



Paradoxes of Time

Today is the Spring equinox. Day and night have reached a short equilibrium, a short peace, a kind of armistice: there is equal time duration between them, for a brief moment. The sun rises exactly in the East and sets exactly in the West, not caring for the legal time. Here, on Earth, at this time, prevails a sense of astronomical justice for a while.

This is the time to start thinking about *Time*. By now you're convinced that *Space* must be infinite and must extend beyond the Universe, perhaps including other Universes. Then you are convinced that all this substance that fills the space, could generate a thought, a conscience, the mind of the *Logos*, the mind of *God*. Stop for a moment to think about yourself, about your problems, about the existence of a God just or unjust, that created all these good or bad things to make you feel good or bad in the World and focus instead on solving some paradoxes of the physics of space-time. The first question to ask yourself is: how does God handle everything that happens in his infinite substance? Perhaps He is not a God who intervenes in the affairs of the Universes, but He certainly must be a God looking, studying, judging and thinking. The first thing that is clear is that He must be able to act and think at infinite speed, that is, instantly, to manage His infinite space making sure that His will be done.

Try to solve this problem, from the point of view of the physics that is known: God, to think and act, must do it in a manner contrary to the Theory of Relativity. Don't worry about Einstein, it's not the first time that he has to admit that he was wrong.

The black holes, stopping the light, have already given a big blow to his theory of relativity, which provided that the light is traveling at constant speed "c" everywhere. Einstein first had noticed that the light was slowed down by the gravity of a heavy object and that it stopped in the black holes, of which he doubted the existence. Already in 1919, astronomers had shown, during an eclipse of the Sun, that the light of the stars was deflected by the mass of the Sun, around which was slowing down. This exercise will help you recover for a while from the depression of everyday life, because to solve these paradoxes you should exit out of yourself, become a docile fibers of the kinetic Universe. I assure you that you will feel better afterwards.

This is the problem to be analyzed and to try to solve:

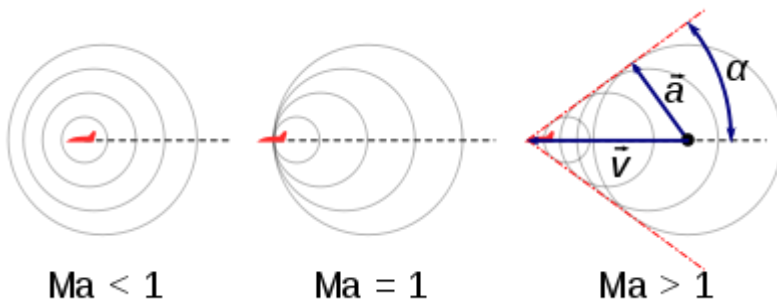
Superluminal speed (faster than light). Do you think that's possible?



Lucky Luke, the world's fastest cowboy, shoots faster than his shadow.

To do this he must overcome the barrier of the speed of light which cannot be overcome in the Universe by particles that have a positive mass between zero and

infinity. Do you think that's possible? The model below shows what happens when an aircraft exceeds the speed of sound (the sound barrier) of 1 Mach.



The wall of sound is about 1,200 km / hr in the air (one Mach). When the aircraft arrives at the wall of sound, the sound waves that were concentric, accumulate in one point, the sound barrier. But then if $Ma > 1$, the plane passes the sound barrier, passes over the center of vibration of the sound waves leaving behind the sound and creating a "bang". Inside the airplane drops a peaceful silence.

The wall of light is 300,000 km / sec in a vacuum.

Since the speed is equal to a space divided by a time: $V = S / T$, also for the light this formula is valid, only remember that we have to write c (celeritas) instead of V , because of Einstein, who was always a little snobbish used the Latin when he could.

So we write the formula for the speed of light: $c = S / T$, where $1 / T$ is the inverse of the time, for example the inverse of one second, that is, 1. What if the time is half a second? The inverse of the time $1 / 0.5$ becomes 2, then c doubles, as 300,000 km divided by 0.5 becomes 600,000 km. But Einstein said that this is not possible because at that speed the mass of the particle would become infinite, in other words it would create a wall of light, a wall impenetrable to the mass.

Let's see why. Let's take the relativistic correction proposed by Einstein to be applied to the mass of a particle moving and don't worry about this formula, even I managed to obtain it (after a week of intense overheating of my poor gray matter):

$$m = \frac{m_0}{\sqrt{1 - \left(\frac{v}{c}\right)^2}}$$

Believe me, this formula has been proved right in millions of experiments.

Since the movement creates kinetic energy, the mass m of a particle increases with the speed according to this formula, where m_0 is the rest mass of the particle, when it stops, and the term in the denominator (called *gamma correction*) represents the square root of 1 minus the ratio to the square of the speed v of the particle, when the particle moves, divided by the square of speed of light c . When this ratio is equal to 1, since the speed of the particle is equal to that of light, the gamma correction of the denominator becomes the square root of $1 - 1 = 0$. Since any number divided by zero becomes infinite, if the mass of the particle at rest m_0 is not zero, the particle acquires infinite mass, which is impossible, because to do so it should have an infinite energy, because of the equivalence between mass and energy. It intervenes in other words the wall of light to stop it. Only if the particle has zero rest mass, like the *photon*, the relativistic correction becomes $0/0 = 1$, and then the *photon* does not change its mass, which remains the same, namely zero, because $m_0 \times 1 = m_0$

Note that to simplify the calculations the speed of light c being a constant is always taken = 1 as suggested by the mathematician Minkowski, professor of mathematics of Einstein, and thus v , the velocity of the particle, depends on the fraction $1 / T$.

If the particle does not move, $1 / T = 0$, because T , the time, is infinite, since any number divided by infinity is zero.

My question is: what happens if the time in the formula $c = S / T$ is zero?

Note: Watch out for the division by zero invented by Brahmagupta! In the new example discussed the time is zero and zero time is the divisor, for this reason the velocity becomes infinite.

In other words, what happens if the motion of the particle takes place with time still, in a space outside of time, where time is always still, or in a black hole where even light stops?

The speed c should become infinite? Einstein says that for a particle with mass different from zero that is impossible because the speed of light should be constant and always equal to $c = 300,000$ (or to simplify $c = 1$) and $c = 1$ is only possible if the space shrivels up to become zero, in front of the particle, so that $c = 0/0 = 1$, then the speed of light is equal to c . And this is what happens to the photon to enable it to travel at the speed of light. A photon has a reality only at the speed of light and his time is stopped, that is, a second of his time becomes infinite. But an infinite speed is possible?

If a particle could travel at infinite speed, what would happen? If that particle and a light signal departed at the same time directed towards the Moon which is located at a distance of about 300,000 km from the Earth the light would arrive in a second and that particle in zero seconds, because it would arrive just as soon as it left and the light would take at least one second. Only tachyons can travel faster than light and sometimes, under certain conditions, even at infinite speed.

Let's see why and let's try to understand what are the tachyons.

A tachyon is a hypothetical particle, since it's not yet found, whose mass squared is negative, that is m^2 is equal to -1 then $m = \sqrt{-1}$

For simplicity we call i the square root of minus one. Then $i = \sqrt{-1}$

$$m = \frac{m_0}{\sqrt{1 - \left(\frac{v}{c}\right)^2}}$$

We apply then this value of m_0 to the formula of the relativistic correction above.

I must admit that this is a mathematical trick to allow the imaginary mass at the numerator of this equation to cancel out with that at the denominator, otherwise the energy of the particle would become imaginary and therefore contrary to the principles of physics. This is not the only trick "ad hoc" of mathematics to allow a particle to do extraordinary things. Think of the photon of mass 0!

Let's start from the formula of Einstein that corrects the mass due to the speed of the particle and suppose the numerator to be $m_0 = i \times 0.1$, that is, that the particle has a small negative mass different from zero and equal to 0.1, while the term in the denominator remains as always equal to gamma. If the tachyon is traveling faster than light, we assume that its speed for example is 0.01 higher than that of light. We can then write the denominator, instead of the square root of -0.01 to avoid the negative sign $i \times 0.001$, where 0.001 is the square root of 0.01. Thus we simplify the gamma correction eliminating the two i which cancel out eliminating the imaginary numbers. Therefore we get that $m_0 = 0.1 / 0.001 = 100$, a number much larger than the mass of the tachyon at rest. The imaginary terms are eliminated and the mass and energy of the tachyon are positive and real, like any self-respecting energy. All this means that because of its superluminal speed, the tachyons acquires a positive

mass, which increases as its speed decreases. From the formula below it can be deduced that if the tachyon has a mass different from zero, if the denominator becomes zero, that is, if its velocity decreases to become equal to that of a photon, its mass becomes progressively larger and it takes an infinite energy to overcome the barrier of light. If instead the rest mass of the tachyon is zero, when its speed becomes equal to that of light, the tachyon is transformed into a photon. Let's study the equation again:

$$m = \frac{m_0}{\sqrt{1 - \left(\frac{v}{c}\right)^2}}$$

When $m_0 = 0$ and also the denominator becomes zero, we obtain, $0/0 = 1$ and the tachyon becomes a photon. Nice, isn't it, this capacity to transform one in the other!

If you followed this simple math so far, the time has come to talk about the tachyons, who are particles of negative mass traveling faster than light.

What does negative mass mean? What are they really? They are possibly the quanta of "expansion", more similar to ultrasounds than to particles. They are exactly the opposite of matter, although not really antimatter. Probably they are formed due to explosions which take place in black holes, in absence of time. They can be formed as well when there are small spontaneous outbursts, caused by quantum fluctuations, outside of the kinetic Universes, where time has stopped or almost stopped. They help God to think and act at infinite speed, linking the various bubbles of time of His substance. They are not only traveling faster than light up to infinite speed, but they cannot travel below the speed of light, because that would require an infinite amount of energy to overcome the barrier of light. Instead, they can easily travel with infinite speed if their energy becomes zero and their mass is zero, because of the principle of equivalence of energy and mass expressed by this famous equation of Einstein:

$$E = mc^2$$

This fact is easily understood by studying this formula correct for the speed of the particle by the gamma correction:

$$E = \frac{mc^2}{\sqrt{1 - \frac{v^2}{c^2}}}$$

When the term at the denominator becomes infinite, because the particle travels at infinite speed, the gamma correction becomes zero, because any number divided by infinity is zero, and therefore the energy of the tachyon becomes zero.

This fact is very useful to God, because it allows Him to think with zero energy outside and inside of the Universes!

Another fact to consider is that if you travel faster than the speed of light, you don't make any "shadow" because your shadow travels at the same speed of the photons. But a tachyon, not only makes no shadow. It precedes its shadow that is linked to the photons. This explains what God told Moses when he asked: *Can I see your face?*

God answered: *No, you can only see my back.*

The explanation of this answer is obvious. God, being outside of time, can only communicate "through Tachyons" at infinite speed.

Well now we understand the reason for this strange divine behavior. I quote what I wrote in the Talmud of Scicli about God:

God is thus the Logos, the Thought, the Consciousness of the Existence and yes, God can think! But we don't know how. We can quote the Bible on this subject where the Prophet says: "For my thoughts are not your thoughts, neither are your ways my ways, says the Lord. For as the heavens are higher than the earth, so are my ways higher than your ways "(Isa: 55, 8.9).

I am sorry if this explanation was difficult to follow, but as Paul Davis said, quoting Maimonides and Galileo: *No one who is totally ignorant of mathematics can grasp the full meaning of the natural order that is intertwined so deeply into the fabric of physical reality.* Because mathematics are the language of God.