The Speed of Light Cannot Be the Same for All Observers

Boris Milvich • email: bm@milvich.com • EinsteinsFirstErrors.com

Abstract

The concepts of the constancy of the speed of light for all observers, and that the motion of the source of light cannot affect the speed of light, are universally accepted concepts on all universities and colleges on all five continents and is stated in all physics textbooks throughout the world.

It was shown in Paper #1 [1] that a major error was made in the interpretation of the travel times in the crucial Michelson-Morley experiment, which was supposed to prove the constancy of the speed of light, and that this experiment can no longer be considered its proof. In Paper #2 [2], it was shown that Einstein's concept of the constancy of the speed of light is in contradiction with his principle of relativity. Paper #3 [3] showed that Einstein's principle of non-simultaneity leads to the ability to detect the motion of the earth and measure its speed from within a uniformly moving vehicle, due to the constancy of the speed of light, which, according to Einstein, was impossible to do.

This paper will provide further proofs and arguments against the constancy of the speed of light for all observers by using a system of clocks and timing gates. It will also show the errors in the interpretation of other experiments that were believed to prove this constancy.

The great dilemma of the modern times

The idea of the constancy of the speed of light *relative to all observers* (stationary or moving) is an extraordinary idea—it defies logic, reason and common sense. In physics textbooks, this idea represents a difficult dilemma, or a paradox, as it is often called. It is admitted to be as such by most physicists.

The dilemma is usually demonstrated with moving vehicles of one sort or another, emitting a light beam toward a stationary observer. In some cases, it is a rocket approaching the earth while emitting a beam of light in the direction of its motion; in other cases, it is an automobile moving along a road in the same manner.

These examples usually are accompanied by the question: At what speed does the light beam travel relative to the observer in the rocket (or a moving vehicle) and relative to a stationary observer standing on the ground?

The question appears very simple, yet it has been a perplexing one, requiring some difficult choices. The following quote by Professor Hans Ohanian attests to that:

> "... according to the Galilean equations rule for velocities, the speed of light ought not to be the same in all reference frames. For instance, imagine that an alien spaceship approaching the Earth with a speed of, say, $1.00x10^8$ m/s flashes a light signal toward the Earth; if the signal has a speed of $3.00x10^8$ m/s in the reference frame of the spaceship, then the Galilean addition rule tells us that it ought to have a speed of $4.00x10^8$ m/s in the reference frame of the Earth.
>
> To resolve this paradox either we must give up the notion that the laws of electricity and magnetism (and the value of the speed of light) are the same in all inertial reference frames, or else we must give up the Galilean addition of velocities. Both alternatives are unpleasant ..." [4]

According to Ohanian, there are only two choices here: Either the classical mechanics of Newton and Galileo must be incorrect, or it is the principle of relativity that is not valid.

The usual choice made by physicists regarding this paradox is that all observers in the above example will observe the same speed of light, even though it goes against common sense.

The problem here is that the textbook authors never give an explanation for how the observers "measure" the speed of light in these examples. This "dilemma" or "paradox" of the speed of light is always explained in physics textbooks with words expressing only the belief of the *hypothetical-observers'-creator* that every observer would observe the same speed *c*. In other words, these observers do not rely on any measuring instruments to pass a judgment.

In contrast to the above analysis, let us present an example of a spaceship similar to the one in Ohanian's quote, a rocket flashing a light pulse while passing through a timing gate. The clocks attached to these gates would register the exact time when the rocket and the light pulse pass through the gates. In this way, it will be the *clocks*, not the opinionated observers, that will tell us at what speed the photons of light will travel relative to observers at different locations. We assume here an airless environment.

The gates are placed in a straight line at a distance of 50 meters from one another. Each gate is connected to a pair of clocks. The upper clocks in *Fig. 1* are controlled by the light pulse as it passes through the gates, while the lower clocks are controlled by the rocket as it passes through the gates.

We are also going to assume that all of the clocks are synchronized, so that they all show the same time. This assumption is perfectly valid, as Einstein also used it in a similar situation in one of his thought experiments concerning the concept of simultaneity. He wrote:

> "For this purpose we suppose that clocks of identical construction are placed at the points A, B and C of the railway line (coordinate system), and that they are set in such a manner that the positions of their pointers are simultaneously (in the above sense) the same. Under these conditions we understand by the 'time' of an event the reading (position of the hands) of that one of these clocks which is in the immediate vicinity (in space) of the event ..."
>
> "This stipulation contains a further physical hypothesis ... It has been assumed that all these clocks go at the same rate if they are of identical construction." [5]

As Einstein did in the above example, we understand that the meaning of the *"time"* of an event is *"the reading (position of the hands) of that one of these clocks which is in the immediate vicinity (in space) of the event."*

The event in our case is represented by the passage of a pulse of light or the rocket through a gate.

Our clocks have no pointers; they start from zero and go to a certain number, at which point they are all reset to zero, then continue running in the same manner as before. The clocks are made so that they indicate very small increments of time. Each whole increment indicates 333 nanoseconds, or about a 0.000 000 333 of a second. In this increment of time, the light pulse will travel approximately 100 meters at speed *c*.

At the instant when all of the clocks are showing zero time, the rocket that is moving at a constant speed passes through the first gate, emitting at this instant a light pulse in the direction of its motion, as shown in *Fig. 1*. The passage of the rocket and the light pulse through Gate 1 will stop the two clocks at this gate, so that both clocks will indicate zero time.

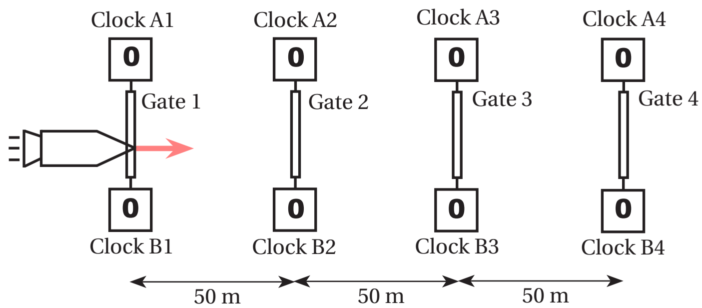

Figure 1

In order for the light pulse to travel at speed *c* unaffected by the speed of the source, the light pulse has to be at Gate 3, 100 meters ahead of the starting gate after one whole increment of time, that is, after about 333 nanoseconds.

If the rocket were able to travel at the incredible speed of half the speed of light, the rocket would arrive at Gate 2 after the same time increment.

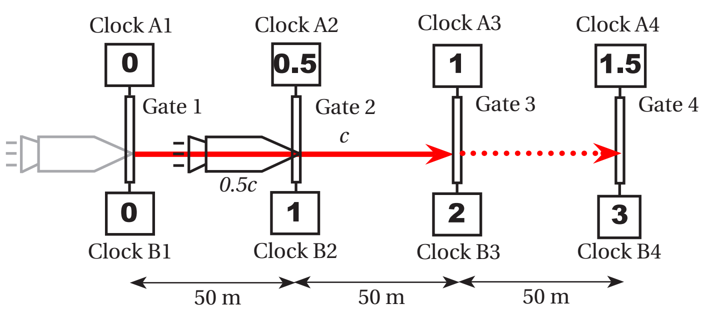

Figure 2

Here are the most important facts of this experimental setting that would be incontestable:

As the light pulse passes through Gate 3, it will stop the clock at this gate, indicating one whole increment of time since it left Gate 1. Because the rocket is at Gate 2 after the same increment of time, the light pulse would be 50 meters from the rocket at Gate 2. That means that the light pulse would have traveled 100 meters in 333 ns relative to the Gate 1 and an observer in it. One hundred meters divided by 333 ns would indeed indicate the speed *c* at which the light pulse is moving relative to the Gate 1 and the observer in it.

Hence, according to the clocks, if the photons of the light pulse stopped the clock at Gate 3 after one whole increment of time (333 ns), this also would mean the pulse traveled a distance of 50 meters relative to Gate 2 (and an observer at this gate). Fifty meters divided by one increment of time (333 ns) yields the speed of 0.5 the speed of light.

In order for the light pulse to travel at speed *c* relative to the rocket, the pulse would have to stop Clock A4 at Gate 4 after one increment of time, while the rocket stops the Clock B2 at Gate 2. The pulse would then travel at speed 1.5*c* relative to the starting gate.

When the light pulse passes through a gate and stops the clock at this gate, indicating that the light pulse was at this specific place in a specific increment of time, the light pulse cannot be at any other place at the same instant of time.

If the above facts are real, true and incontestable and if the photons of the light pulse and the rocket can only be in one specific place at one specific instant of time, we have to conclude that *the photons of the light pulse in the above example cannot travel at the same c speed relative to both the moving rocket and the starting gate*.

Suppose that instead of a rocket we use a laser to emit a pulse of photons to the right; another laser to emit a pulse to the left and an electron gun to emit a pulse of electrons to the right (*Fig. 3*). The setup would be identical to the experimental setting in *Fig. 2*, except that the lasers and electron sources would remain stationary.

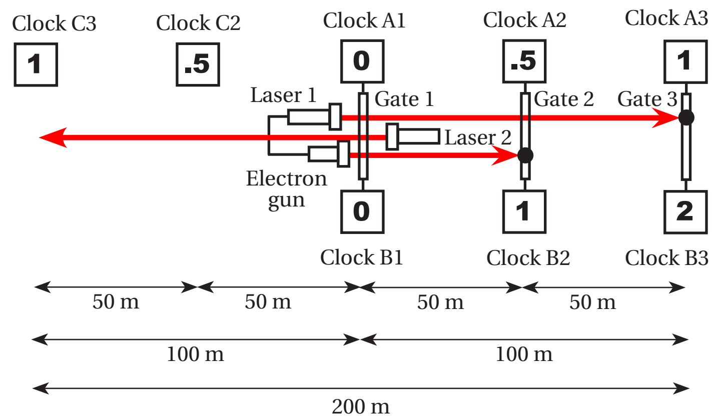

Figure 3

When the lasers emits pulses of light and the electron gun emits a pulse of electrons, the three pulses would pass through Gate 1 at the same time, stopping the clocks at this gate when they indicate zero time.

Because the light pulses travels at speed *c* relative to the stationary Laser 1 at Gate 1, the pulse will cover 100 meters in 333 ns (one whole increment of time) and arrive at Gate 3. In this same amount of time, the electron pulse traveling at half the speed of light will arrive at Gate 2, as this gate is half the above distance, or 50 meters from the starting gate.

The undeniable fact in this setting is that after one whole increment of time (333 ns after the lasers and electron pulses leave Gate 1), the laser pulse will be at Gate 3, and the electron pulse will be at Gate 2, and in no other places.

If the above facts are true and incontestable, then the pulse from Laser 1 will travel 100 meters in one increment of time (333 ns), which yields the speed *c* relative to its source and the starting gate. The distance between the laser pulse and the electron pulse after the same increment of time (333 ns)—after they leave the starting gate—will be 50 meters. When this distance is divided by 333 ns, we get a speed that is half the speed of light (0.5*c*). This is the speed at which the laser pulse must travel relative to the pulse of electrons.

The clocks, not the imaginary observers, would tell us that the photons from Laser 1 traveled at speed *c* relative to the source at rest but at half this speed relative to the electrons in motion.

The pulse from Laser 2, traveling in the opposite direction, will cover a distance of 100 meters in the same increment of time at speed *c* relative to the starting gate and twice the speed *c* relative to the laser pulse arriving at Gate 3, as the distance between the two laser pulses is 200 meters after one increment of time. The 200 m divided by 333 ns yields *2c*.

In the experimental settings presented in this paper, the observers could walk to the clocks, get the readings, measure the distances between the gates, do some arithmetic and only then arrive at certain numbers. With these numbers in their hands, the observers would have no choice but to conclude that the two laser pulses traveled twice the speed of light *c* relative to each other in *Figure 3*, but at speed *c* relative to the starting gate. The pulse from Laser 1 traveled at half the speed *c* relative to the pulse of electrons.

According to Einstein's theory, a photon of light can be at two different places at the same time

An interesting and unexpected fact is surfacing from these analyses that remained hidden in the verbal descriptions of the type of examples found in physics textbooks: In order for the speed of light to be the same for all observers, a photon of light would have to exist in *different places at the same time*.

According to the experiments with the rocket in *Fig. 2*, a photon of light has to be at Gate 4 in order to travel at speed *c* relative to the moving rocket, but it also has to be at Gate 3 at the same instant of time in order to travel at speed *c* relative to the stationary observer at Gate 1.

In the experiment with the laser and electrons in *Fig. 3*, a photon of light has to be at Gate 3 in order to travel at speed *c* relative to the stationary laser at Gate 1, but it also has to be at Gate 4 farther to the right (not shown) in order to travel at the same speed *c* relative to electrons.

No physics textbook or relativity manual has ever proposed such a possibility, nor has such an outcome ever been observed in an optical laboratory. Considering that the gates in this case are 50 meters apart, the possibility of a photon of light traveling at a known speed to be present at two different gates at the same time is unthinkable.

The notion of the constancy of the speed of light relative to all observers is obviously against common sense, and relativists are admitting the fact. While the supporters of classical mechanics rejected this concept, because it contradicted common sense, Einstein and relativists rejected common sense instead, stating that there must be something wrong with it.

Why would that be so?

Because of the results of a few experiments, as interpreted by Einstein and his followers. The most important and most crucial was the Michelson-Morley experiment.

Misinterpretation of the MM experiment led to the theory of the constancy of the speed of light

Einstein and his followers believed that the only possible way the null results of the MM experiment could be explained would be if the light traveled at a constant speed relative to all observers and independently of the speed of its source.

Thus, the interpretation of the MM experiment took precedent over logic and reason in the examples presented here and in physics textbooks. And this is how physicists abandoned common sense.

The following words from Professor Nolan's textbook exemplify the common understanding of the mechanics of the MM experiment, its importance in the emergence of the concept of the constancy of the speed of light for all observers, of the theory of relativity and its subsequent role in the surrender of common sense:

> "But the negative result of the experiment ***requires*** the light to move at the same speed *c* whether the light was moving with the earth or against it. Hence the negative result implies that the speed of light in free space is the same everywhere regardless of the motion of the source or the observer." [6] (Emphasis added.)
>
> "This also implies that there is something wrong with the Galilean transformations, which gives us the *c+v* and *c-v* velocities. Thus it would appear that a new transformation equation other than the Galilean transformation is necessary."[6]
>
> "... Postulate 2 (of relativity) says that the velocity of light is always the same independent of the velocity of the source or the observer. ***This can be taken as the experimental fact deduced from the Michelson-Morley experiment***." [7] (Emphasis added.)

We have seen, however, that the MM experiment does not *require* light to move at the same constant speed in all directions, and independently of the motion of its source, in order to explain the null results of this experiment. Contrary to Einstein's belief, the classical mechanics of Newton and Galileo, which permits speeds *c+v* and *c-v*, can perfectly explain the null results of the experiment from both particle and wave theories of light, as shown in *Paper #2*. Therefore, there is nothing "wrong with the Galilean transformations," as the null results are not in contradiction with the classical principle of relativity. On the contrary, it is Einstein's principle of relativity that is not in agreement with the constancy of the speed of light nor with the results of this experiment, as was demonstrated in this paper and in *Papers #2* and *#3*.

The truth about the Galilean equations and the MM experiment is that when they are used in conjunction with the theory of the existence of the ether. These equations indeed yield the non-null results of the experiment. But the Galilean equations have nothing to do with the ether theory. In other words, it is the ether theory that failed the MM experiment, not the Galilean transformation equations.

When the Galilean transformation equations are used with Newton's theory that there is no such thing as the ether, as shown in *Paper #2*, these equations predict the same travel time *(2L/c)* for the two light beams in the experiment. That is, Newton's theory and the Galilean equations predict the negative result, which is in agreement with the actual outcome of the experiment. In other words, the MM experiment cannot be used as the experimental proof of the theory of relativity or that light travels at speed *c* relative to all observers.

The deception in Einstein's and relativists' concept of observers

Because we have been dealing extensively with observers in this section, this is the appropriate place to discuss the relativistic concept of observers and the frames of reference.

The term "observer" implies an impartial individual who does not care about any theory or about the implications that his or her observations may have.

A true observer simply collects data from instruments, does some arithmetic—like dividing distance by time—and gives us certain facts and numbers. From these facts and numbers we make certain conclusions. The conclusions are strictly guided by these facts and numbers, regardless of our expectations.

Do relativistic observers fit this description?

Not at all.

When relativists refer to observers, their observers are part of the hypothetical theory that gives the illusion of employment of "true" and objective observers. In the statements that "all observers will observe the same speed of light," no relativist or textbook writer ever states how these observers collected the data. Relativistic observers do not carry any kind of measuring devices nor are they independent from the theory that has created them. They are part of the hypothetical theory that cannot be presented with gates and clocks, as was done in this paper.

While the relativistic observer can be biased, or even brainwashed by the theory that has created him, the "true" observer is independent from any theory. He is capable of walking to the clocks, checking readings and measuring distances, which is not the case with the relativistic observer.

The relativistic statement that "all observers will observe the same speed of light" is often reworded using terms like "frames of reference" or "system of coordinates." Hence, the language in the above statement is usually changed to: "All observers in their own frame of reference will observe the same speed of light."

This only confuses the issue, giving the appearance of some geometric validity, as these "frames of reference" are never presented with a diagram, but, instead, their geometry is always described with words.

All of the figures shown in this paper also can be represented as a system of coordinates, but this will not change the essence of their meaning or change the outcomes. The path along which the rocket and pulses travel would be the x axis of such a system, while the starting gate would be the point where the y axis intersects with the x axis. Hence, x=0, y=0 and t=0 would represent the starting point in space and time for the motions of the rocket and pulses.

The position of the rocket in *Fig. 2* after one increment of time *(t')* would be represented by x=50, while the position of the light pulse would be represented by x=100, when t'=333 ns.

Regardless of how we look at this system of coordinates, the photons of the light pulse *can only be in one specific place at an instant of time t*, as is also the case with the rocket and electrons. This fact prevents us from making a statement that, from the point of view of the observers' frames of reference, the light pulse would be in different places at the same time, so that the light pulse could somehow travel at the same speed relative to all observers. The frame of reference of an observer is part of the main system of coordinates and is *subordinate* to it. No scheme of observers or frames of reference can change the fact that the distance between the rocket in position x=0 and the light pulse in position x=150 is 150 meters, and that the light pulse would cover this distance in 333 ns, if clock #B4 in *Fig. 2* shows 1.

Physics textbooks state that *"if you add velocities that are too big, you reach a region where the rules of addition go wrong."* [8]

We are here in this region, and there are no "rules" that could change where the gates, rocket, photons of light or electrons are, so that the addition of distances 50+50+50=150 meters, or the increment of time 333 ns, could be wrong or be something else. The "natural limit to speed," mentioned in physics textbooks, is easy to formulate and describe in words, but to show it in a diagram, as was the case in the last three figures, is impossible.

The system of coordinates and frames of reference are only different methods of analysis, which must produce the same results as those produced by a system of gates and clocks. Relativists thought that their interpretations using a system of frames of reference would yield a different outcome, which would confirm relativistic theory. They did not notice that the reason why their concept of observers and frames of reference were giving the results they *wished* was because they were using part of the truth and altering the rest, which is easy to hide in a verbal analysis. That is why neither Einstein nor any other relativist could draw a diagram or a schematic of the concept that the speed of light is the same for all observers as in the manner done in this paper with clocks and gates.

In spite of these problems, Einstein went a step further: He considered the observations that were based on nonexistent measurements, and made by nonexistent observers, as proof of his theory. In fact, the entire theory of relativity emerged from the view of nature that is based on the hypothetical observers' frames of reference and sustained by this type of imaginary proof.

The speed barrier *c* is being continuously broken

The power and strength that radiate from the experiments with gates and clocks that were elaborated upon in this paper must be incorporated into our overall view of nature.

If we take into consideration that it was the incorrect interpretation of the null results of the MM experiment that was the cause of the abandonment of logic, reason and common sense in the interpretation of the experiments with cars and rockets shown in physics textbooks and represented here with gates and clocks, there are no longer any obstacles in our path of returning to common sense.

Any possible obstacle to this return will be removed by the fact that, contrary to Einstein's statements, the classical mechanics of Newton and Galileo is in perfect agreement with the null results of the MM experiment from both particle and wave theories of light. This is reinforced by the fact that it is Einstein's interpretation of the same results that is in contradiction with the principle of relativity.

Thus, we have regained the freedom to state, without being embarrassed or fearing ridicule, that light *can* travel faster or slower than speed *c*, depending on the speed and direction of motion of an observer.

This means that, as we walk, drive a car or fly in an airplane, the photons of light passing by us are moving relative to us either at a faster or a slower speed than the speed of light *c*. Because everything in nature is in motion, the speed barrier *c* is being continuously broken innumerable times throughout the universe.

Misinterpretation of the binary-star experiment

Because the most important concepts of contemporary physics are based on the concept of the constancy of the speed of light for all observers, moving or stationary, let us further examine the constancy of the speed of light and the experiment that Einstein believed to be its proof. The experiment is known as the binary-star experiment.

Willem de Sitter observed that the light spectrum of the binary stars, which orbit each other at very high speeds, did not change regardless of whether the stars were at one point moving toward the earth or away from the earth, as shown below.

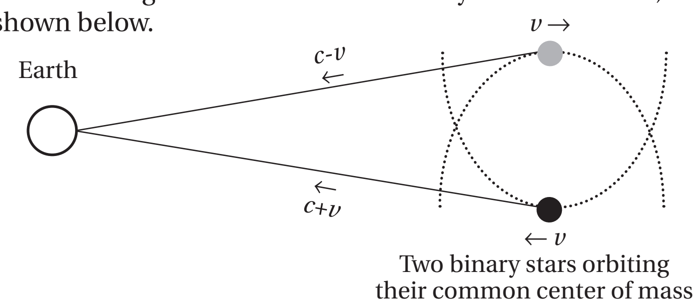

Figure 4

Physicists concluded that this type of outcome can be produced only if the light coming from the two stars traveled through space at a constant speed unaffected by the motion of the two stars.

The binary-star "evidence" was the only evidence, besides the MM experiment, in favor of the constancy of the speed of light for more than half a century. This supposed evidence was finally rejected when it was observed that binary stars are usually surrounded with gases and that the atoms of the gases would re-emit light at speed *c*, thus erasing the speed signature that the light might have had when emitted by the fast-moving stars.

Another objection to the binary-star "evidence" was that there is approximately one atom of gas per one cm^3 in our interstellar space. This density would effectively make the space between the earth and any star completely opaque many times. This opacity would eliminate any speed signature of the native light coming to us from any star through the process of absorption and re-emission of light.

On the other hand, the light from distant stars must pass through the earth's atmosphere, where the light would be absorbed and then re-emitted by the molecules of air at speed *c*.

This theory of the loss of the speed signature of light through absorption and re-emission is called the "extinction theory." According to this theory, the thickness of air at a sea level of about 0.1 mm, or the thickness of glass, about 10^{-4} mm, is enough to wipe out any difference in speeds between the incident and transmitted light. In addition, the light that is reflected off the surface of any matter is reflected or re-emitted by the electrons on the surface at speed *c*, regardless of its incident speed.

This is why it was so difficult to design an experiment or to build an apparatus that would have given us direct proof of the constancy of the speed of light. Every optical instrument contains a lens or a mirror of some sort that would be used to capture the native light. In the process, the signature of the speed of light would be lost.

Binary-star "evidence" became deeply rooted in the minds of physicists

As was the case with the ether, which became so deeply rooted in the minds of 19th-century physicists that they could not get rid of it in spite of overwhelming evidence against it, the belief that binary-star "evidence" was undisputable evidence in favor of relativity became even more deeply rooted. Even now, more than half a century since this theory was rendered invalid, binary-star "evidence" is still considered by many physicists (and textbook writers) as proof of the theory of the constancy of the speed of light and the theory of relativity.

Professor Wolfson used this binary-star "evidence" in 1997 in his audio lecture on relativity to demonstrate its validity. He stated:

> "Let us look at this double-star system for a minute. I have two tennis balls in my hands, and I am whirling them around simulating the double-star system. Now, at one point, this star, the star that is in my left hand, is coming towards you, and the other star is going away from you. If the speed of light depends on the motion of the source, if the speed of light is 186,000 miles a second, or *c*, relative to the source of the light, then the light from the star coming towards you relative to the source of the light is moving faster than the light that is coming from the star moving away from you.
>
> Now, this star may be many many thousands of light years away from the earth, and it's going to take many many thousands of years for light to get to you, and that means over that time the light from the star moving towards you is going to gain significantly on the light coming from the star going away from you.
>
> Consequently what you see on earth is not going to be this simple motion ... it is going to be something much more complicated, due to the fact that at one point the light will be going faster, then moving slower relative to you ... By using a spectroscope, we can figure out what is going on there.
>
> We find that what we are seeing is essentially what is happening. Namely, the stars are simply moving around each other, and we can verify Einstein's laws very nicely for these systems. There is no hocus-pocus dealing with different speeds of light. The speed of light appears to be completely independent from the speed of the source." [9]

Wolfson is saying that the speed of the light rays that are coming to us from distant binary stars, as interpreted by a spectroscope, is the same regardless of whether the rays are coming from the star that is moving away from us or moving toward us. Thus, Einstein's theory of the constancy of the speed of light is supposed to be verified.

It was explained earlier that the light rays from the binary stars would lose their speed signature many times on their way to an observer on earth: first as they leave the gas area in which they orbit, then as they move through space that contains hydrogen atoms, then again as they pass through earth's atmosphere, and, finally, as they pass through the lenses or reflect from the instruments used for their capture.

Einstein also believed that the binary-star experiment was the positive evidence that confirmed his theory. He wrote:

> "By means of similar considerations based on observations of double stars, the Dutch astronomer de Sitter was also able to show that the velocity propagation of light cannot depend on the velocity of motion of the body emitting the light." [10]

Einstein's unequivocal acceptance of binary-star "evidence" as proof of his theory of the constancy of the speed of light and the above words reverberated through the world of physics during the entire 20th and the beginning of the 21st century. Even when binary-star "evidence" was invalidated, it was still used in classrooms of many universities as the evidence of the validity of the theory of relativity.

Neither the fact that Einstein was wrong about the double-star experiment as the proof of the constancy of the speed of light nor the fact that there was no proof of the constancy of the speed of light during Einstein's lifetime is mentioned in physics textbooks. Such is the case with the theory of the extinction of the speed signature of light due to the re-emission of light by atoms. This theory is never explored in contemporary textbooks of physics or optics, and its significance in the debate about the nature of the speed of light is never mentioned.

J.G. Fox, a confirmed supporter of the theory of relativity, had to make the following admission in 1962:

> "In spite of all the experiments and arguments which have been made, dealing with sources of electromagnetic radiation in motion with respect to the observer, a completely certain conclusion cannot be reached, from the experimental point of view, in regards to the second postulate of special relativity (constancy of the speed of light). The material considered as evidence in the past has been shown to be possibly either irrelevant or inconclusive.
>
> "This is a surprising situation in which to find ourselves half a century after the inception of the special relativity." [11]

For more than half a century from the time the theory of relativity was born through Einstein's lifetime, there was no positive experimental proof in favor of Einstein's theory of the constancy of the speed of light.

What happened to the glorious statement found in every physics textbook that the experiment is the only valid proof of the legitimacy of a theory?

If humans can err when creating theories they can also err when interpreting experiments.

The mistake in the method of calculating the relative speed between two fast-moving particles or two spaceships

Professor Nolan presented in his *Fundamentals of College Physics* [12] an example of two spaceships approaching a space station from opposite directions, each traveling near the speed of light, as shown *Fig. 5*.

Nolan presented the following question: "What is their relative speed according to (a) the Galilean transformation and (b) the Lorentz transformation?"

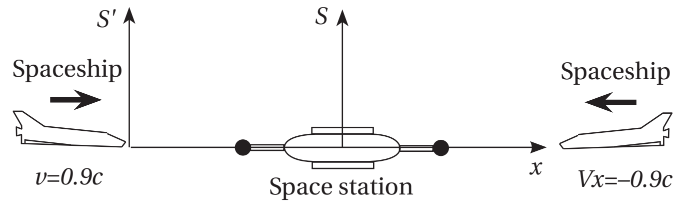

Figure 5

A spaceship is moving from left to right at speed v=0.9c relative to a space station that is at rest. Another spaceship is traveling from the right at the same speed but in the opposite direction of the first one.

The observers in the space station can positively determine the precise locations where each spaceship is and the distances between the two at every increment of time. Neither location nor distance can be contested. The distances divided by time increments would yield the speed of the spaceships relative to each other.

This method would confirm the result that would be obtained using the Galilean transformation equations, that the relative speed between the two spaceships would be the addition of the two speeds, that is, 1.8c.

In contemporary physics, however, the relative velocity between the two rockets traveling near the speed of light but in the opposite direction is calculated using Lorentz's transformation equations. Nolan wrote:

> "According to the Lorentz transformation, the relative velocity of approach as observed by the S' spaceship, given by equation
>
> $$V'_x = (V_x - v)/[1-(v/c^2)V_x]$$
>
> is ...
>
> $$V'_x = -0.994c$$
>
> Thus, the observer in the left-hand spaceship sees the right-hand ship approaching at the speed of 0.994c. The minus sign means that the speed is toward the left in the diagram." [12]

As explained in *Paper #1*, Lorentz's transformation equation for V'_x is derived from the incorrectly calculated travel time of the vertical light beam in the MM experiment, which renders this equation invalid and the calculations meaningless.

This conclusion is confirmed by the experiments in circular accelerators. When the accelerators were first built, the protons were accelerated in a large circle to speeds of 0.999 999c, then guided to a stationary target. Soon afterward, physicists arrived at the idea of accelerating another beam of protons moving in the opposite direction of the first beam and then guiding them to a head-on collision. They expected that these head-on collisions, where the particles of each beam travel at almost the speed of light, would be twice as violent. Indeed, such collisions produced much higher temperatures, and the overall results were in agreement with the assumption that the charged particles traveled against one another at almost twice the speed of light.

But, according to the prevailing theory, Lorentz's transformation equations and Nolan's example of spaceships, the charged particles of the two beams were supposed to travel relative to one another at only a fraction faster than the speed of the individual protons and slower than the speed of light. If they traveled at this speed relative to one another, then they would have collided at the same speed. The results would have been only slightly different from the results when the protons struck a stationary target at the speed of 0.999 999*c*.

But just the opposite is true. The collisions produced results resembling collisions at twice the speed of light.

In changing the design of the accelerator, so that the charged particles collide head-on and produce twice as violent collisions, engineers followed their common sense. If they followed the prevailing theory, they would never have made such a change, as the theoretical change in the relative speed would not have made a significant difference.

The absurdity of the concept that two charged particles would travel against each other only a small percentage faster, when each one travels at near the speed of light, is demonstrated in the next figure.

A proton on the left is traveling at almost the speed of light toward a stationary target. Another proton from the right also is traveling at the same speed, but in the opposite direction, toward the same target.

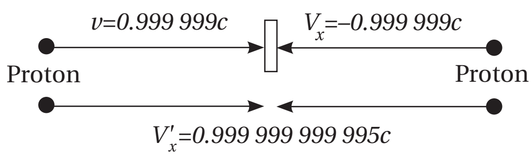

Figure 6

The speed of either proton is 0.999 999*c* relative to the stationary target. But, according to Einstein's relativity and contemporary physics, when the target is removed, the relative speed between the two protons, and the speed at which the two protons are supposed to collide, is only slightly faster than the individual speeds and just slower than the speed of light (0.999 999 999 995*c*). The percentage of change is negligible, less than 0.000 001% of the individual speeds.

Why is it that physicists insist that the protons of the two beams travel just slightly faster relative to one another than their individual speeds, and slower than the speed of light, when the same physicists agree that the results and the violence of the collisions indicate the protons must have collided at almost twice the speed of light, exactly as the designers of the accelerators expected?

Once again, the reason is the blind adherence to unsubstantiated theories, one of them being the theory that light travels at a constant speed relative to all observers, in spite of the overwhelming evidence against it, and in spite of the fact that it contradicts common sense.

Here is a vivid example of where the notions of absurdity in nature come from and why there exists a confusion about the most fundamental concepts of physics.

Einstein's theory of relativity arose from simple arguments and is rendered invalid by equally simple objections

In the hierarchy of arguments against the theory of relativity, the simplest ones are the most important—they must take precedent. The simple arguments presented in this paper are so important that they are sufficient to render the theory of relativity invalid.

The backbone of the theory of relativity are the two postulates. *Postulate 1*, or the postulate of the principle of relativity, was invalidated by the arguments presented in *Paper #2*. *Postulate 2,* or the postulate of the constancy of the speed of light for all observers, is rendered invalid by the arguments presented in this paper and in *Paper #3*.

Postulate 2 is the most fundamental concept of the theory of relativity. It represents the beginning of the theory, as everything Einstein created is based on this concept.

Constancy of the speed of light Reality v. theory

Experiments with gates and clocks shown in this paper represent ***reality*** which is incontestable and unchangeable. However, the constancy of the speed of light for all observers is a *theory*, which is a human product. Since humans make mistakes, theories can change or prove faulty. However, the distances between the gates (50 m), the increments of time (333 nm) in *Fig. 3*, the distance between the two light pulses moving in opposite direction when they arrive at clock C3 and A3 is 200 m, and that the speed is the distance divided by time *(v=d/t),* will always remain unchanged according to any theory.

Hence, *the* ***reality*** takes precedent over ***the theory***.

Even though the constancy of the speed of light for all observers goes against common sense, it was accepted because it was believed erroneously that only this constancy can successfully explain the null results of the MM experiment. The faulty yet categorical statements made by Einstein and by textbook writers that Newton's classical mechanics had failed to explain the same results testify to that.

Unless we can prove that photons of light can somehow exist at different places at the same time, Einstein's *Postulate 2*, or the theory of the constancy of the speed of light for *all observers,* cannot hold.

Proofs presented in this paper, that the speed of light is not constant for all observers, lead to a new law that states: ***The speed of light is constant in a vacuum and only relative to the emitting source and the bodies that are at rest relative to that source***.

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