

Chapter

Schrödinger's Cat and His Timeless ($t = 0$) Quantum World

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Abstract

The most famous cat in modern physics must be the Schrodinger's cat, in which he hypothesized that his cat cannot be determined alive or dead until we look into his box, by which the paradox of his half-live cat had been puzzling the quantum physicists over three quarter of a century since Schrödinger disclosed it in a Copenhagen forum in 1935. Since the disclosure, the paradox has been debated by Einstein, Bohr, Schrodinger, and many other renowned physicists, until now. We have found the cause of the paradox, and we will show in this chapter of which the hypothesis of Schrodinger's cat is not a paradox after all. It was the timeless radioactive particle he introduced into the box, since timeless and temporal spaces are mutually exclusive. We will show that the whole quantum world is timeless (i.e., $t = 0$), since quantum mechanics can be regarded as mathematics.

Keywords: Schrödinger's cat, quantum mechanics, superposition principle, timeless subspace, temporal space

1. Introduction

One the most famous cats in science must be the Schrödinger's cat in quantum mechanics, in which the cat can be either alive or dead at the same time, unless we look into the Schrödinger's box. The life of Schrödinger's cat has been puzzling the quantum physicists for over eight decades as Schrödinger disclosed it in 1935. In this chapter, I will show that the paradox of the cat's life is primarily due to the underneath subspace in which the hypothetical subatomic model is submerged within a timeless empty subspace (i.e., $t = 0$). And this is the atomic model that all the particle physicists, quantum scientists, and engineers had been using for over a century, since Niels Bohr proposed it in 1913. However, the universe (our home) is a temporal space (i.e., $t > 0$), and it does not allow any timeless subspace in it. I will show that by immersing the subatomic model into a temporal subspace, instead of a timeless subspace, the situation is different. I will show that Schrödinger's cat can only either be alive or dead, but not at the same time, regardless if we look into or not look into the Schrödinger's box. Since the whole quantum space is timeless (i.e., $t = 0$), we will show that the fundamental superposition principle fails to exist within our temporal space but only existed within a timeless virtual space. This is by no means of saying that timeless quantum space is a useless subspace. On the contrary it has produced numerous numbers of useful solutions for practical application, as long as the temporal or causality condition (i.e., $t > 0$) is not the issue. In short, we have found the hypothesis of Schrödinger's cat is not a physical realizable

postulation, and his quantum mechanics as well as his fundamental principle of superposition is timeless, which behaves like mathematics does.

One important aspect within our temporal universe (or time-dependent universe) [1, 2] is that one cannot get something from nothing: there is always a price to pay. For example, every piece of temporal subspace (or every bit of information) takes energy and time to create. And the created subspace (or substance) cannot bring back the section of time that has expensed for its creation. Every temporal subspace cannot be a subspace of an absolute empty subspace, and any absolute empty space cannot have temporal subspace in it. Any science proven within our temporal universe is physically real; otherwise, it is fictitious unless it can be repeated by experiments.

Science is a law of approximation and mathematics is an axiom of absolute certainty. Using exact math to evaluate inexact science cannot guarantee the solution exists within our temporal subspace. Science is also an axiom of logic; without logic science would be useless for practical application.

In addition, all the fundamental sciences need constant revision. For example, science has evolved from Newtonian mechanics to Einstein's theory of relativity and to Schrödinger's quantum mechanics. And the beauty of the fundamental laws must be mathematical simplicity, so that their complicated logics and significances can be understood easily. And the advantages have been very useful for extending scientific researches and their applications.

Nonetheless, practically all the particle sciences were developed from point-singularity approximation and had been "unintentionally" embedding a point-singularity atomic model [3] within an empty timeless subspace, as shown in **Figure 1**.

In which we see that, nucleus and electrons were shown by a dimensionless singularities representation. And we may not be aware that the model is not a physically real model, since the submerged background represents a timeless empty subspace. However, a timeless empty subspace cannot exist within our temporal universe! Although Bohr's atomic model have been used since the birth of Bohr's atom [3], its background has been mistakenly interpreted as an absolutely empty timeless subspace. Strictly speaking, as a whole it is not a physically correct model, and the solution

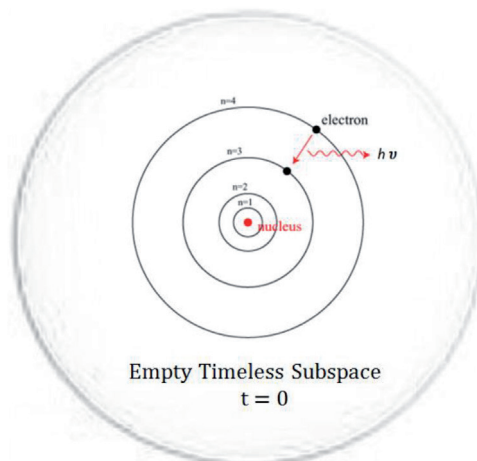


Figure 1. An isolated Bohr's atomic model (or a timeless model); h is the Planck's constant, and v is the radiation frequency.

should not be used for temporal or causality problems. The reason is that the timeless subspace model (i.e., $t = 0$) cannot exist within our temporal space (i.e., $t > 0$).

On the other hand, any atomic model as presented in **Figure 2** is physically real, in which we see that a Bohr atom is embedded within a temporal (time-dependent) subspace (e.g., our universe).

2. Flaws of a physical model

Basically all the models are approximated. For example, point-singularity approximation for an atomic model offers the advantage of simplicity representation, but it deviates away from a real physical dimension, which causes the accuracy in solution. Secondly, physical model embedded within a timeless (i.e., $t = 0$) subspace is absolutely incorrect, since every physical subspace is a temporal (i.e., $t > 0$) subspace, and it cannot be coexisted with a time-independent (or a timeless) subspace [1, 2]. Therefore as we can see, solution obtained from a physical model embedded within a timeless empty subspace shown in **Figure 2** is absolutely incorrect, and it bounds to have incomplete or fictitious solution. The fact is that one of the significant reasons other than the singularity approximation is the temporal or causality condition (i.e., $t > 0$) which is required as we applied within our temporal universe. Therefore as depicted in **Figure 1**, it is not a physical realizable model, since time-dependent (or temporal) atom cannot exist within an absolute empty timeless subspace. As shown, it produces physically nonexistent fictitious solutions, which is similar as plunging a temporal machine into a nontemporal subspace.

On the other hand as referenced to **Figure 2**, a temporal (time-dependent) atomic model which is embedded within a time-dependent (or temporal) subspace is a physical realizable model, in which we see that the temporal or causality requirement (i.e., $t > 0$) imposed by our temporal subspace is included. In fact our universe was created by a Big Bang explosion followed by the laws of physics, which is a temporal (i.e., $t > 0$) universe [1, 2]. Therefore, any physical system within our temporal space has to follow the law of time (or causality condition), so that every physical science has to be proven temporal (i.e., $t > 0$) within our universe (our home); otherwise it is a virtual fictitious science.

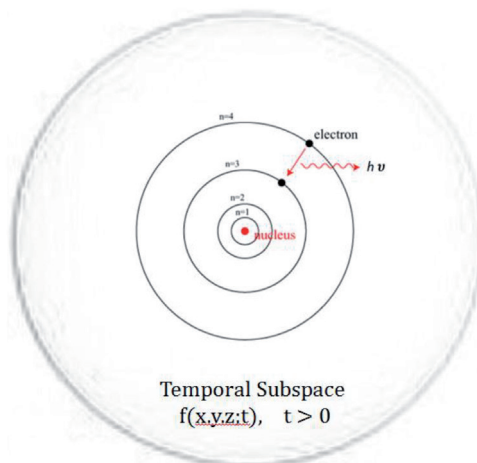


Figure 2. An isolated atomic model embedded in temporal subspace (or a temporal atomic model). $f(x, y, z, t); t > 0$ represents a function of three-dimensional space and time t as a forward variable.

3. Schrödinger's equation

One of the most important equations in quantum mechanics must be the Schrödinger equation as given by [4, 5]:

$$\frac{\partial^2 \psi}{\partial x^2} + \frac{8\pi^2 m}{h^2} (E - V)\psi = 0 \quad (1)$$

where ψ is the Schrödinger wave function, m is the mass, E is the energy, V is potential energy, and h is Planck's constant. The description of Schrödinger equation shows that changes of a physical system over time, in which quantum effects take place, such as wave-particle duality, are significant. However, the derivation of Schrödinger equation was based on point-singularity dimensionless atomic model submerged in a timeless empty space. And we have seen that there is a contrasting paradox, by which the model used in deriving the famous Schrödinger equation is incorrect, since a time-dependent atomic structure was, by not knowing it, embedded in an absolute empty timeless subspace, for which the evaluated Schrödinger equation is also a timeless equation [5]. We note that the intention of using the timeless subspace Bohr model was inadvertent, since Bohr's atomic model has been successfully accepted, in fact for over a century, and we are still using this model. This may be the reason that causes us to overlook the basic assumption, of which a time-dependent (temporal) subspace should not be embedded in a timeless subspace, since they are mutually exclusive. Nevertheless, the essence of Schrödinger equation is to predict a particle probabilistic behavior, as a dynamic particle, by means of a wave function. In other words, the outcome is not deterministic but a distribution of possible outcomes. But the question is: Is Schrödinger equation a physically reliable equation to derive its wave equations? The answer is "no," as remained to be shown in the following:

Since the derivation of Schrödinger equation is based on point-singularity approximation which is not a perfect assumption, it is an acceptable good approximation for this hypothesis. But it is the timeless subspace of the Bohr's atomic model embedded, which produces timeless solutions (i.e., $t = 0$) that are not acceptable within the temporal (time-dependent) subspace. In other words, the solution as derived from Schrödinger equation is expected to be timeless since Schrödinger equation is a time-independent equation. Thus we see that Schrödinger's quantum mechanics is a time-independent mechanics or timeless (i.e., with respect to the absolute empty timeless subspace) mechanics, which does not exist within our temporal universe!

As quoted by Feynman [6], "He think he can safely say that nobody understands quantum mechanics. So do not take his lecture too seriously..." Yet, after we understood the flaw of Schrödinger's cat, which has haunted quantum physicists for decades, we shall take a closer look at the paradox of the Schrodinger's cat. And at that moment, we may change our mind to saying that we have learned the inconsistency of Schrödinger's timeless (i.e., $t = 0$) quantum mechanics, as applied within our temporal universe (i.e., $t > 0$).

However, as I attempt to derive a wave dynamic where a particle is assumed situated within a temporal subspace, I am not sure that I will not be buried by complicated mathematical formulation (e.g., I have not attempted to do it yet at the time being). But I anticipate that the new result would not be paying off at least for the time being; it will have a better one than the Schrödinger equation that has already provided. But I am sure the solution will obey toward the causality condition (i.e., $t > 0$).

As has been done by using the Schrödinger equation to evaluate the particle wave function, one may need to reinterpret the solution to meet the causality constraint as imposed by our temporal universe. Otherwise, the evaluated solution would not be useful for practical application, in which we see that instant quantum entanglement [7] is one of the typical examples that was derived from the classic Schrödinger superposition principle. And we can see that the “instant” (i.e., $t = 0$) entanglement between particles is “fictitious” and it would not happen within our temporal space. As we know that within our temporal universe time is distance and distance is time, any particle entanglement cannot happen instantly without a price to pay (e.g., time or distance).

As we look back to the particle model embedded in an empty subspace for deriving the classic Schrödinger equation, without such a simplistic model, viable solution may not be able to obtain even using tons of complicated mathematic manipulation. Although those assumptions alleviate (somewhat) the complexity in analysis, it also introduces incomplete results that may not exist within our universe. Thus by knowing Schrödinger's quantum mechanics, it is a time-independent (or more precisely a timeless quantum computing machine) mechanics which was the consequence of using the assumed particle model within a timeless subspace. Since in practice timeless substance cannot exist within our temporal universe, we see that the flaw of Schrödinger cat as well the whole quantum space is due to the assumption that the embedded subspace is absolutely empty, in which we see that one cannot simply insert a timeless quantum machine into a time-dependent (i.e., $t > 0$) subspace.

4. Pauli exclusive principle and particle entanglement

The Pauli exclusive principle [8] states that two identical particles with the same quantum state cannot occupy the same quantum state simultaneously, unless these particles exist with a different half-spin. While quantum entanglement [7] occurs when a pair of particles interacts in such a way that the quantum state of the particles cannot be independently described, even when the particles are separated by a large distance, a quantum state must be described by the pair of particles as a whole.

In view of Pauli exclusive principle, the entanglement between particles does exist, but the separation between the particles has to be limited, since the particles are situated within a time-dependent subspace (i.e., $t > 0$) [8]. Again we see that the flaw of instant entanglement comes from the assumption that the exclusive principle was derived within the timeless subspace, in which we see again that temporal and timeless subspaces cannot coexist. In other words, time-dependent particles cannot coexist within a timeless subspace.

Before we move away from the timeless issue, we would point out that practically all of the fundamental principles in science, such as Paul's exclusive principle, Schrödinger's superposition principle, Einstein's energy equation, and others, are timeless principles, of which they were hypothesized “inadvertently” within a timeless environment.

5. Schrödinger's cat

One of the most intriguing cats in quantum mechanics must be the Schrödinger's cat, in which it has eluded the particle physicists and quantum scientists for decades. Let us start with the Schrödinger's box as shown in **Figure 3**; inside the box

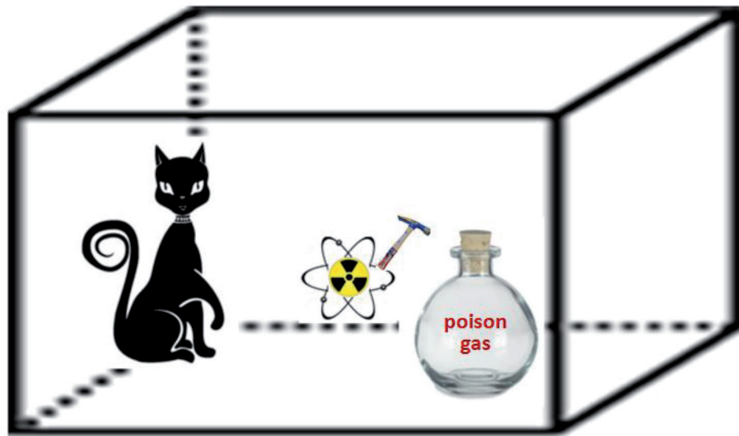


Figure 3. Inside the box we equipped a bottle of poison gas and a device (i.e., hammer) to break the bottle, triggered by the decaying of a radioactive particle, to kill the cat.

we have equipped a bottle of poison gas and a device (i.e., a hammer) to break the bottle, triggered by the decaying of a radioactive particle, to kill the cat. The box is assumed totally opaque of which we do not know that the cat will be killed or not, as imposed by the Schrödinger's superposition principle, until we open the box.

With reference to the fundamental principle of superposition of quantum mechanics [4], the principle tells us that superposition holds for multi-quantum states in an atomic particle, of which the principle is the “core” of quantum mechanics. In other words, without the superposition principle, it will not have Schrödinger's quantum mechanics. In view of this principle, we see that the assumed two states of radioactive particle inside the box can actually simultaneously coexist, with a cloud of probability (i.e., both one thing and the other existed at the same time).

Since the hypothetical radioactive particle has two possible quantum states (i.e., decay or non-decay) that existed at the same time, which is imposed by the virtue of superposition principle in quantum mechanics, this means that the cat can be simultaneously alive and dead, before we open the box.

But as soon as we open the box, the state of superposition of the radioactive particle collapses, without proof! In an instant, we have found that after the box is opened, the cat is either alive or dead, but not both. This paradox in quantum mechanics has been intriguing particle physicists and quantum scientists over eight decades, since the birth of Schrodinger's cat in 1935, as disclosed by Erwin Schrödinger who is as famous as Albert Einstein in modern physics.

Let us momentarily accept what the fundamental principle holds, such that superposition of a dual-quantum state radioactive particle exists within the box. This tells us that the principle has created itself a timeless (i.e., $t = 0$) quantum subspace or time-independent quantum space. However, timeless subspace cannot exist within our temporal universe, in which we see that any solution (i.e., wave function) as obtained by Schrödinger equation contradicts the basic superposition principle, such that a timeless quantum subspace exists within our temporal (i.e., time-dependent) universe. This conjecture tells us that the hypothetical radioactive material cannot actually exist within the box, since both quantum states (i.e., decay or non-decay) cannot occur at the same time within a time-dependent subspace. We stress that time is distance and distance is time within a temporal subspace.

Nevertheless, it remains a question to be asked: Where is the source that produces the timeless radioactive particle? Why is Schrodinger's superposition principle timeless (i.e., $t = 0$) for which the particle's quantum states exist simultaneously (i.e., $t = 0$)? A trivial answer is that it has to be coming from a timeless subspace where the particle model embedded is shown in **Figure 5**. As we continue searching the root of paradox of the Schrödinger cat, we will provide an equivalent example to show that the paradox of the half-life cat is not a paradox.

6. Paradox of Schrödinger's cat

Let us replace the binary radioactive particle with a flipping coin in the Schrödinger's box shown in **Figure 4**.

So as one flips a coin before it is landed, it is absolutely uncertain that the coin will land either as a head or as a tail. Suppose we are able to "freeze" the flipping coin in the space at time t' ; then the flipping coin is in a timeless mode subspace at time t' , which is equivalent to a two-state timeless particle frizzed as time equates to t' . Then as soon as we let the flipping coin continuingly flip down at the same instance time $t = t'$, there should be "no" lost time with respect to the time of the coin itself, but "not" with respect to the time of the box. In other words, there is a section of time Δt that the box has gone by. So there is a time difference between the coin's time and box's time. That is precisely why we cannot tell if the cat will die or be alive, as Schrödinger himself assumed his fundamental principle is correct. As soon as we open the box, we have to accept the physical consequence that the cat is either dead or alive, but not both. Then I guess Schrödinger creates a logic to save his fundamental principle that superposition of the radioactive particle quantum states suddenly "collapses" as we open the box, without any physical proof. Otherwise the core of quantum mechanics fails to live up with the physical reality. Nevertheless as we see it, the failure of the fundamental principle is due to the fact that a timeless flipping coin "cannot be coexisted" within a time-dependent (i.e., $t > 0$) box.

We further note that it is possible to alleviate the timelessness of superposition, if we appropriately add the temporal constraint (i.e., $t > 0$) in deriving the Schrödinger equation. We can change the timeless Schrödinger's equation to a

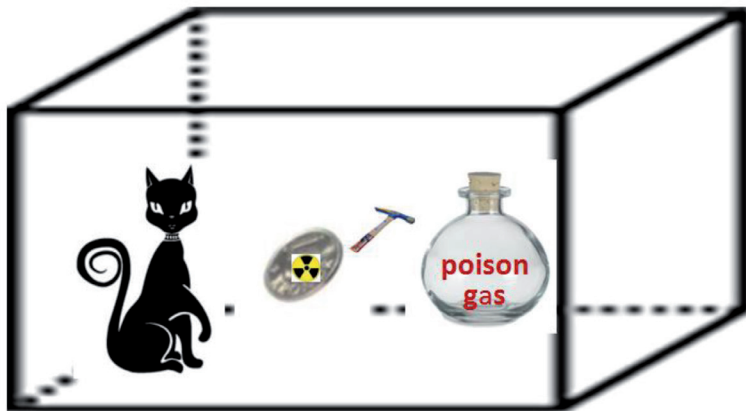


Figure 4.
A flipping coin analogy is substituted in the box for Schrödinger's cat paradox.

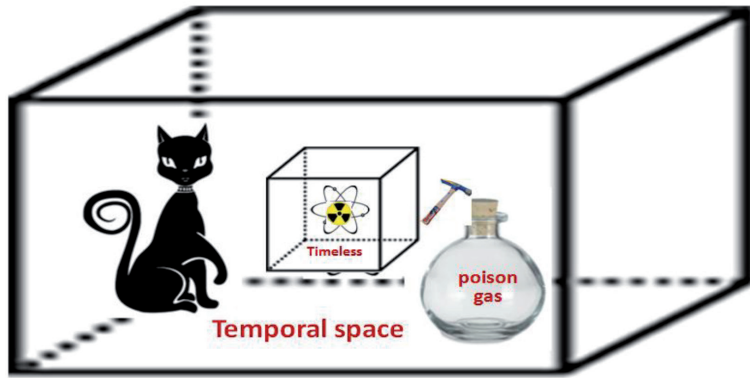


Figure 5. Schrödinger's box with a timeless radioactive particle. Notice that timeless radioactive particle cannot exist in a temporal (i.e., time-dependent) subspace.

time-dependent (i.e., $t > 0$) equation, of which we will see that Schrödinger's wave functions of the dual-state radioactive particle can be shown as $\psi_1(t)$ and $\psi_2(t + \Delta t)$, respectively, where Δt represents a time delay between them. Since time is distance and distance within a temporal subspace, we see that the quantum states will not occur at the same time (i.e., $t = 0$). Furthermore, the degree of their mutual superposition states can be shown as a time ensemble of $\langle \psi_1(t) \psi_2^*(t + \Delta t) \rangle$, respectively, where $*$ denotes the complex conjugate, in which we see that a perfect degree of mutual superimposition occurs if and only if $\Delta t = 0$, which corresponds to the timeless (i.e., $t = 0$) quantum state of the radioactive particle.

Now let us go back to the half-live cat in Schrödinger's box, where the radioactive particle is assumed within a timeless sub-box as shown in **Figure 5**, in which we see that a timeless (i.e., $t = 0$) radioactive particle is situated inside the time-dependent (i.e., $t > 0$) box, which is "not" a physical realizable postulation for Schrödinger's cat. The fact is that a timeless ($t = 0$) subspace cannot exist within a time-dependent ($t > 0$) space (i.e., the box). Thus we have shown that again the paradox of Schrödinger's is not a paradox, since the postulated superposition is timeless, and it is not a physical realizable principle within our temporal universe!

However, by replacing the timeless particle with a time-dependent (i.e., $t > 0$) particle shown in **Figure 5**, then we see there is a match in time as a variable with respect to the box. Then Schrödinger's cat can only either be dead or not be dead but not at the same time, in which we see that there is nothing to do whether we open the box or not to cause the fundamental principle to collapse. In other words, a dead cat or a live cat has already been determined before we open up the box. And the occurrence of the particle's quantum states is not simultaneously by means of the fundamental principle of Schrödinger, in which we have shown that superposition principle does not exist within our temporal space and it only exists within a timeless virtual subspace similar to what mathematics does.

At last, we have found the flaw of Schrödinger's cat, where Schrödinger was not supposed to introduce a timeless radioactive particle into the box. This vital mistake that he committed is apparently due to an atomic model in which subspace is assumed to be absolutely empty as shown in **Figure 1**, in which we see that a timeless (i.e., $t = 0$) particle is wrongly inserted into a temporal (i.e., $t > 0$) box. I believe we have finally found the root of the paradox of Schrödinger's cat, for which we shall leave the cat behind with a story to tell; once upon a time, there was a half-life cat!

7. Essence of a subatomic model

With high degree of certainty, most of the fundamental laws of science embraced the singularity approximation which includes the atomic models embedded within a timeless subspace. As we look at any conventional atomic model, we might inadvertently assume that the background subspace is an absolutely empty space. And this is the consequence of Schrödinger's timeless quantum mechanics, since any physical atom (i.e., $t > 0$) cannot be situated within a timeless (i.e., $t = 0$) subspace. Although singularity model works very well for scores of quantum mechanical application until the postulation of Schrödinger's cat emerged. Since the paradox of the half-life cat is the core of the fundamental principle, it has been argued for over eight decades by Einstein, Bohr, Schrödinger, and many others since Schrödinger disclosed the postulation at a Copenhagen forum in 1935. This intrigues us to look at Schrödinger's equation which was developed on an empty (i.e., $t = 0$) subspace platform, in which we see that superposition position collapses as soon as we open Schrödinger's box. This must be the apparent justification for Schrödinger to preserve the fate of his fundamental principle. Otherwise his timeless fundamental principle cannot survive within our temporal universe (i.e., $t > 0$). In short, we see that the hypotheses of Schrödinger's cat are a fictitious postulation, and we have proof that it does not have a viable physical solution, since any timeless radioactive particle cannot coexist in a temporal box, and we have seen that Schrödinger have had inadvertently introduced in the box (**Figure 6**).

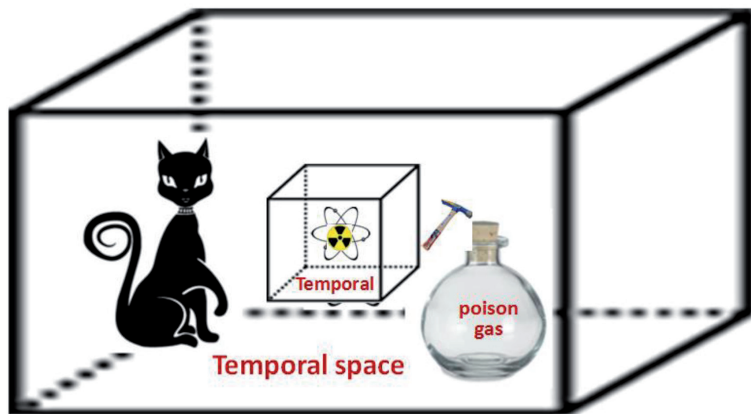


Figure 6. A time-dependent cat is in a temporal (time-dependent) box, in which we see a temporal radioactive particle is introduced within Schrödinger's temporal box.

8. Timeless quantum world

Fundamental principle of quantum mechanics tells us that superposition of a multi-quantum-state particle holds if and only if within a quantum environment, by which it creates itself a timeless quantum subspace, but quantum subspaces cannot exist within our temporal universe. Then there is a question being asked: Can those quantum subspaces be utilized in our temporal universe? The answer is “no” and “yes.”

The “no” part answer is that if time component in application is an issue, such as applied to “instant” quantum entanglement [9] and “simultaneous” quantum

states computing [10], then the superposition principle as derived from the time-independent Schrödinger equation would have a problem, as applied within our temporal universe, since the superposition is timeless. For example, those instant and simultaneous response promises by the fundamental principle do not exist within our temporal space. And the postulated Schrödinger's cat is not a physical realizable solution, in which we have shown that the burden of the cat's half-life can be liberated by using a temporal (i.e., $t > 0$) radioactive particle instead, in which we see that the paradox of Schrödinger's cat may never be discovered that it is not a paradox, if we did not discover that Schrödinger's quantum mechanics is timeless.

Since the Schrödinger equation is a timeless quantum computer, which is designed to solve a variety of particle's quantum dynamics, the solution as obtained from Schrödinger's equation is also timeless, which produces a non-realizable solution such as timeless (i.e., $t = 0$) superposition.

We see that if one forces a timeless (i.e., $t = 0$) solution into a temporal (i.e., $t > 0$) subspace, one would anticipate paradox solution that does not exist within our temporal universe, such as Schrödinger's half-live cat. This is equivalent to chasing a ghost of a timeless half-life cat in a temporal subspace, in which we have found that a timeless radioactive particle was inserted within Schrödinger's box!

As to answer the "yes" part, if temporal aspect as applying a quantum mechanical solution is not an issue within our temporal space, then we have already seen scores of solutions as obtained from the Schrödinger equation which have been brought to use in practice, since the birth of quantum mechanics in 1933. This is similar to using mathematics (i.e., a timeless machine) to obtain solution for time-dependent application and sometime produces solution not physically realizable, in which we see that the Schrödinger equation is a mathematics, which requires a time boundary condition (i.e., $t > 0$) to justify that its solution is physically realizable.

9. Math and temporal ($t > 0$) space duality

Every physical science existed within our temporal subspace must be temporal (i.e., $t > 0$); otherwise, it is a virtual (or fictitious) science as mathematics does. The burden of a scientific postulation is to prove it exists within our universe and then find the solution. We shall now show that there exists a duality between science and mathematics in which any scientific hypothesis has to be shown that it is within the boundary condition of our temporal universe, before accepting it as a real postulation. Otherwise, the hypothesis is not a guarantee to be physically real. One of the essential boundary conditions is the causality condition (i.e., $t > 0$), which is to show that the solution is temporal and causal (i.e., $t > 0$). For instance, take Einstein's energy equation [11] as an example as given by.

$$\epsilon = mc^2 \quad (2)$$

where m is the rest mass and c is the speed of light. In view of this equation, we first see that it is not a temporal or time-domain function. Strictly speaking, this equation cannot be directly implemented within our temporal subspace, since our universe is a temporal variable spatial function which can be described by [1, 2].

$$f(x, y, z; t), t > 0 \quad (3)$$

where (x, y, z) is a spatial variable and $(t > 0)$ is a forward time variable, in which we see that every subspace within our universe is time-dependent variable

space. Since energy equation of Eq. (3) is not time variable equation, it is apparent that the equation cannot be directly implemented within our temporal universe. To make the energy equation be acceptable or match to our temporal (i.e., $t > 0$) subspace condition, we can transform the equation to become time-domain or temporal equation as given by [4].

$$\frac{\partial \varepsilon(t)}{\partial t} = c^2 \frac{\partial m(t)}{\partial t}, t > 0 \quad (4)$$

where $\partial \varepsilon(t) / \partial t$ is the rate of increasing energy conversion, $\partial m(t) / \partial t$ is the corresponding rate of mass reduction, c is the speed of light, and $t > 0$ represents a forward time variable. Notice that we have transformed the equation into a partial differential form which exists only at time $t > 0$. This indicates that the solution as obtained by this equation is compiled by means of the causality (i.e., $t > 0$) constraint, of which the solution can be used within our temporal universe (i.e., $t > 0$).

On the other hand, if Eq. (4) is imposed by a timeless (i.e., $t = 0$) constraint as shown by

$$\frac{\partial \varepsilon(t)}{\partial t} = c^2 \frac{\partial m(t)}{\partial t}, t = 0 \quad (5)$$

then we see that the solution as obtained by Eq. (5) will be timeless (i.e., existed at $t = 0$). And it cannot be implemented within our temporal (i.e., $t > 0$) universe.

Needless to say, if we put a constraint on Eq. (3) as can be shown by $f(x, y, z; t)$, $t = 0$. Then we see that a temporal equation has been transformed into a timeless equation which exists only at $t = 0$, in which we see that Eq. (5) cannot be used within our temporal universe (i.e., $t > 0$).

As we know that a timeless space is actually a mathematical virtual space, only mathematician and possibly quantum physicist can produce it, since quantum mechanics is mathematics. Nevertheless, a timeless space has no time and no substance in it. When we look back at all the fundamental laws in science, they are mostly presented by point-singularity approximation, and many of them are timeless or time-independent equations, such as Schrödinger's equation. And we have shown in proceeding that Schrodinger's quantum machine is timeless since its mechanics was built on an empty subspace. Nevertheless we are going to show some possible outcome when a timeless superposition principle is implemented within a timeless platform. Before showing, let us introduce a few subspaces that may be used for the illustration, as depicted in **Figure 7**.

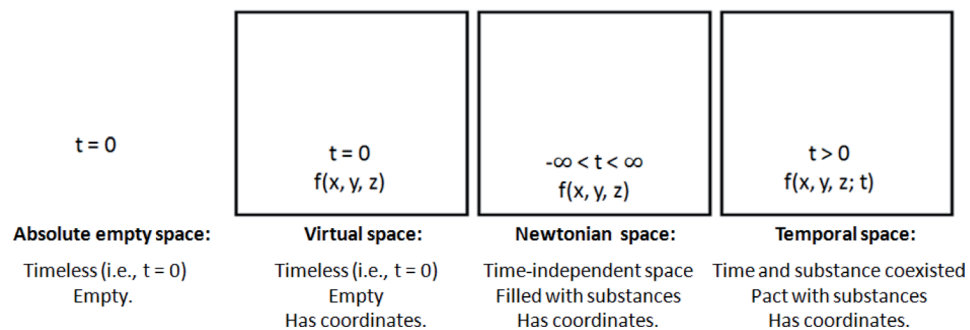


Figure 7.
 This figure shows an absolute empty space (a), a virtual space (b), a Newtonian space (c), and Yu's temporal space (d).

In Ref. to this figure, we see an absolute empty space which has no time, no substance, and no coordinate. A mathematical virtual space is an empty and timeless space with spatial coordinates. A Newtonian space is filled with substance but treated time as an independent variable. And finally a temporal space is filled with substance and existed only at $t > 0$, of which substance and time coexisted [1, 2]. We further see that none of the spaces such as absolutely empty, virtual, and Newtonian spaces can be a subspace of the temporal space or vice versa, since temporal (i.e., $t > 0$) space is a time-invariant system (i.e., the system analysis standpoint) and the others are not.

Now, let us take an example as illustrated in **Figure 8** in which we assume three delta functions $\delta(t-t_1)$, $\delta(t-t_2)$, and $\delta(t-t_3)$ representing a set of particles that are plunging into a timeless subspace system diagram as depicted in **Figure 8b**. We see that output delta functions are superimposed on top of each other at $t = 0$, shown in **Figure 8c**, of which we note that all the input pulses (i.e., particles) lost their temporal identities within a timeless space. And this is precisely the superposition principle tells us that the entire quantum states exist simultaneously and instantly (i.e., at $t = 0$). However, superposition principle does not exist within a temporal (i.e., $t > 0$) space. Since time is distance and distance is time, the entire quantum states exist simultaneously everywhere only within a timeless space as can be seen in **Figure 8e**. Therefore, it is a serious mistake to assume superposition principle works within our temporal universe, such as the paradox of Schrödinger's cat and possibly others. It is interesting to find out from system analysis standpoint [3] how a timeless (i.e., $t = 0$) subspace respond to a time-domain input excitation.

On the other hand, if we plunge the delta pulses within a temporal subspace, as shown in **Figure 9**, we see the output responses are faithfully temporally reproduced, which shows the time-invariant property of our temporal subspace, in which these particles (e.g., quantum states) are temporally separated, instead of superposing together at $t = 0$. And this is precisely the moment when we open Schrodinger's box, we found the cat can only be either dead or alive but not both at the same time. Instead of assuming the fundamental principle collapses to justify the superposition principle.

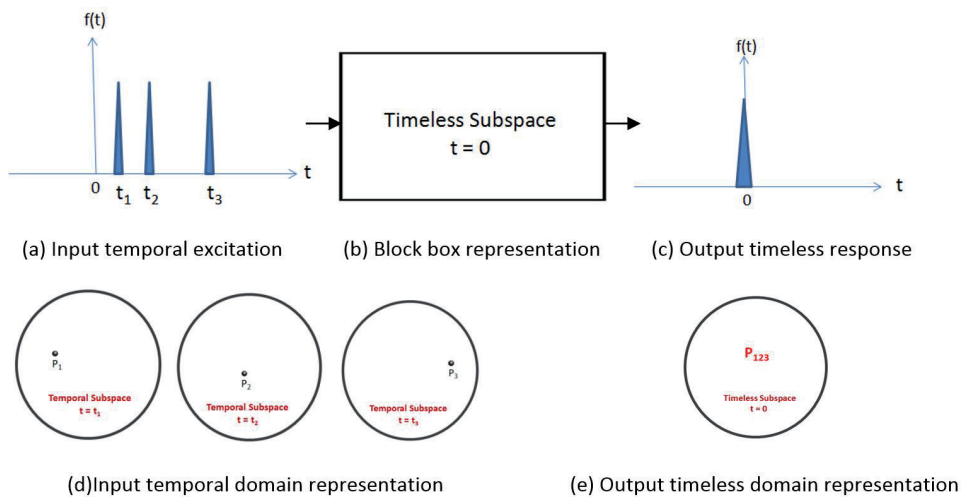


Figure 8.

(a) Shows a set of three pulses (e.g., particles) within a temporal subspace as shown in topographical view in (d). As these particles plunge into a timeless subspace of (b), the output responses are superposing at $t = 0$ shown in (c), and the superimposed particles can be found all over the timeless domain as can be seen in (e). It is interesting to note that within a timeless space, all things are in one and one is everywhere within the space.

In summing up our illustration, our universe is a causal (i.e., $t > 0$) time-invariant system which can be symbolically described by $f(x, y, z; t)$, $t > 0$, in which time and space coexisted. Since time is a constant forwarded variable, the speed of time is determined by the velocity of light as given by $t \approx 1/c$, where $c \approx 186,282$ miles/sec, by which our temporal universe was indeed created by means of Einstein energy equation that was derived with his relativity theory, in which we see that time is distance and distance is time within our temporal universe. In contrast within a timeless (i.e., $t = 0$) space, it has no time and no distance, since $d = ct$ and $t = 0$, for which everything collapses instantly at $t = 0$ (or $d = 0$) within a timeless space, as superposition principle does. Although scores of quantum mechanical solutions have been put into use, it is the fundamental principle of superposition that confronted with the temporal boundary condition $t > 0$ that produces Schrödinger's cat.

Regardless the mutual exclusive issues between timeless and temporal subspaces, some quantum scientists still believe they can implant superposition principle within our universe. This is the reason that we would show what would happen when a multi-quantum states particle is implemented within a temporal space. For simplicity, we will simulate a two-quantum states particle plunging into an empty subspace as shown in **Figure 10a** and **b**. We further let two quantum states associated with two eigenfunctions $\exp.[i(\omega_1 t)]$ and $\exp.[i(\omega_2 t)]$, where ω represents the angular frequency of the quantum state. And the output response from an empty space is given in **Figure 10c** that corresponds to a "timeless" superposing dual-quantum state (a real quantity), where we assume energy is conserved. When this timeless simulated response is plunged into a temporal (i.e., $t > 0$) space as depicted in **Figure 10d**, its output response is shown in **Figure 10e**, in which we note that the output response occurs at $t > 0$ and it was not started instantly at $t = 0$, since time is distance and distance is time within a temporal space. In view of this simulation, we learn that particle's quantum states lost their personalities as soon it plunges into a timeless space. Since the timeless subspace is assumed to be within a temporal (i.e., $t > 0$) space, it is the temporal space that dictates the end response, as shown in **Figure 10e**. This shows us that all the "instance and simultaneous" quantum states as indicated by the superposition principle are not happening. Equivalently

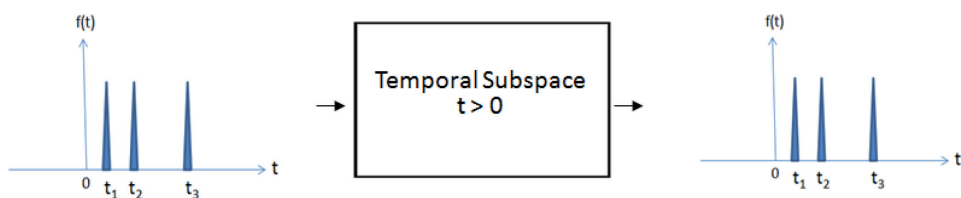


Figure 9.
 The time-invariant response property from a temporal subspace.

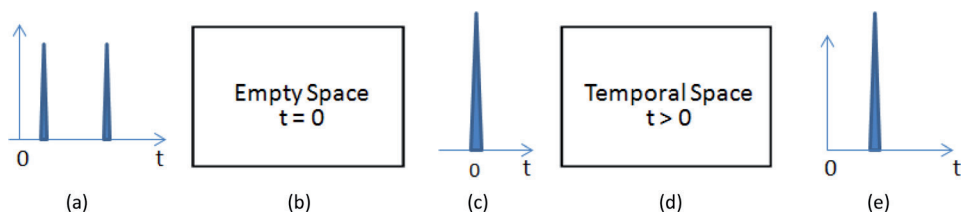


Figure 10.
 System simulation for an empty subspace within a temporal space. (a) Input excitation, (b) empty timeless system, (c) output response from an empty space, (d) temporal system, and (e) final output from a temporal space.

speaking, this is precisely why the dual-quantum states of the radioactive particle within Schrodinger's box are dysfunctional or impaired, within a temporal space.

10. Quantum mechanical assessments

The Schrödinger equation was developed on an absolute timeless subspace platform, for which all the solutions are timeless or time-independent. Since the fundamental principle of superposition was derived from the timeless Schrodinger equation, the corresponding quantum states' wave functions are also timeless with respect to the subspace that the particle is embedded in. Although wave function is time-dependent equation, it is with respect to the corresponding quantum state itself. This can be easily understood by an atomic model where the particle quantum states are represented by $h\nu_n$, where $n = 1, 2, \dots, N$, number of quantum state, in which we see that each n -th wave function is time dependent with respect to $h\nu_n$ quantum state. And it is not with respect to the subspace that the atomic model is embedded in, which is an empty subspace. Since time-dependent wave functions dictate the legitimacy of the superposition principle, the time dependency with respect to the particle's subspace is timeless, which is precisely the reason the fundamental principle of superposition is timeless and the whole Schrodinger's quantum world is timeless (i.e., $t = 0$).

Since the whole quantum space is timeless, it cannot coexist within our temporal universe. In view of the logic of collapsing superposition principle as soon as we open up the Schrödinger's box, it must satisfy the physical reality that the cat cannot be alive and dead at the same time. Otherwise, the fundamental principle of superposition has proven itself to not exist within our temporal (i.e., $t > 0$) universe. It is apparent that Schrödinger's fundamental principle only exists within a timeless subspace. Personally I believe this must be the reason for him to justify the fate of his fundamental principle; otherwise, the principle is not able to survive. It must be Schrödinger himself that made the argument; otherwise, the paradox of his half-life cat has no physical foundation to debate by the world's top scientists over three quarter of a century, since 1935.

Since quantum mechanics is a virtual quantum machine as mathematics is, we have found that Schrödinger's machine is a timeless (or a virtual quantum) computer and it does not exist within our temporal universe. As we have seen, the Schrödinger equation was derived within an empty subspace; it is not a physical realizable model to use, since empty subspace and non-empty subspace are mutually exclusive. And we have seen that, as one plunges the timeless superposition principle within a temporal (i.e., $t > 0$) subspace and then anticipates the timeless superposition to behave "timelessly" within a temporal subspace is physically impossible. We have shown that only mathematician and quantum mechanists can do it, since quantum mechanics is mathematics.

But this is by no means to say that timeless quantum mechanics is useless, since it has proven to us with scores of practical application that long solutions are not directly confronted with time-dependent or causality (i.e., $t > 0$) issue within our temporal universe. As quoted by the late Richard Feynman [12] that "nobody understands part of quantum mechanics," we have found the part of quantum mechanics nobody understands which must be from the "timeless superposition principle" that causes the confusion. And the root of timelessness quantum world is from the empty subspace that the atomic model was inadvertently anchored on. We are sure this discovery would change our perception as applying the fundamental principle to quantum computing and to quantum entanglement in communication, for which the "instance and simultaneous" (i.e., $t = 0$ and concurrent)

phenomena as promised by the fundamental principle do not exist within our temporal universe. The important fallout from this discovery of the non-paradox of Schrödinger's cat encourages us to look for a new time-dependent quantum machine, similar to the one that Schrödinger has already paved the roadmap for us.

11. Remarks


In conclusion, I have shown that the atomic model that Schrödinger used must be anchored within an absolute empty subspace. And it must be the underneath timeless subspace that caused the paradox of his half-life cat. The reason for overlooking the underneath timeless subspace must be due to the well-accepted Bohr's model that has been used for over a century, since the birth of Niels Bohr's atom in 1913 [3]. It has been very successfully used with excellent results for over a century. And it has never in our wildness dream that the underneath empty subspace causes the problem. In view of Schrödinger's time-dependent wave solutions, we have found the time dependency is with respect to the atomic particle itself but not with respect to the subspace the atomic model embedded in. In searching the root of the paradox of Schrödinger's cat, we found that a timeless radioactive particle should not have had introduced within a time-dependent (or temporal) Schrödinger's box. To alleviate the timeless radioactive particle issue, we have replaced a time-dependent (i.e., $t > 0$) radioactive particle for which we have shown that the paradox Schrödinger's cat is not a paradox after all. We have also used science and math duality analogy to illustrate the outcome of a temporal excitation into a timeless system analog, as well as onto a temporal subspace, in which we have shown temporal space is a time-invariant space, while superposition principle is timeless and it is neither a time-invariant nor time-variant principle. It is however a no-time or timeless principle, which cannot be implemented within a time-invariant space. In short, we found the hypothesis of Schrödinger's cat is not a physical realizable postulation and his whole quantum world is timeless and behaves like mathematics does. Nonetheless, many of Schrödinger's timeless solutions are very useful until the implementation of fundamental principle that confronts with causality (i.e., $t > 0$) issue of our universe.

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