistency can avoid these paradoxes.

A second question is whether time travel is physically possible? Many physicists take Einstein to have shown that travel to the future is physically possible, but the more interesting question is whether the laws of physics allow for travel to the past. Some physicists, such as Stephen Hawking, have certainly resisted this possiblity, he suggested what he called ‘the chronology protection conjecture’: *The laws of physics prevent the appearance of closed timelike curves.* But most physicists take this conjecture to be mistaken, J.Richard Gott Ⅲ and Li-Xin Li haved given a counterexample of the chronology protection conjecture. Most physicists believe that time travel is physically possible, as evidenced by the solutions of various closed time-like lines. However, the current physics theoriesare not the ultimate theory, and the time travel paradox involves the compatibility of various theories. The closed time-like lines in relativity involve curved spacetime and rotational motion under special conditions, and are related to the illusory mirrors caused by various horizons. The closed time-like lines in quantum mechanics come from feedback correction of boundary response to initial conditions, similar to the cyclic causal feedback mechanism in control theory. The negative energy matter and exotic matter imagined in the framework of quantum mechanics cannot create miracles such as wormholes, time machines, and warped flight in the framework of general relativity, and trigger the paradox of time travel, because quantum mechanics and general relativity are incompatible.

Again, based on some metaphysical reasons, time travel back to the past can be cancelled, while based on other metaphysical reasons, time travel is allowed. A large number of metaphysical debates involve whether the ontological basis of multi world interpretation is reasonable, and how multi world interpretation should be understood. Different physical theories, and even the same physical theory, have different metaphysical assumptions, leading to different understandings of the possibility of time travel. Hawking's Chronology Protection Conjecture prohibits going back to the past in many world interpretations, while Novikov's self consistency principle allows for time travel back to the past without altering history in many world interpretations.

A fourth and final question is whether time travel is technological possible?The technological possibility of time travel involves whether the space-time structure of our universe allows for the existence of closed time-like lines? If a physical model exhibits closed time-like lines, can a time machine be built in our universe? Most physicists take general relativity to allow for backward time travel in a variety of diferent scenaries such as wormholes (Thorne,1995), cosmic strings(Gott,1991), or infinite universes filled with rotating dust(Gödel,1949). Despite having closed timelike curves, there is no exotic matter in Gödel’s universe. However, it does not violate Hawking’s theorem, because it is infinite in size and thus (obviously) can not be constructed in a finite time. The universe would have to have this structure ab initio.However, our universe is not a Gödel universe, and we cannot establish Gödel spacetime as a time machine in a limited area. Our infinitely long cylindrical time machines have no region of negative egergy density. However, if we made the time machine just very long, but not infinite, Hawking would tell us that there could be no closed time-like curves, that is, no time machines[12] . After research, almost all physical models of time machines with closed time-like lines are technically impossible to construct.

However, our current physics theory is not the final theory, and perhaps future theories completely negate time travel or provide possible conditions and technical feasibility for time travel. And conceptualizing time travel in science fictions remains a tempting topic,because the fictional space-time scenes in literature, although similar to real space-time, are a virtual space-time, time travel only needs to satisfy logical possibilities in science fiction.

II. Conclusion

According to our analysis, using negative energy matter in quantum mechanics to establish a time machine in the framework of relativity is a mistaken argument that violates conceptual identity. Because quantum statistics is different from classical statistics, the objects in quantum mechanics, such as quantum identical particles are different from those in relativity, the closed time-like lines in quantum mechanics cannot function as a time machine,.The deviation from Leibniz's unidentifiable principle of identity of the identical particle ontology in quantum mechanics is the philosophical root of the causal anomaly world line in Feynman diagrams. The time coordinate of a Feynman diagram is not the intrinsic time variable of particles, but the statistical average product of the individual time variables of a larger amount of particles. Although there is no sufficient reason to exclude time travel in such as Gödel spacetime, such time machines satisfy Novikov's self consistency principle due to the special constraints of initial boundary conditions.

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