Stationary Points in Space

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Abstract: *When we look at a distant galaxy through a telescope, we do not see that galaxy where it is today, we see it where it was when the light photons we receive were emitted. That tells us that while light photons are emitted by atoms within a star, the points of emission remain stationary in space while the star and its atoms move on. All light originates from stationary points in space. That appears to be what Einstein meant when he wrote that a "'luminiferous ether' will prove to be superfluous" since his theory of Special Relativity does "not require an 'absolutely stationary space' provided with special properties." Wherever a photon is created there is "a stationary point in space."*

Key words: Relativity; Time Dilation; Speed of Light; Photon.

It is an undeniable and proven fact that when light is emitted, the emitter may move on but the point of emission in space remains stationary. The nearest star to our sun is Alpha Centauri, which is 4.367 light years away from our sun. That means that when we look at Alpha Centauri through a telescope, we see it where it was located 4.367 years ago. Farther from Earth, when we look at the Andromeda Galaxy, we see it where it was located 2,537,000 years ago. A star within Andromeda that appears "normal" to us today may have exploded into dust many thousands of years ago.

It is often said that when we look through telescopes at the universe around us, we are looking into the past. And because light typically travels in a straight line from its point of origin to our telescope, what we see is no longer located where we see it.

Additionally, the light from an emitter – be it a star or a common lightbulb - travels at the same speed in all directions, regardless of the speed of the emitter.

Albert Einstein understood this when he stated his Second Postulate in his 1905 paper "*On the Electrodynamics of Moving Bodies*."[1] That postulate was:

> light is always propagated in empty space with a definite velocity *c* which is independent of the state of motion of the emitting body.

Usually, that postulate is simply interpreted to mean that, contrary to "Emission Theory," which was generally accepted as valid in 1905, the speed of the emitter does <u>not</u> add to the speed of the light that is emitted. But that postulate actually says a lot more about the nature of light.

It is often said that "a picture is worth a thousand words," and it might also be said that "a picture is worth ten thousand equations." Figure 1 below illustrates how light is emitted from a stationary point in space.

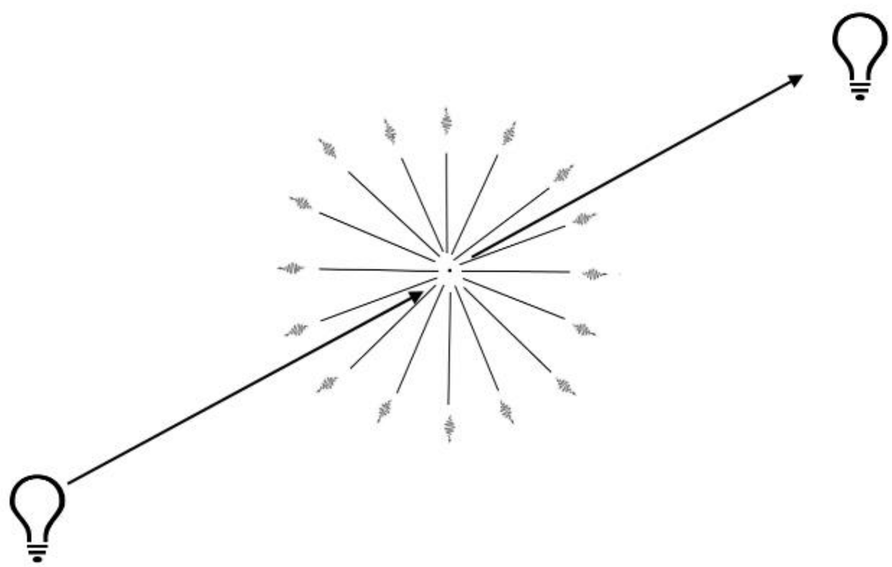

Figure 1

The light emitter (shown as a light bulb, but it could also be a star) travels at high speed through space from the lower left corner of the image to the upper right corner. When it is in the middle of the image it emits an instantaneous burst of photons that spreads out in what Einstein describes as a "spherical wave"[2] moving outward at the speed of light from the "stationary" point of emission. All the photons move at the same speed, "independent of the state of motion of the emitting body." The photons that travel in the <u>opposite</u> direction the emitter is moving travel at the same speed, *c*, as do the photons that travel in the same direction or at any angle to that direction.

These are established and verifiable facts that no one can seriously debate. But there are a number of interesting <u>implications</u> that are not so readily accepted.

The first implication is that the light we see traveled in a straight line from the point of emission to our eyes, even though our eyes are on a planet that is spinning on its axis at over 1,000 miles per hour (mph) while also orbiting our sun at 67,000 mph, while the sun also orbits the center of the Milky Way galaxy at 486,000 mph.

The second implication is that that straight line must have begun at a stationary point in space.

The third implication is that Einstein was correct when he wrote that such a stationary point in space doesn't need any "special properties."[3] It is just a point in empty space that is no different from any other point in empty space.

The fourth implication is that there is clearly no need for any "luminiferous ether," since all light is created at stationary points in space.

The fifth implication is that, if all light is created by moving atoms at stationary points in space, some properties of the moving atoms at that point affect the nature of the light photons that are emitted, regardless of the direction the atom was moving. An atom that is moving faster relative to "stationary space" has more energy than a slower moving atom, giving more energy to the photons it emits.

The sixth implication is that, because all light is emitted from stationary points in space, there can be no "red-shifting" or "blue-shifting" due to the emitter's speed away from or toward an observer on Earth.

The seventh implication is that, since we can usually calculate by triangulation or other means the distance from the Earth to the stationary point in space where a light photon was created, that light can appear to have properties caused by the Earth's motion relative to that stationary point in space. The light will appear to be blue-shifted to a higher frequency if the Earth is moving toward that stationary point in space, and the light will appear to be red-shifted to a lower frequency if the Earth is moving away from that stationary point in space.

The eighth implication is that, because the light from most galaxies appear to us on Earth to be "red-shifted," the universe must be expanding. But it is not expanding away from us, it is expanding away from countless stationary points in space located somewhere between the Earth and those galaxies, the points where each of those stars in each of those galaxies was located when it emitted the light we see.

There may be other implications regarding "dark energy," the nature of gravity, and other topics, but those eight will suffice for our purposes here.

In reality, of course, bursts of photons are usually not emitted in just one instantaneous burst as shown in Figure 1. The photons are typically emitted at frequent intervals as the emitter moves through space, intervals that depend upon how fast the atom is receiving energy that it is incapable of holding and must therefore release as a photon. But, when we receive each of those light photons, we receive each of them in a straight line from the stationary point in space where they were emitted. Due to the high speed at which the photons travel, we do not notice this in our everyday life, but it becomes much clearer when the emitter is significantly further away and the photons must travel vast distances to reach our eyes.

Another key factor is that the atoms that emit the photons have different properties depending upon how fast they are moving relative to those "stationary points in space." The type of atom and the atom's speed through space relative to that stationary point determine the oscillation frequency of the electric and magnetic fields which comprise the photon that is emitted.

Einstein seems to have understood this when he described how motion causes an electron to gain mass.[4] Some energy force caused the atom and its electrons to move through space, and that force adds to the mass of each electron. That means that the mass of the electron tells you how fast that electron is moving through space – even when that electron is part of a tungsten atom in a lightbulb fixed to the ceiling above you in your laboratory, which is fixed to the Earth. It appears "normal" because everything in your laboratory is moving at about the same speed through space, which means Time ticks at about the same rate for everything in your laboratory. But that rate is very different from what it would be at a stationary point in space.

I came across this issue when reading some college physics textbooks. One textbook[5] described how a photon emitted at a 90 degree angle across a compartment within a spaceship traveling at very high speeds would not appear to move laterally but would appear to move in a curve toward the floor. But then the textbook described the curved trajectory to be the result of gravity. Here's a passage from that textbook:

> A light ray traverses a laboratory accelerating upward in empty space. [...] The path of the light ray is straight. However, the laboratory moves upward in the time the light ray takes to cross. The exit point of the light ray is, therefore, lower in the laboratory than the entry point. Thus, for an observer in the accelerating laboratory the light ray falls with an acceleration g. The equivalence principle implies that the same observation is made in a laboratory at rest in a uniform gravitational field. A light ray in a gravitational field must fall with the same acceleration as other objects. Gravity attracts light.

As I saw it, the curve was entirely the result of the speed of the laboratory traveling through the path of the moving photons (not a ray) which were in turn traveling in a straight line from a stationary point in space to some other stationary point in space. Gravity had nothing to do with anything. Nor did acceleration.

Searching through other physics textbooks and sources about physics, I found several which described how gravity causes photons to "fall" toward the earth and thereby gain energy, resulting in the oscillation frequencies of the photons starting out slower at the higher altitude and then becoming faster at a lower altitude. They'd cite the Pound-Rebka Experiment as confirmation of their claims.[6][7]

The clear fact that photons are emitted from a "stationary point in space" says that the properties of an atom, when it is at a point in space, determines the oscillation frequency of the photon that is emitted by that atom at that stationary point. Photons do not change their frequency while traveling from atom to atom. Pound-Rebka demonstrated that due to differences in gravity at different altitudes, photons created at a higher altitude have a higher oscillation frequency than photons created at a lower altitude.[8] "Falling" from a roof to the ground doesn't change the oscillation frequency of a photon. The photon was created with a higher frequency on the roof. A photon created on the ground will have a lower frequency. Gravity and motion both affect the properties of an atom.

Additionally, when a moving photon hits a moving atom and is absorbed by that atom, the receiving atom may be unable to hold the extra energy. In that case, the receiving atom gets rid of that excess energy by emitting a NEW photon – again from a "stationary point in space." If the receiving atom was moving toward the oncoming photon, kinetic energy is added to the new photon, giving the new photon's electric and magnetic fields a higher oscillation frequency than the photon that was absorbed. This is the basic principle that allows radar guns to measure target speeds by comparing the oscillation frequency of the photons the gun emits to the oscillation frequency of the photons that get returned from the target.

The apparently undeniable fact that every photon is emitted from a "stationary point in space," and the fact that the energy of that photon is determined by the creating atom's motion relative to that "stationary point in space," evidently allowed Einstein to realize that such a process eliminated the need for any "luminiferous ether." All photons are emitted at and travel away from "stationary points in space." The properties of the atom that created the photon, and the atom's motion relative to that "stationary point in space," determine the oscillation frequency of the photon's electromagnetic fields.

Everything in our visible universe is moving relative to "stationary points in space." Or perhaps more accurately, everything in our visible universe is moving relative to "stationary space." If you believe "space" cannot be stationary, the facts indicate otherwise.

References

[1] Albert Einstein, *On the Electrodynamics of Moving Bodies,* June 30, 1905, page 20-21, Annalen der Physik 17 (1905) Translation by G. B. Jeffery and W. Perrett, *The Principle of Relativity*, London: Methuen and Company, Ltd. (1923) – page 1.

[2] *Ibid*, page 8.

[3] *Ibid*, page 1.

[4] *Ibid*, page 20.

[5] James B. Hartle, *Gravity: An Introduction to Einstein's General Relativity*, published by Addison-Wesley (2003), page 114.

[6] Kenneth Krane, *Modern Physics*, 3rd edition, published by John Wiley& Sons, Ltd., (2012), page 488.

[7] https://einstein.stanford.edu/content/relativity/q56.html

[8] Robert V. Pound & Glen A. Rebka, Jr., *Apparent Weight of Photons*, Physical Review Letters, Volume 4, Number 7, April 1, 1960.