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# The mystery of the light speed

## Abstract

One of the major topics in the physics is the survey of speed and emission of light. Most physicists believed that light required to a medium to emit into space. They proposed aether, a supposed medium permeating space that was thought to be the carrier of light waves. The Michelson–Morley experiment was an attempt to detect the existence of aether, while their results led to the rejection of this theory. After this, Albert Einstein proposed the theory of special relativity wherein the speed of light is independent of the motion of the observer and it is the same in all situations. Nevertheless, the answer to some of the questions about the emission of the light remains unanswered. The aim of this study is to consider the speed of the light and the reason of its emission into the space. This study presents that based on Galilean relativity the space around matter is moving with the speed of light and any electromagnetic waves that formed result from vibrating charged particles obey from the space that moved with light speed.

**Keywords:** light speed, michelson–morley experiment, special relativity, galilean relativity, electromagnetic spectrum, visible light

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## Introduction

Light is electromagnetic radiation within a certain portion of the electromagnetic spectrum. The word usually refers to visible light, which is the portion of the spectrum that can be perceived by the human eye. Visible light is usually defined as having wavelengths in the range of 400–700 nanometers (nm). In physics, the term light sometimes refers to electromagnetic radiation of any wavelength, whether visible or not. In this sense, gamma rays, X-rays, microwaves and radio waves are also light. Like all types of EM radiation, visible light propagates as waves.[1] The history of light recognition is as much a history of physics. Curiosity about the nature and how light is emitted back to ancient Greece. Different physicists have attempted to measure the speed of light throughout history. Galileo attempted to measure the speed of light in the seventeenth century. He noticed that light does not emit instantaneously and it has a determined speed. An early experiment to measure the speed of light was conducted by Ole Rømer, a Danish physicist, in 1676.[1] Newton examined light from the perspective of being a particle.[1] Thomas Young and Huygens believed that light had a wave behavior.

It was not until the early twentieth century that it became clear that light reflected dual-wave behavior. The special relativity theory proposed by Albert Einstein is based on the speed of light.[2] Physicists have long assumed the existence of a substance called ether in the environment to find the cause of light emitting into the environment.[3] Then the riddle caught their minds that as the Earth orbits the sun, the speed of light is affected by the direction of the Earth's orbit.[3] But two physicists, Michelson and Morley, ruled out the existence of ether in space by a subtle experiment by reflecting light from fixed and moving mirrors.[4] However, Maxwell equated his theories with the existence of ether in space.[5] After rejecting the ether theory, the mathematical fields theory or Einstein's space - time theory took its place. But why did physicists insist that there must be something in space now, whether ether or mathematical fields? Why does light or any other electromagnetic wave need an emission medium to propagate? And why so fast? And why can't anything be faster than light? This article discusses these questions.

## Materials and methods

Related articles and books on the light speed and propagation were used to present the new theory. Using some of the previous theories, a new theory was introduced.

## Results and discussion

To explain the theory presented, should be refer to the Galileo's experiment. The question that struck Galileo's mind was falling objects from a height. Before him Aristotle believed that in a free fall a larger object would hit the ground earlier. Galileo believed that objects in free fall, with any mass, fall simultaneously regardless of air resistance, and he experimentally conducted it. Moreover, he believed all objects in freely falling have a constant acceleration. Galileo also postulated that an object that falls freely from a tower keeps its distance from the tower to the end of the fall without affecting the Earth's motion. This theory is well known in Galilean relativity.[1]

According to this theory, the vertical velocity component is independent from the horizontal velocity component and does not affect each other. Besides, the rules of mechanics are the same for both observers when two observers are moving at a constant speed. Also, any static object that departs from a moving object that is moving at a uniform velocity follows the static object.[2] But why does light emitting from a moving light source not follow the motion of the light source and the transitional motion of the earth?

The second part begins with the assumption that the Big Bang theory is correct. In the initial explosion, where excessive energy was released, light energy was scattered in all directions. Energy in very dense places has become matter that is the same as celestial bodies. According to Newton's First Law, whenever a body is released in a frictionless environment at an initial velocity and does not force the path of the object to be thrown, the object continues its path to infinity at the same initial velocity.[6] We know that light and heat are produced in an explosion. Also assuming the two waves are electromagnetic, so the energy and light from the explosion are propagated at the speed of an electromagnetic wave. If so then Newton's First Law does not

 

force us to move in space because space and celestial bodies must move at the speed of light.

According to Einstein's theory in general relativity, when an object moves at the speed of light, its length decreases in the direction of its motion. Whenever the length of an object becomes zero, its volume becomes zero, and as a result the mass of that object tends to zero. According to Einstein's famous equation ($E=mc^2$), mass is converted to energy and vice versa.[2] Therefore, matter has arisen in areas of space where there has been a divergence of energy and a force in that region has affected the motion of space. It includes celestial objects as I have argued in the previous article and can be seen in the Einstein equation.[7]

The formed components are stars and planets and rotate in a random pattern. But the expanding space has continued to accelerate, which is equals with the speed of light. As a result, the space around each object is propagating at the speed of light and, according to Galileo's relativity, a wave from vibrating particle from the object moving at the speed of Earth follows the motion of the surrounding space at the speed of light. That is why the speed of the waves emitted by the vibrating particles is similar and there is no speed beyond the speed of light in the universe. And that's why the universe is expanding, and the speed of gravitational waves is equal to the speed of electromagnetic waves.

## Conclusion

The speed of light is independent both of the motion of the wave source and of the inertial frame of reference of the observer. This invariance of the speed of light was postulated by Einstein, after being motivated by Maxwell's theory of electromagnetism and the lack of evidence for the luminiferous aether; it has since been consistently confirmed by many experiments. According to the theory presented in this study, the specific speed of the electromagnetic waves is due to the speed of movement of the space around the material, which is flowing at the speed of light.

The speed of these waves is independent of the speed of movement of the light source and the motion of the observer. Because, according to Galilean relativity, the vertical velocity component is separate from the horizontal velocity component and does not affect each other. Based on presented theory, the space around us and the space that surrounds matter and the whole the universe is moving at the speed of light. The motion of an object is a function of the moving object on which it is positioned, such as objects on the planet Earth that follow the motion of the earth. Therefore, the motion of an electromagnetic wave is function of the space around the objects that moves at the speed of light.

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## Conflicts of interest

The author declares there is no conflict of interest.

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