Is it possible to reconcile space and time with spacetime?

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Abstract

Is it possible to reconcile Newton's claim that space and time in the universe are two distinct and not related entities, whereas Einstein claimed that space and time are inextricably linked in one entity called space-time?

Yes, it is possible to reconcile these two claims that at first glance seem to be contradictory. I claim that these terms can be reconciled when taking into account the structure of the entire universe.

Definitions:

Time, in Newton's view is a fundamental and absolute entity, that flows uniformly in the entire universe and is independent of anything else in the universe. On the other hand, In Einstein's theory of relativity, time is relative and can be influenced by the speed and gravity of an observer.

Space, according to Newton, is an absolute, fixed, and unchanging background in which all physical events occur. Space is infinite and permeates everywhere in the universe. Newton also postulated that space is filled with a substance called "ether" in which light propagates, however, he could not define the nature of the ether. Newton's theories of space and time were challenged, e.g., the Michelson-Morley experiment that failed to prove the existence of the ether. Eventually, Newton's ether was, at the beginning of the 20th century, replaced by Einstein's theory of relativity introduced the idea of spacetime, where space and time are interconnected and can be influenced by the presence of matter and energy. In other words, space is not an absolute and unchanging entity, but is instead a dynamic component of the fabric of the universe. It is to be noted that general relativity poses a serious doubt regarding the existence of the ether. It is predicted from general relativity and also was measured in an experiment Gravity probe B, that frame-dragging exists around any celestial bodies. The question now is: If Michelson-Morley is correct and there is no entity (or ether) between celestial bodies, then what is dragged?

How can these contradictory definitions of space and time be reconciled?

First, I would like to define the term "entire universe" versus "matter universe". The entire universe is infinite and includes infinite space and time. The entire universe includes also one or more matter universes located in it. I write "one or more matter universes" because currently we only know that our matter universe exists, but we cannot verify the multiverse.

I claim that the two seemingly contradictory definitions can be reconciled by the following suggested structure of the universe: Although the Michelson-Morley experiment showed that there is no matter between celestial bodies, it was found from another theory - Quantum physics, that space is not a total

void but is filled with various quantum fields, such as electromagnetic field, quarks fields, etc. These fields fluctuate, even in the absence of matter particles. These fluctuations give rise to virtual particles that briefly pop in and out of existence, creating a dynamic and energetic environment in space. Thus, space in the form of temporarily virtual particles has existed forever. The question now is how long-lived particles, such as neutrons emerged from the virtual particles, without violating energy conservation law. I suggest a speculative hypothesis on how a neutron can be created from fields of quarks. https://www.academia.edu/59136046/The_origin_of_matter_docx

Our matter Universe is an isolated island located somewhere in the infinite vacuum space. It is composed of two parts: a massive spinning neutron star designated the Pivot and a ring-shaped visible Universe that orbits this Pivot. The Pivot, from the quantum physics point of view, is composed of neutrons and antineutrons packed at the highest possible density in the Universe. From the GR point of view, the Pivot is described as a Kerr black hole. Therefore, the ring-shaped visible Universe must reside outside the event horizon of the Pivot. The Pivot theory postulates that our Universe started as a spinning primeval nucleus. This primeval nucleus accumulated mass from the vacuum space energy. The growth of this nucleus stopped when the acceleration on its equator surface reached the maximum acceleration possible and then it exploded into two distinct parts: The Pivot that stayed at its place and an orbiting ring of the visible Universe.

The Pivot theory is verified against known cosmological observations. For example, the flat rotation curve in Spiral Galaxies, the Spiral shape of Galaxies, the high redshift of Galaxies, the Michelson-Morley experiment, the Sagnac effect, CMB, Nucleosynthesis, and other observations.

More details on the evolution and current structure of Pivot universe in: https://www.academia.edu/45575390/The_structure_of_the_Pivot_Universe

It is important to note that the structure of the matter (or Pivot) universe is governed by general relativity.

An additional speculative hypothesis is that our matter universe is only one among many others located in the entire universe, similar, to the fact that our Milky Way galaxy is only one among many others in our matter universe. (Note: I write "speculative" because contrary to the Pivot universe, we, currently cannot verify it by observations).

Description

Fig. 1 depicts schematically the entire universe. The entire universe is composed of an infinite vacuum space and **one or more** matter universes inside it. There is a free region in the vacuum space outside the matter universes. In this free region of vacuum space, there are no gravitational fields, because there are no celestial bodies. Space and time behave the way postulated by Newton, i.e., space is stationary, and time flows uniformly in the entire universe and is independent of anything else in the universe. A small body that is located in the free vacuum space and is momentarily pushed will continue in a straight line at a constant velocity. In the vacuum space time is equal everywhere, or the time difference between any points is $\Delta t_0 = 0$.
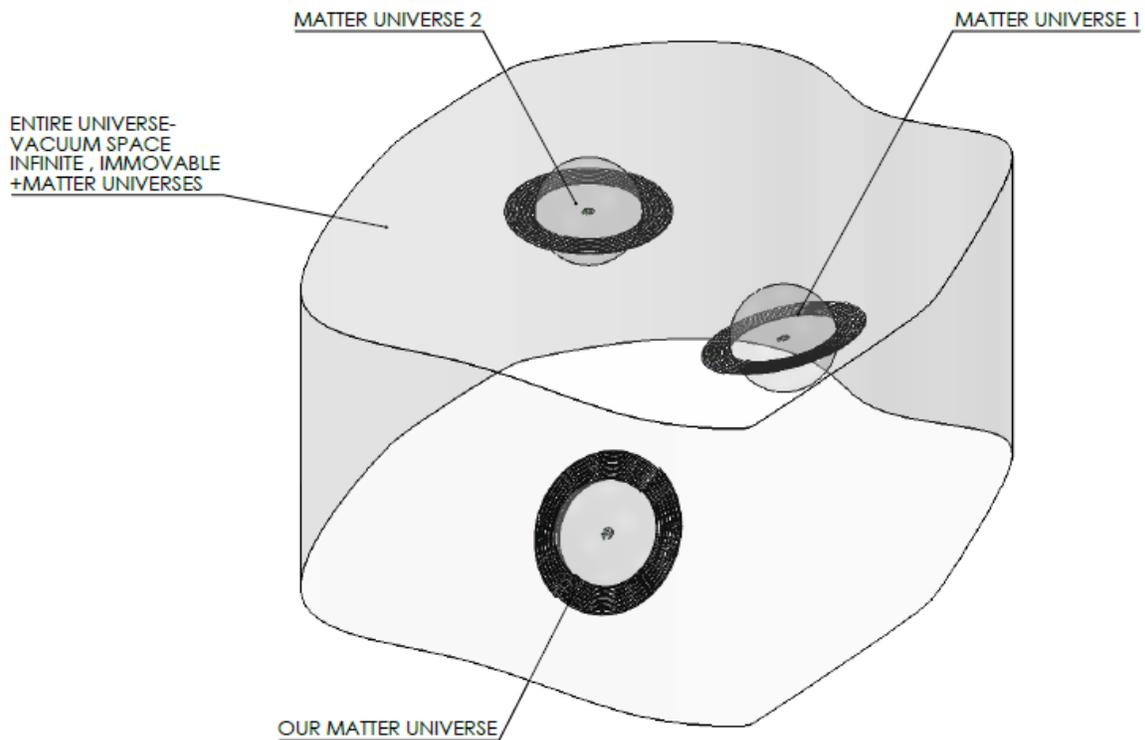
Fig. 1- The entire universe

On the other hand, in the matter universe, Einstein's theory prevails, everything is influenced by the Pivot's gravity, including space that is dragged by the Pivot. Galaxies' motion in dragged vacuum space and time is dependent on the gravity and velocity at a specific location.

Fig. 2 shows the structure of our matter universe. At the center of our matter universe, there is the Pivot, which is a spinning neutron star. The center point of the Pivot is immovable relating to the vacuum space outside our matter universe therefore time there flows exactly as in the vacuum space. However, the time in other places within the matter universe is changing and behaves according to general relativity.

In Fig. 2 it is also shown two arbitrary galaxies, Galaxy A and Galaxy B. The two galaxies must be located outside the event horizon of the Pivot.

Now relating to the measurements of time. Time has no physical properties to measure. What we are really measuring is time intervals, the duration separating two events. In the past, people recorded the passage of time in many ways such as using the sunrise and sunset. Nowadays atomic clocks are used. In atomic clocks, the cesium atoms react to radiation with a frequency of 9,192,631,770 cycles. In the international standard units of time, the second is defined as the duration of 9,192,631,770 cycles.

Each galaxy is orbiting the Pivot at a different radius. According to general relativity, there is a time dilation between each galaxy and the stationary point of the Pivot.

The effect of time dilation has two components:

1) According to special relativity, time dilation is dependent on the velocity of the galaxy around the Pivot.

$$\Delta t_v = \frac{\Delta t_0}{\sqrt{1 - \dfrac{v^2}{c^2}}}$$

2) The gravitational time dilation of a galaxy, according to general relativity, is dependent on its distance r from the center of the Pivot.

$$\Delta t_g = \frac{\Delta t_0}{\sqrt{1 - \dfrac{2 \cdot G \cdot M}{r \cdot c^2}}}$$

There is one point, the center of the Pivot, where $\Delta t_v = 0$ and $\Delta t_g = 0$. This point is an absolute reference frame of our matter universe. At this point, time passes as it passes in the free vacuum space.
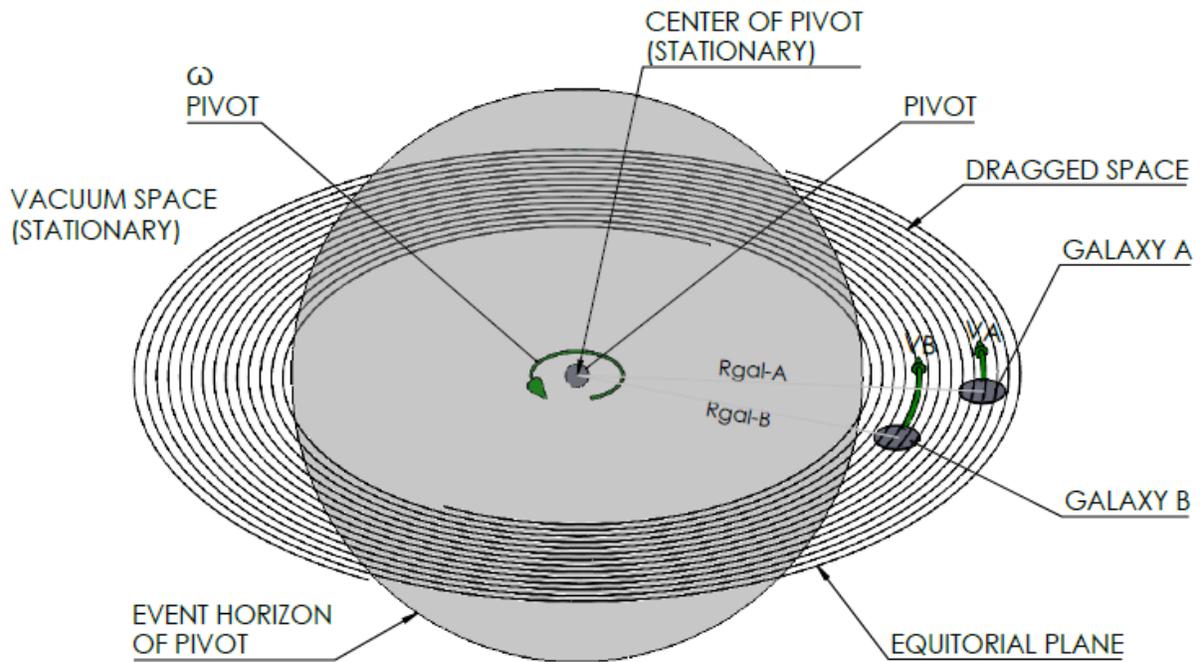

Fig. 2- The Pivot universe