

Einstein's Fallacy of Non-Physical Yet Physical Space

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One of the most important questions in physics is what is the medium in space responsible for the transmission of light and forces. Throughout much of history, space was thought of as a container filled with a medium commonly known as aether. After the Michaelson-Morley experiment there were doubts about the existence of aether and some physicists, most notably Albert Einstein, chose to reject the idea that space contains a physical medium. In formulating his theory of special relativity Einstein denied the existence of a physical medium. At the same time, he was forced to conceive of space as a physical medium with physical properties of spatial and time dimensions that changed when his conceptual physical space moved relative to other space. For unknown reasons, physicists did not recognize the fallacy behind Einstein's logic of a non-physical yet physical space. A few years prior, Max Planck determined that every system experiences oscillations at a non-zero energy, which Einstein called zero-point energy. Over the past century scientists have accumulated substantial evidence that space does contain zero-point energy confirming that space contains a medium.

1. Introduction

In 1905 while formulating his theory of special relativity Albert Einstein made the assumption that space does not contain a physical medium, which was commonly known as aether.[1] Now that physicists have found overwhelming evidence for the existence of quantum vacuum energy we are now quite confident that Einstein's assumption was false. What is not commonly considered is that Einstein's assumption was a logical fallacy.

Historically, space was treated as a container filled with physical objects. At the most fundamental level there was thought to be a medium that was the transmission medium for light as hypothesized by James Clerk Maxwell and many others.[2] It was also considered that this medium was responsible for inertia and the transmission of electromagnetic forces and gravity.

Maxwell conjectured that an experiment where light was sent in directions parallel and perpendicular to the Earth's motion relative to aether would show a directional dependence in the speed of light.[3] Michaelson and Morley tested this hypothesis in their infamous experiment and they showed that Maxwell's conjecture was incorrect. This eventually led many physicists, including Einstein, to assume incorrectly that space was empty and did not contain a physical

medium, instead of merely showing that Maxwell's conjecture was incorrect.

At the time, however, the majority of physicists led by Fitzgerald, Lorentz, Larmor and Poincare took the position that Maxwell's assumption was correct and there still is an aether.[4][5][6][7] In order to solve the problem of the Michaelson-Morley experiment they devised a scheme in which the distance travelled by light in a moving frame of reference is somehow contracted such that the speed of light appears to be the same. They later recognized that time, or more specifically clock rates, must also change such that faster moving objects have a slower clock rate. In their minds this was still somehow due to aether.

Einstein was stuck, in that by denying the existence of aether, or any other medium of transmission of light, he still wanted to explain clock rate slowing and hypothetical distance contraction. In order to do that, he imagined that space itself must change its spatial and time dimensions when that space is moving relative to other space. His space was not a wall-less container but was physical.

In order to do away with aether theory, he had to treat space like it had physical properties, including spatial and time dimensions that were variable. Therein lies Einstein's fallacy. He claimed space is non-physical and physical at the same time.

2. Space and Physicalism

Physics is a physical science and is tasked with providing physical explanations of nature and then modeling them mathematically, although in many cases a mathematical model comes first. In all cases, it is the physical explanation of a physical reality that is paramount in physics.

Philosophically, the physical nature of science falls under the category of physicalism, where everything is physical and has a physical explanation or cause. The exception is for those physical things that have existed for infinity, as they have no physical cause while still being physically real.

This is in opposition to so-called supernatural causes, which are not really causes, since the supernatural does not exist. As such, science does not involve itself with fictional causes such as the non-physical and super-natural.

At the heart of Einstein's problem is how we define space. Traditionally we define space as a container for all things physical. Then we go on to define the universe as a container for all space. We now know experimentally that all space contains vacuum energy consistent with Max Planck's theory of quantum oscillators. Per his theory it is impossible for space to be empty.

Planck oscillators are something physical that we can use to explain all the known physical properties of space. Quantum vacuum energy has wavelengths and frequencies that give space its spatial and time dimensionality. The quantum vacuum also gives us a standard reference frame to use when making relativistic frame transformations, as well as giving us a physical medium for light and force transmission.

Einstein was stuck without a medium since he assumed that space is empty, and thus he had to invent an alternative solution. He invented a version of space that had physical spatial and time dimensions, which could be varied. By doing so he contradicted his original premise of empty space and gave the space physicality.

He never bothered to explain the underlying physical nature of space as he understood it, nor how those dimensions physically arise and vary with respect to the velocity of his physical space or an observer. He also did not explain how an essentially infinite number of physical spatial reference frames overlay each other and can move relative to one another. Note that

a container type space cannot have a velocity. Only physical objects have velocities.

Einstein had not actually solved the problem. He merely turned space into a new form of aether while still failing to provide a physical explanation for its physical properties.

To this day we continue to have competing definitions of space. In one definition, space is a container that contains everything physical and in another, space is something physical yet unexplained. And now, some physicists try to grapple with a variation of space that is both a physical medium and contains a physical medium. Physicists, and other people who write about space, will often switch back and forth between these three definitions, which further clouds the issue and obscures the underlying problems.

In the end, it is incumbent on physicists that support the space as a physical medium idea, which can be called space-medium, to ultimately provide a physical description of that medium. For now, Einstein's version of space remains a placeholder for some unidentified physical something, to be determined later.

3. The Physical Medium of Space

In analyzing the different models of space, the space as an empty container model does not work as it is impossible to account for the Casimir effect and relativistic frame transformations. Most importantly we cannot account for the physical origin of distance and time.

That leaves the three possibilities above. Fortunately, we are acquiring very good evidence that supports the existence of vacuum fluctuations, which supports the older model of space as a container filled with something that constitutes the medium. Perhaps the best evidence for this is the Cosmic Microwave Background (CMB) radiation.

The existence of the CMB tells us that all space we observe is emitting radiation in the microwave range such that all space is a very low temperature black body radiator. This means first and foremost that there is some substance throughout space that is radiating. Truly empty space cannot radiate.

As far as we can tell, Einstein's model of space does not radiate, as he provided no physical explanation for his space-medium, even less showing that it can radiate. Beyond that, someone would need to provide an explanation for how his space-medium model would radiate a black body spectrum.

The quantum vacuum model for the medium of space does not have such a difficulty. Max Planck showed that his oscillators make ideal black body radiators.[8] As such, all that is necessary is for the quantum vacuum to acquire a non-zero temperature. It is important to note that any hypothetical medium of space must be an ideal black body radiator.

Planck's theory also tells us that the temperature of the quantum vacuum cannot be absolute zero, however we have achieved temperatures well below the CMB temperature, so we can be fairly certain that the CMB temperature is not the quantum vacuum's minimum temperature.

We must also consider that black body radiation due to medium of space is the same over the entirety of observable time, since we look back in time with distance when measuring the CMB. This means that the medium temperature has been constant, homogeneous and stable for billions of years. This also means the mechanism responsible for heating the quantum vacuum must be stable and constant, whatever that mechanism may be.

Given the CMB evidence, it appears that the quantum vacuum is a superior choice for the medium of space when compared to the unexplained space-medium hypothesis.

4. The Physical Origin of Distance and Time

In order to successfully match experiment, the medium of space must account for spatial and time dimensionality of space. As discussed before, nobody ever explained how a space-medium has spatial and time dimensions, or how those dimensions could physically change. Even worse it is not explained how a space-medium is a physical medium with physical properties in the first place.

Vacuum fluctuations on the other hand have both wavelengths and frequencies. They populate all space and as such they establish spatial and time dimensions throughout space. Vacuum fluctuations are the physical origin of the spatial and time dimensions of space.

Vacuum fluctuations necessarily have a rest frame where its properties are neutral. This rest frame is the same as the observed CMB rest frame. This is necessary since the CMB has a measured rest frame, so whatever is radiating the black body spectrum must share that rest frame.

As such, the quantum vacuum gives us a rest frame that is relevant to all frame transformations in relativity theory. This eliminates the paradoxes that come out of special relativity and its hypothetical space-medium without a rest frame. Note that one could hypothesize a space-medium with a rest frame, which would have made a little more sense and avoided the paradoxes.

5. Conclusion

It is clear from developments in physics over the past century, including the experimental evidence for the Casimir effect and CMB, that the idea of empty space with no physical medium is false. It is also clear that starting with a hypothesis of empty space with no physical medium and, consequently, being forced to turn space into a physical medium, is contradictory.

Space cannot be empty of a physical medium and have a physical medium at the same time, even if one is calling space the physical medium. As such, Einstein's theory of special relativity is not only based on a false premise, it is a logical fallacy.

He was also playing kick-the-can-down-the-road as he failed to explain how space is physical and derives its properties of spatial and time dimensions, even less explain how space is able to move past other space, and how that causes physical changes in space's spatial and time dimensions. He replaced one mystery, the classic aether, with another mystery. Invoking one mystery to explain another is logical fallacy. Even worse, since Planck's theory predates special relativity, he invoked a mystery and rejected an excellent theory.

It is also clear, without going into further detail, that Maxwell's conjecture that led to the Michelson-Morley experiment was simply wrong. The null result of the experiment does not mean that vacuum fluctuations do not exist. The modern aether in the form of Planck oscillators does exist.

Additional details about how the quantum vacuum accounts for changes in clock rates and distances in special relativity were not discussed in the interest of brevity, but it can be shown that relativity theory can be accounted for without having to resort to a physical space-medium hypothesis. We can confidently define space as a container that contains a medium that consists of quantum vacuum fluctuations.

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