Part I: Time without observers

With a time without observers, time is only a sequence of events.

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Wubbo Ockels (Dutch astronaut)

‘Our image of the world is the tool with which we think.’
The picture of the century is the first picture of a black hole. I have included this picture on my websites www.objectivetime.space and www.objectievetijd.nl.

A book that I can recommend to everyone is the book 'Trespassing on Einstein’s Lawn: A Father, a Daughter, the Meaning of Nothing, and the Beginning of Everything' by Amanda Gefter, published in 2014. This book inspired me to look for my own questions, to which natural science currently has no answers.

When international astronomers from the Event Horizon Telescope presented the first picture of a black hole on April 10th, 2019 and showed that this black hole in diameter is four times the size of our solar system and has 6.4 billion times the mass of our sun, I was pleasantly surprised.

In my five year quest I had come up with the concept of objective time. A theory in which Einstein’s theory about ‘stagnant time’ turned out to be right and wrong at the same time. This allowed me to explain why a black hole contains no singularity. The size and mass of the photographed black hole is the proof that my theory about objective time is correct.

The well-known Dutch science journalist and publicist in the field of astronomy, Govert Schilling - an autodidact in the field of astronomy - calls me an 'amateur scientist'. As an amateur scientist in the field of theoretical natural science, I have also been able to obtain the necessary autodidactic knowledge from the internet - with its immense amount of knowledge. In addition, I have an urban development education, in which I am blessed with a strong spatial insight and the ability to see things in a broad perspective.

In preparing this document, my special thanks go to my brother Bert, who regrettable passed away on March 30, 2017. He encouraged me to continue along the chosen path, and my daughter Miranda, who created and managed my websites and often acted as a philosophical sounding board.

Henk Lahuis
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Summary

All his life Stephen Hawking was looking for a solution to the Theory of Everything. Did I find him? No, not. But I think I did find one of the keys to this theory. Also the universe appears to be much simpler to put together with this.

What the key is on the way to a Theory of Everything and how the universe is much simpler can be read in this document.

What is a Theory of Everything? In physics the particles and the forces between them are described by means of fields. A Theory of Everything tries to unite the four fundamental forces (or fields) of nature; the strong nuclear force, the weak nuclear force, the electromagnetic force and the gravity. The first three forces are described by the standard model, a quantum mechanical field theory. Gravity is part of the General Theory of Relativity. A conflict between the two models arises in situations where both should be applied: strong gravity fields on a small scale, for example at a black hole or during the Big Bang. In such cases, it turns out that the combination does not give meaningful results. For example, infinitely large numbers come out. That means something’s not right. So we have to wait for a Theory of Everything. The figure below (in Dutch) summarizes the connections between the fundamental theories:

![Diagram summarizing the connections between the fundamental theories](image)

The designations SU(3), SU(2) and U(1) are the mathematical designations of the theory. More specifically, they are the calibration groups of the corresponding quantum field theory.

To this day, natural science still describes its laws of nature with the help of observers. Einstein used several observers in his Special Theory of Relativity from 1905 and his General Theory of Relativity from 1916. Is there something wrong with that? No, not at all. What Einstein brought, we can be happy with that.

Yet I think that it is precisely the description of the laws of nature by means of observers that prevents us from making a Theory of Everything. Does it matter? Well, surely. For example, I have discovered that the concept of time without observers is very different from time with observers. I am convinced that herein lies one of the keys on the way to a Theory of Everything.

I will introduce you to this key. It starts with the question, what is time? In the many definitions of time we always see two characteristics recurring. The sequence of events and their connection to an observer (or measurement or reference system). A universal
description of time based on these two characteristics is then an 'observation of the sequence of events'.

We realize that nature had no observers in most of its 13.8 billion years of existence after the Big Bang. So why do we link the description of the laws of nature to observers? Without observers, time is simply a 'sequence of events'. Note that you as an observer do not play any role in this.

The core of my 'Objective Time Theory' is time as a 'sequence of events'.

You will see that my Objective Time Theory has enormous consequences for natural science.

When we now make a description of the laws of nature without observers, we see something special happen. With a time like 'sequence of events', a stagnant time in the special theory of relativity loses its raison d'être! Also the concept of space-time, formulated by Hermann Minkowski in 1908, loses its raison d'être. Consequence is that we no longer work with relativistic formulas, length contraction does not exist, the speed of light is not an incorrigible limit and space and time are two separate entities.

As you already understand, natural science will not so easily accept a description of the laws of nature without observers. An important consequence of describing the laws of nature without observers is that in that case the laws of nature always remain valid, even in black holes and the Big Bang! This, I think, is one of the keys towards a Theory of Everything!
Chapter 1  
Objective Time Theory

What is time? As observers of what is happening around us, we have come up with concepts such as past, present and future. In classical physics time was absolute (until the 20th century) or relative (20th century). But what is time really? For that I consulted both the English, German and the Dutch Wikipedia.

English version Wikipedia: Time is the indefinite continued progress of existence and events that occur in apparently irreversible succession from the past through the present to the future.

What is striking about this?
✓ Time is a sequence of events!
✓ Time is linked to an observer, without an observer there is no 'past', 'present' or 'future'!

German version Wikipedia: Die Zeit beschreibt die Abfolge von Ereignissen. Translated: Time describes the sequence of events.

What is striking about this?
Time is a sequence of events!
Time is linked to an observer, without an observer nothing can be 'described'!

Dutch version Wikipedia: Tijd is het verschijnsel waarbij van een gebeurtenis gezegd kan worden dat deze na een andere gebeurtenis plaatsvindt. Translated: Time is the phenomenon whereby an event can be said to occur after another event.

What is striking about this?
✓ Time is a sequence of events!
✓ Time is linked to an observer, without an observer nothing can be 'said'!

Time' has been conceived by man as an observer as an 'observation of the sequence of events'. Without you as an observer 'time' remains just a 'sequence of events'. It is a process of chain of events that is irreversible.

Within the laws of nature, there is no direction of time, the laws of nature treat forward and backward in time equally. Many scientists assume that the direction of time (as observation of sequence of events) is determined by a state of maximum entropy (measure of disorder) as required by the second principal law of thermodynamics. This law says that in a closed system, such as the universe, entropy can only remain the same or increase. However, the direction of time (as a sequence of events) is not determined by the second principal law of thermodynamics, but by causality in sequence of events. Causality (or the law of cause and effect) is the theory that events take place as a result of certain preceding events. However, the second principal law of thermodynamics, like gravity, influences how events follow each other (think of an egg falling on the ground).

Physical theories are contained in mathematical equations. As an observer, we can reverse the factor time (t replaced by -t) without changing the outcome. Fortunately, we can say on a macroscopic scale (anything that can be seen with the naked eye) that time only goes in one direction, namely forward. On the microscopic scale of the quantum world, time plays no role at all.
Time is a good example of both an objective and subjective entity. With an objective entity, existence and nature do not depend on whether someone is aware of it, if no interpretation is needed. Time as a 'sequence of events' is thus an objective entity. A subjective entity depends on the personal view of an individual. Time as 'observation of the sequence of events' is thus a subjective entity. A measurement or reference system is according to many an objective time. However, these systems also require an interpretation and are therefore an interpretation of an 'observation of the sequence of events'. Without an observer, the vibration of an atomic clock is nothing more or less than a 'sequence of events'.

The classical mechanics of Newton (1643 - 1727) with his theory of gravity and Maxwell (1787 - 1856) with his theory of electromagnetism, assumed that time was constant (immutable or absolute) in the universe. Einstein thought in his Special Theory of Relativity that time was not absolute, but relative. In his Special Theory of Relativity the time for two different observers is different and therefore 'relative'.

Einstein was the first who thought that one had to describe laws of nature independently of observers. Therefore he came up with a theory in which all reference systems (observers) with a uniform relative motion (so not in accelerated motion) are invariant (a characteristic is invariant if it does not change from one frame of reference to another), not only for mechanical movements, but also for electromagnetic properties (light). Two observers in a uniform linear motion would be invariant if they both measured the same speed of light (in vacuum). Because of the invariant nature of different observers in uniform relative motion, Einstein believed that his Special Theory of Relativity had to be observer-independent. An observer-independent description of an (subjective) 'observation of the sequence of events'. When Einstein had started from the objective 'sequence of events' he never had drawn up his Special Theory of Relativity. Below it appears that the Special Theory of Relativity is in conflict with being able to go in only one direction of time as a result of the causality in the sequence of events. I will show this by means of a thought experiment.

Not long ago, the series Genius about Albert Einstein (1879 - 1955) was shown on Dutch television on National Geographic's net. In this series he told his friend Michele Besso (1873 - 1955) why he thought time was not absolute but relative.

"Close your eyes Einstein said and imagine you see a train at an incredible speed. Imagine that I am standing on the platform and at the moment the train passes by two lightning strikes strike simultaneously in the front and back of the train. Imagine also that in this same scenario you drive along with the train in the middle of the train. Would the lightning strikes strike at the same time? The answer is of course yes. This answer cannot be correct if the light only has one speed, as Maxwell indicates. Now go back to the moment you are in the train. Then see if you see the two lightning strikes simultaneously. Because the light has one fixed speed, the answer is no. You drive towards one lightning strike and away from the other. When I was still on the platform I saw the lightning strikes strike simultaneously. So how is it possible that I and you on the platform experience the same event differently on the train? Newton's claim that time is absolute cannot therefore be true". With this Einstein told his friend that time was not absolute, but relative.

I can imagine that Einstein really thought that time would stand still if you travel as fast as light. Just think, if the train travels as fast as the light, then his friend would never see the lightning strike at the back of the train and therefore time must come to a standstill if you travel as fast as the light goes. Yet I can show that Einstein's thought experiment is not the whole story.

Imagine, that in Einstein's thought experiment, you put him in the back of the train and his friend Besso in the front of the train. Again lightning strikes simultaneously at the front and back. At the back of the train Einstein sees the lightning strike in his coupe and a little later he sees the lightning strike in the coupe at the front of the train where his friend is sitting. His
friend Besso at the front of the train sees the lightning strike in his coupe and a little later Besso sees the lightning strike in the coupe at the back of the train where Einstein is seated. Time may be relative in Einstein's eyes, but one of them will really have to go back in time to observe the two lightning strikes in the same way, which is contrary to being able to go in only one direction of time as a result of the causality in the sequence of events. The Special Theory of Relativity is therefore in conflict with this.

The physicists among us will say that the story that Einstein told his friend Besso is not correct and that we should assume two clocks (instead of observers) and only one light source (so no two lightning strikes). In annex 1 we see that Einstein does not tell the whole story here either, but that in reality there is no time difference!

A second proof of the fact that a stagnant time in the special theory of relativity loses its right to exist, is shown by the fact that the speed of light is a natural constant. We know that if we want to keep this constant 'constant', the ratio of meters and seconds must increase or decrease equally. Therefore length contraction and time dilatation (dilatation = stretching) are inextricably linked. As we know, in the Special Theory of Relativity, the speed of light is not dependent on the state of movement of the emitting body. The concept of length contraction stems from the Michelson-Morley experiment from 1887 to prove the existence of Ether, see annex 4. We also know that when the concept of length contraction is created, the motion state of the emitting body is taken as the point of departure. So here we see a contradiction to keep the speed of light constant. One is not dependent and the other is dependent on the state of motion of the transmitting body. Because the time dilation and length contraction must go together, it cannot be the case that one is not dependent on and the other is dependent on the motion state of the transmitting body! Here, too, we see that a stagnant time in the special theory of relativity loses its right to exist!

A third proof of the fact that a stagnant time in the special theory of relativity loses its right to exist, is the deep-rooted principle in the Special Theory of Relativity that time stands still when you go as fast as light itself. We see that in that case also for a photon itself time must stand still because a photon after all goes as fast as itself. We know that light is an electromagnetic radiation with a certain frequency for visible light. Frequency indicates the number of waves (the distance between two consecutive points with the same phase) per second. However, when time stands still it is impossible to have a frequency. This means that it is impossible for a photon to exist because its time stands still because of its own speed. Because photons really do exist this means that time cannot stand still.
Chapter 2 No prove of Special Theory of Relativity

Einstein's Special Theory of Relativity indicates that time stands still if you go as fast as light. However, in 1905, if he had assumed time as a 'sequence of events' - a time without observers - he would never have postulated his theory. But all proofs of the Special Theory of Relativity then? In this chapter I will show that these are by no means hard proofs.

Special Theory of Relativity proves itself?

According to the experts, the Special Theory of Relativity, for which there is so much evidence and for which the logical and mathematical foundation is so solid (and simple), can certainly not be called into question. However, relativistic formulas prove themselves, they are self-fulfilling prophecy (see annex 2). Just look at the formula to relativize the speeds of two colliding objects: \( W = \frac{V+U}{1+VU/c^2} \), where \( V \) and \( U \) are the speeds of the two objects and \( c \) is the speed of light in meters per second. Fill in 'c' but 'infinite' and the relativistic formula disappears.

E=mc² proof of Special Theory of Relativity?

Many see the famous formula \( E=mc^2 \) as proof of the Special Theory of Relativity. However, this formula has nothing to do with it. Einstein chanced his original formula \( m=L/V^2 \), dating form 1905, in which \( m \) stands for mass, \( L \) for energy and \( V \) for the speed of electromagnetic radiation, in 1907 into the more popular version \( E=mc^2 \).

Observed time dilation evidence of Special Theory of Relativity?

The fact that we have observed time dilation has everything to do with a curved energy field around mass, as described in part II: Gravity is energy (see also appendix 3).

What about the evidence of antimatter using relativistic formulas?

Quantum theory also goes against intuition. An atom can tremble in a mixture of states, in 'superposition'. Quantum superpositions are usually eliminated by measuring the quantum object. A famous example is 'Schrödinger's cat'. This caused a great philosophical shock in the development of quantum theory, because it seemed to undermine scientific objectivity: the observer influenced the result. Compare this with objective and subjective time, also with subjective time the observer influences the result!

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1 Einstein, A., "Über das Relativitätsprinzip und die aus demselben gezogenen Folgerungen", Jahrbuch der Radioaktivität 4, 1907, pp. 411-462

2 Einstein, A.: Does the Inertia of a Body Depend upon its Energy Content?, Annalen der Physik, 18(1905), pp. 639-641. (September 1905; received September 27, 1905)
Paul Dirac (1902 - 1984) forged the wave equation of the quantum mechanics of Erwin Schrödinger (1887 - 1961) together with the mathematical description from the Special Theory of Relativity of particles moving close to the speed of light. With this he calculated the existence of an antiparticle. However, he had to use a spectacular hypothesis, that seemingly empty space contained an infinite ‘sea’ of negative energy electrons, which filled all possible negative energy states and prevented electrons from decaying into negative energy. He predicted that this sea could contain 'holes': missing negative energy electrons, which would be the equivalent of positive anti-electrons, or positrons. He foresaw the existence of antimatter before it was discovered.

It is therefore questionable whether Dirac's hypothesis of a sea of 'holes' and thus the introduction of the possibility of the existence of antimatter should be seen as the ultimate proof of the Special Theory of Relativity.
Chapter 3  

Length contraction does not exist

In 1887 (six years after the introduction of electric lighting) Michelson (1852 – 1931) and Morley (1838 – 1923) wanted to experimentally demonstrate that the universe would be filled with Ether. It became the most famous failed experiment in history (see annex 4). The existence of Ether could not be proved. To explain the fact that all observers measure the same speed of light regardless of their own state of motion George FitzGerald (1851 – 1901) thought in 1889 that objects shrink or stretch physically just as much that compensates for the effect of an observer's motion and that the speed of light remains constant (in this case, the distance travelled by the experiment through space was taken into account by the distance the light had travelled in the experiment from various directions). In 1892 the Dutchman Hendrik Antoon Lorentz (1853 – 1928) came up with his famous relativistic formula \( \gamma = \sqrt{1 - v^2/c^2} \) with which he could calculate this length contraction. In 1998, Jules Henri Poincaré (1854 – 1912) stated that the speed of light would be an incorrigible limit, if the assumption of length contraction was correct.

Where different observers report differently on the same observation of the sequence of events, each of those descriptions should be understood as relative to a particular observer. A description of a particular system (state and/or values of physical quantities) cannot therefore be understood as an 'absolute' (observer-independent) description of reality, but rather as a formalisation of the characteristics of a system relative to a particular observer. With objective time without observers, length contraction loses its right to exist!


4 FitzGerald, G.F.: The ether and the earth's atmosphere, Science deel 13, nr. 328, p. 390, jaar 1889

5 Lorentz, H.A.: La théorie électromagnétique de Maxwell et son application aux corps mouvants, Archives néerlandaises des Sciences exactes et naturelles, 1892.

6 Poincaré, H. (1905), Sur la dynamique de l'électron'
Chapter 4  Space-time does not exist

Since space and time are interdependent according to the Special Theory of Relativity, not Einstein but Hermann Minkowski (1864 - 1909) introduced the concept of spacetime \(^7\) in 1908, combining the three dimensions of space with a single dimension of time into one four-dimensional entity representing the whole of spacetime. Minkowski thought that if you multiply the speed of light by the time, you have something left, expressed in the unit meter ('second' times 'meter per second' = 'meter'). Because the three tangible dimensions of space (length, height and width) we know are also expressed in the unit meter, Minkowski thought that the four vectors of space and time would be interchangeable in the four-dimensional entity of space-time.

This unified vision stems from the Special Theory of Relativity, which states that space and time are not separate but interwoven. Space and time should not be spoken of as two separate entities, but only as one entity, namely spacetime, which contains all events in the past, present and future in our universe. The four dimensions are measured in the same unit, namely the unit meter when we multiply time by the speed of light. The unification of space and time is illustrated by the common practice of selecting a metric (the measure that specifies the interval between two events in space-time), such that all four dimensions are measured in terms of units of distance: an event represented as \((x_0, x_1, x_2, x_3) = (ct, x, y, z)\), where \(c\) is the speed of light and \(t\) is time.

As described in chapter 1 'time' has been conceived by man as an observer as an 'observation of a the sequence of events'. Without you as an observer 'time' simply remains a 'sequence of events'. However, a process of sequence of events that is irreversible.

Even Stephen Hawking (1942 - 2018) recognizes this in his postmortem book 'Brief Answers to the Big Questions' in chapter 2 'How did everything begin' with the following text: 'We are used to the idea that events are caused by previous events, which in turn are caused by even earlier events. There is a sequence of causality". It is a pity that he did not see the consequences of this.

Hawking also indicated that cosmic inflation lacks general covariance, the main ingredient of Einstein's theory that ensures that each frame of reference contains an equally valid description of the universe. Instead of working with the fully unified four-dimensional spacetime cosmic inflation requires according to Hawking that spacetime is divided into three dimensions of space and one of time (see Amanda Gefter's book \(^8\)).

The concept of 'space-time' becomes nonsensical with time as a 'sequence of events'. A time as 'sequence of events' (or 'existence') cannot be multiplied by the speed of light to get a geometric unit meter. This makes it impossible to get a space-time expressed in four interchangeable vectors, all expressed in the unit meter. Also the translation of this with time as pages in a 'scroll book', where the thickness of the book is a geometric translation of time, becomes nonsensical. No, space and time are really two separate entities. Or rather, space is an entity (even without an observer), but time only becomes an entity when we introduce an observer.


\(^8\) Gefter, A.: "Trespassing on Einstein’s Lawn: A Father, a Daughter, the Meaning of Nothing, and the Beginning of Everything", 2014
Chapter 5    Laws of nature remain valid everywhere

Chapter 1 shows that a standing time in the special theory of relativity loses its right to exist. That means that time does not stop at reaching the speed of light. The greatest consequence of this is that laws of nature remain valid everywhere. The clearest example of a natural phenomenon of which until now it has been thought that laws of nature no longer apply there are black holes.

If the Schwarzschild radius is greater than (or equal to) the radius of the object, then we speak of a black hole. The Schwarzschild radius, named after Karl Schwarzschild (1873 - 1916) who invented the effect in 1916, is the boundary beam of a round object from which the escape velocity is equal to the speed of light. This boundary is an Event Horizon, since the outsider can no longer obtain information about what is happening within this boundary. Once an object goes beyond the Event horizon, it can according to the General Theory of Relativity no longer escape from its underlying gravitational field. The Schwarzschild radius is directly proportional to the mass of the object. Most celestial bodies have a Schwarzschild radius that is many times smaller than the radius of the object: the Schwarzschild radius of the sun is 3 km and the Schwarzschild radius of the earth is 9 mm. With black holes, all mass is within the Swarzschild radius, so the radius of the object is less than (or equal to) the Schwarzschild radius.

Because natural laws no longer apply according to current insights in black holes, science assumes that in black holes the mass is infinitely compressed. The mass would have been compressed in such a way that a singularity arises, in current cosmology a point of infinitely small volume with an infinitely large density.

The tendency of science to summarize everything in mathematical formulas has led us to think that nature has concepts such as 'infinite' and 'nothing'. However, because time cannot stand still at the edge of an Event horizon (assuming a time as 'sequence of events'), it can be assumed that the mass inside the black hole does have a certain size (smaller than the Event horizon, comparable to the size of the black dot in the picture above). In other words, it is not a singularity. And if a singularity in a black hole does not exist, the Big Bang will not originate from a singularity, but from something with a certain size.
Chapter 6  First photo black hole sufficient circumstantial evidence that the Objective Time Theory is correct

International astronomers from the Event Horizon Telescope have succeeded in taking a picture of a black hole for the first time. On April 10, 2019, a photo was presented of a super-heavy black hole and its shadow that is in the center of the Messier 87 (M87) galaxy, about 55 million light-years from Earth. The Event horizon has a diameter of just under 40 billion kilometers and is therefore more than four times larger than our solar system. Observations from, among others, the Gemini observatory show that this black hole is 6.4 billion times heavier than our sun. Our sun has a diameter of 1,392,000 km. If we made our sun 6.4 billion times larger, its diameter would be 1.6 billion km. He would thus be just larger than the orbit of Jupiter around the sun, or Jupiter would "disappear" into it.

The General Theory of Relativity predicted the existence of black holes. The first photo of a black hole is therefore certainly a proof of the correctness of the design of the General Theory of Relativity. But is it also proof for the Special Theory of Relativity?

Because the Special Theory of Relativity indicates that time stands still at the border of an Event horizon, the General Theory of Relativity assumes that in black holes the mass is infinitely compressed. Specifically, the mass of the black hole in the center of M87 (6.4 billion times heavier than our sun) should therefore be at the point of infinitely small volume with an infinitely high density. Imagine an Event horizon four times larger than our solar system. Nothing more behind this Event horizon, except for a singularity in the middle with an infinitely small volume and an infinitely large density. And why? Just because the Special Theory of relativity indicates that time stands still on the edge of an Event horizon.
The Event horizon of the black hole in the center of M87 has a diameter of almost 40 billion km. If we make our sun 6.4 billion times as large, it will have a diameter of 1.6 billion km. Only 4% of the Event horizon of the black hole in the center of M87. Now we know that when matter $1.25 \times 10^{14}$ is compressed, such that all empty space between the atomic nuclei and electrons disappears, a neutron star is created. Doing this also with the mass of the black hole in the center of M87 creates a neutron star with a diameter of almost 52,000 km. A neutron star with a diameter four times larger than the earth. Because neutrons are made from quarks, it is assumed that under even more extreme circumstances, such as in a black hole, neutrons are compressed even further into a star of densely packed quarks. According to super string theory, each particle is composed of a small energy wire, a few hundred billion times smaller than a single atomic nucleus. If we also squeeze this neutron star into a quark star, a star with a diameter of 8 meters remains. That's still no singularity for a long time!

On January 14, 2019, the Las Cumbres Observatory published the article "Some super-heavy black holes show enigmatic outbursts." Moderate eruptions in the area of super-heavy black holes have been observed that persist for more than a year. Around the black hole, the optical, ultraviolet and x-ray radiation increases by about 50% for more than a year before it fades. The explorers do not yet have a good explanation.

When the black hole in the center of M87 is indeed nothing more or less than any other star it is logical that this star produces solar flares. These will be thrown into the universe at a faster speed than the speed of light, after which they will be visible in optical, ultraviolet and X-rays for a longer period of time as they pass the Event horizon.

The observed size and mass of a black hole and the observed eruptions in the vicinity of super-heavy black holes are therefore sufficient indirect evidence that a black hole contains no singularity, that the laws of nature are valid everywhere and that the Objective Time Theory is correct!
Chapter 7  Objective Time Theory and Ockham's Razor

The 14th century English philosopher William of Ockham said: "the simplest explanation must be assumed to be the correct one", a statement now known as "Ockham's razor". What did Ockham's razor say again when asked whether the sun revolved around the earth or the earth around the sun? The movements in our solar system can be explained mathematically with the assumption that the earth is in the middle. However, this results in much more complicated formulas than assuming that the sun is in the middle. The second explanation must therefore be accepted as true.

What does a universe without observers teach us?

What we no longer have:

- no length contraction
- no relativistic formulas
- no stagnant time when you reach the speed of light
- no speed of light as an incorrigible limit
- no laws of nature that no longer apply behind the Event horizon of a black hole
- no singularities at black holes and the Big Bang
- no spacetime
- no second law of thermodynamics that determines the direction of time

What we do have:

- able to travel faster than the speed of light
- Laws of nature remain valid everywhere
- a causality (law of cause and effect) in sequence of events which determines the direction of time

With Ockham's razor, an Objective Time Theory must be assumed to be true.
## Glossary

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<th>Term</th>
<th>Definition</th>
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<tr>
<td><strong>absolute time</strong></td>
<td>Newton’s (classical Theory of Gravity) and Maxwell’s (Theory of Electromagnetism) assumed that time is constant (unchanging or absolute) in the universe.</td>
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<tr>
<td><strong>Big Bang</strong></td>
<td>Georges Lemaître in 1931 had created from General Theory of Relativity that the universe long ago was packed sat. There was one very small, terribly hot sphere of quark-gluon plasma. The term 'Big Bang' was used by Fred Hoyle in 1950 as a derogatory designation for its aversion to the theory of Lemaître. Hoyle himself was in favor of the competitive but now left behind steady state model. After the Big Bang the universe underwent exponential expansion (Cosmic inflation). When cooling down first small structures formed such as protons and neutrons, later on larger structures like stars and Galaxies.</td>
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<tr>
<td><strong>black hole</strong></td>
<td>A region of the astronomical space where the gravity is so strong that even light cannot escape.</td>
</tr>
<tr>
<td><strong>causality</strong></td>
<td>Causality (or the law of cause and effect) is the theory that events occur as a result of certain events that preceded it.</td>
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<tr>
<td><strong>classical mechanics</strong></td>
<td>From the beginning of the 20th century the classical mechanics turned out to be no longer sufficient to all observations. Basic extension turned out to be needed with the General Theory of Relativity and quantum mechanics. Classical mechanics applies only when there is speeds that are small compared to the speed of light, when gravity is not abnormally strong and when the behavior of matter at atomic scale is negligible. In everyday life, the classical mechanics though function sufficient.</td>
</tr>
<tr>
<td><strong>Cosmic Inflation</strong></td>
<td>In 1981 Alan Guth described the idea in which the universe in a short period of time after the Big Bang underwent an exponential expansion. During the tiny time interval of $10^{-35}$ second would the universe between $10^{30}$ and $10^{100}$ times as large.</td>
</tr>
<tr>
<td><strong>Cosmic Microwave Background Radiation</strong></td>
<td>Leftover radiation from the Big Bang, composed of photons whose frequencies by the expansion of the universe is stretched to the microwave area, with a frequency corresponding to the frequency of a 2.7 kelvin heated empty space.</td>
</tr>
<tr>
<td><strong>cosmological principle</strong></td>
<td>The cosmological principle described in 1935 by Arthur Milne is the assumption in Cosmology that the universe on a large scale is isotropic and homogeneous.</td>
</tr>
<tr>
<td><strong>Cosmology</strong></td>
<td>Cosmology is the science that studies the global structure and evolution of the universe.</td>
</tr>
<tr>
<td><strong>dark energy</strong></td>
<td>Cosmologists assume that the universe consists of 69% dark energy, 26% dark matter and only 5% visible matter. It is possible that dark energy is nothing but the energy of the Higgs field, in which the Higgs field has an opposite effect to gravity.</td>
</tr>
<tr>
<td><strong>diffeomorphic transformation</strong></td>
<td>This is a method to mismatched to reconcile points of view by introducing a force, such as gravity. <em>If you want to fit a curve on a straight line, just bend your paper.</em> This is the main tool of the General Theory of Relativity.</td>
</tr>
<tr>
<td><strong>electron</strong></td>
<td>The electron is a negatively charged elementary particle with spin ½ (so it has mass), that can be bound (for example, in an Atom) or move freely in space. Moving free electrons moving through the electric and magnetic fields create free space. The electron has like a photon (massless particle) also golf properties and is subject to the same duality of waves and particles as photons.</td>
</tr>
<tr>
<td><strong>electromagnetic radiation</strong></td>
<td>The whole area of electromagnetic waves (radiation) runs from the very long (low frequency) radio waves, via infrared radiation, visible light, ultraviolet radiation up to and including the very short-wave (high frequency) X-ray and gamma radiation. All types of electromagnetic radiation (and therefore also visible light) have a velocity of 299,792,458 m/s in the vacuum (almost 300,000 kilometers per second).</td>
</tr>
<tr>
<td><strong>entity</strong></td>
<td>An entity is something that existed. The term stresses of the capacity that it is there. Time is a fine example of both an objective and subjective entity. Objective in the form of a 'sequence of events', Subjective in the form of an 'observation of the sequence of events'.</td>
</tr>
<tr>
<td><strong>entropy</strong></td>
<td>Entropy is an important concept in thermodynamics (part of physics that studies the interactions between large collections of particles on a macroscopic level). It is at the most fundamental level a measure of the disorder in a system, or rather the probability, as the number of possible molecular configurations of a macroscopic State (in terms of macroscopic quantities pressure, temperature, etc.) divided by the total number of possible molecular configurations. A State in which macroscopic quantities as pressure and temperature are unevenly distributed over a volume generally has much less realization possibilities than one with an even distribution. The unequal distribution of macroscopic quantities in an isolated system (with a fixed volume, without that energy can go in or out) tends so on statistical grounds for flattening that uneven.</td>
</tr>
<tr>
<td><strong>equivalence principle</strong></td>
<td>In 1907, Einstein devised the principle of equivalence: whoever drops a ball on earth or in an accelerated rocket outside gravitational fields sees no difference. The heavy mass on earth behaves just like the slow mass in the accelerated missile without gravity.</td>
</tr>
<tr>
<td>Ether</td>
<td>A medium from which, to approximately 1900, was assumed that electromagnetic waves traveled within. The whole area of electromagnetic waves (radiation) runs from the very long (low frequency) radio waves, infrared radiation, visible light, ultraviolet radiation to the very short-wave (high frequency) x-ray and gamma radiation.</td>
</tr>
<tr>
<td>---</td>
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</tr>
<tr>
<td>evolution</td>
<td>Charles Darwin's theory of evolution from 1859 is the theory for the evolution of life on Earth. It describes how a specie can evolve: hereditary genes of an animal are transferred to the child from that animal; If an animal has a specific property whereby that can survive better than any other child, that animal has more likely to give birth to that child and so also those good features to that child.</td>
</tr>
<tr>
<td>FLRW-model</td>
<td>The Friedmann-Lemaître-Robertson-Walker model (FLRW model) describes a singularly coherent, homogeneous, isotropic expanding or shrinking universe, so far based on the gravity present in the universe. This model is sometimes called the 'standard model' of modern cosmology, although such a description is also associated with the further developed Lambda-CDM model.</td>
</tr>
<tr>
<td>Galaxy</td>
<td>A Galaxy is a large collection of billions of stars held together by its own gravity is in a globular cluster. We suspect there are is a large black hole in each center of a Galaxy. Our own Galaxy (with 100 billion stars, of which our Sun is one) has a diameter of approximately 120,000 light years (the takes light 120,000 years from one side to the other side). In the universe there are at least 2 quadrillion galaxies (2.000.000.000.000). The total universe has therefore approximately $2 \times 10^{23}$ stars. Whether we are alone or we are the only one in the center of the universe can therefore be answered with a firm no.</td>
</tr>
<tr>
<td>General covariance</td>
<td>Einstein's core principle that there is no preferred way to use the space in space and time on cutting: cut how you like, and the basic Laws of Mechanics remain unchanged. In a world with both observers in accelerated frames of reference (General Theory of Relativity) as observers in uniform (opposite to accelerated) reference frames (Special Theory of Relativity) the General-diffeomorphic covariance transformations must be true.</td>
</tr>
<tr>
<td>General Theory of Relativity</td>
<td>The General Theory of Relativity was published by Einstein in 1916 and replaces and improves the Theory of Gravity by Newton. General relativity is a geometric theory (a theory that deals with determining dimensions, shapes, the relative position of figures and the properties of space), in which it is assumed that both mass as energy curves space-time and that this curvature affects the movement of free particles, including light.</td>
</tr>
<tr>
<td><strong>homogeneous</strong></td>
<td>Homogeneous means that the universe looks the same for all observers, no matter where they are. This means that each large area in the universe has the same average properties, such as matter density and inflationary speed.</td>
</tr>
<tr>
<td><strong>Higgs boson</strong></td>
<td>The carriers of the Higgs-field are called Higgs bosons. On July 4, 2012, it was announced that with the help of the Large Hadron Collider a particle was discovered whose mass corresponds to that of the Higgs boson. Simplistically, Higgs bosons are the clumps in a thick soup (the Higgs-field) through which all particles move; the more Higgs bosons stick to a particle, the more difficult it moves and the more mass the particle that moves through it has.</td>
</tr>
<tr>
<td><strong>Higgs-field</strong></td>
<td>The Brout-Englert-Higgs field (BEH field or Higgs-field for short) explains the existence of inertia with the addition of an extra energy field to the standard model. The Higgs-field exists to make the standard model of particle physics beating. The Higgs-field is an omnipresent energy field, from which all particles derive their mass.</td>
</tr>
<tr>
<td><strong>invariant</strong></td>
<td>An observation (with an observer in unidirectional rectilinear movement) is invariant when the one observation (with an observer in unidirectional rectilinear motion) measures the same speed of light (in vacuum) as the other perception. A characteristic is invariant if it does not change from one frame of reference to another.</td>
</tr>
<tr>
<td><strong>isotropic</strong></td>
<td>Isotropic means that the universe looks the same in any direction for an observer. The isotropy of the universe can be seen in the Cosmic Microwave Background Radiation which produces the same temperature in all directions with only very minor abnormalities.</td>
</tr>
<tr>
<td><strong>kinetic energy</strong></td>
<td>A moving object has kinetic energy.</td>
</tr>
<tr>
<td><strong>Length contraction</strong></td>
<td>When two objects are moving relative to each other, they see each other in terms of length shorter than they would do in a stationary position. This phenomenon is observable at very high speeds, which approach the speed of light. It is called length contraction or lorenzcontractie and is a property of the Lorentz transformation. It also occurs at low speeds but is not measurable.</td>
</tr>
<tr>
<td><strong>light</strong></td>
<td>The three variables that describe light (consisting of photons) are light intensity (or amplitude), color (either frequency or wavelength) and the polarization, or the direction of the vibration which is always perpendicular to the propagation direction. The photon is actually an information carrier of past events.</td>
</tr>
<tr>
<td><strong>Light-year</strong></td>
<td>A light-year is the distance light travels in one year. Completed this is 9.5 trillion kilometers (9,500,000,000,000 km). The nearest star Proxima Centauri has distance of 4.3 light-years. The light has traveled more than four years from the star to the Earth. The nearest galaxy in addition to our Galaxy is the Andromeda Galaxy 2.2 million light-years away. The light we receive from that Galaxy left 2.2 million years ago. Astronomers often work with another remote size, namely parsec (abbreviated 'pc'). One parsec is equal to 3.26 light-years. Proxima Centauri is on 1.32 parsec. The Andromeda Galaxy is on 0.675 Mpc (Mega parsec, the prefix mega means million).</td>
</tr>
<tr>
<td><strong>Livable planets</strong></td>
<td>We search for exoplanets that are located in a zone around a star where life is possible as shown on Earth. The most important factor in this is the temperature to allow water, a key condition for life as we know it, not freezes or evaporates (between 0 and 100°C). The degree of quality of life is expressed in ESI (Earth Simmilar Index).</td>
</tr>
<tr>
<td><strong>Lorentz transformation</strong></td>
<td>The Lorentz transformation, named after its discoverer, the Dutch physicist Hendrik Antoon Lorentz, forms the basis of the Special Theory of Relativity. This theory was posited to remove the contradictions between the theories of electromagnetism and classical mechanics. Specifically, if an object that has a length $L_o$ when standing still moves with a speed $v$ relative to an observer, it seems that object than just a length $L$, $L=L_o/\sqrt{1-V^2/C^2} = L_o/\gamma$ with $\gamma$ being the Lorentzfactor.</td>
</tr>
<tr>
<td><strong>Nuclear fusion</strong></td>
<td>For many years the fission of heavy atomic nuclei (for example uranium) energy released in nuclear power plants used for electricity generation. Nuclear fusion is the fusion of the nuclei of different atoms, with a different, heavier nucleus is formed. When atoms of light elements such as hydrogen, fuse together a part of the mass is converted into energy. Nuclear power stations that work with nuclear fusion will probably only become operational in 2050.</td>
</tr>
<tr>
<td><strong>objective</strong></td>
<td>An objective entity is an entity whose existence and nature does not depend on whether someone is aware. The universe is a fine example of an objective entity. Objective means it is independent from the view of people, When there is no interpretation needed.</td>
</tr>
<tr>
<td><strong>photon</strong></td>
<td>Photons (massless particles) are a form of electromagnetic radiation. Depending on the measuring setup radiation (a form of energy) will occur as waves or like a stream of massless particles, photons.</td>
</tr>
<tr>
<td>quark</td>
<td>Quarks are the elementary particles (a particle that is not split in other particles). There are six types of quarks, known as flavors. <em>Up</em> and <em>down</em> for everyday normal matter (also called Hadronic matter). <em>Charm</em> and <em>strange</em> in particles and photons with high energy that reach us from deep space. <em>Top</em> and <em>bottom</em> are only formed under extreme conditions, such as in particle accelerators and in the Big Bang. They have a lot more energy (are heavier) than <em>up</em> and <em>down</em>. For every quark there is an antiparticle, an antiquark with opposite charge.</td>
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</tr>
<tr>
<td>quark-gluon plasma</td>
<td>In the twentieth century showed that the atomic nucleus is made out of smaller particles: the positively charged protons and electrically neutral neutrons. These are held together by the strong force in the core, also called nuclear force. Protons and neutrons were found in particles, which we call quarks, quarks also subject to the strong force. Each proton and neutron contains three quarks. In addition, protons and neutrons 'glue particles' hold together the quarks. These so-called gluons are to be seen as the carrier particles of the strong force. In addition, they form a significant portion of the mass of the protons and neutrons. An extremely high temperature and density creates a quark-gluon plasma. It is thought that in the first 20 to 30 microseconds after the Big Bang there was a quark-gluon plasma.</td>
</tr>
<tr>
<td>Relativistic formula</td>
<td>Classical mechanics are converted with relativistic formulas into formulas that in accordance with the Special Theory of Relativity fit speeds towards the speed of light.</td>
</tr>
<tr>
<td>relative time</td>
<td>Einstein coined in his Special Theory of Relativity that time was not absolute, but relative. In his Special Theory of Relativity time is different for two different observers and is therefore 'relative'.</td>
</tr>
<tr>
<td>Singularity</td>
<td>A place where the space curvature is infinite and the laws of General Theory of Relativity, along with all notions of space and time, lose their meaning.</td>
</tr>
<tr>
<td>space-time</td>
<td>Space-time (in 1908 postulated by Minkowski, not by Einstein) is in physical theories described as three dimensions of space dimensions (length, height and width) combined with a single dimension of time to one four-dimensional entity called space-time. By multiplying the time with the speed of light we can describe any random place in the universe in four interchangeable vectors, all expressed in units of meters.</td>
</tr>
<tr>
<td><strong>Special Theory of Relativity</strong></td>
<td>In 1905 Einstein devised in its Special Theory of Relativity that space and time depend on each other. The speed of light would be an incorrigible limit (there is nothing faster than light). The Special Theory of Relativity says that your time will stand still soon as you reach the speed of light. A speed according to the Special Theory of Relativity you will never achieve.</td>
</tr>
<tr>
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</tr>
<tr>
<td><strong>speed of light</strong></td>
<td>The whole area of electromagnetic waves (radiation) runs from the very long (low frequency) radio waves, infrared radiation, visible light, ultraviolet radiation to the very short-wave (high frequency) x-ray and gamma radiation. All types of electromagnetic radiation (and thus visible light) have in the vacuum a speed of 299,792,458 m/s (almost 300,000 kilometers per second). According to one of Maxwell's equations, the speed of light waves in vacuum is determined by the inverse of multiplying electric permittivity of vacuum and magnetic permeability of vacuum (both natural constants). The speed of light in vacuum is therefore also a natural constant. Electrical permittivity is a physical quantity that describes how an electric field influences and is influenced by a medium. Magnetic permeability indicates the extent to which a material polarizes magnetically, so focuses on the magnetic field and thus amplifies it. The speed of electromagnetic radiation is expressed with the term 'c' from the Latin 'CELERITAS'. The same 'c' in the famous formula ( E=mc^2 ).</td>
</tr>
<tr>
<td><strong>steady state model</strong></td>
<td>The steady state theory is a model of the universe proposed that the universe always was and always will continue to expand (the steady state model). This theory is drawn up in 1948 as a counterpart to the Big Bang Theory from dissatisfaction with the fact that this theory had a beginning (a 'moment of creation').</td>
</tr>
<tr>
<td><strong>String Theory</strong></td>
<td>A theory that states that all different kinds of elementary particles are based on one-dimensional vibrating energy wires, but that does not necessarily use supersymmetry (in which the laws remain unchanged when particles with a healing spin - force particles - are exchanged with particles with a half spin - matter particles). Sometimes also used as a shortened spelling for super-symmetry theory, the theory in which the elementary components are one-dimensional loops (closed strings) or loose pieces (open strings) of vibrating energy, and which merges the general theory of relativity and quantum mechanics.</td>
</tr>
<tr>
<td>Schwarzschild-radius</td>
<td>The Schwarzschild-radius (named after Karl Schwarzschild, who has figured out the effect in 1916) is the border radius of a round object (usually a black hole) from where the escape velocity is equal to the speed of light. This limit is an event horizon, since the outsider no more can acquire information about what is happening within this boundary. If an object goes past the event horizon it can no longer escape the gravitational field behind. The Schwarzschild-radius is directly proportional to the mass of the object.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>subjective</td>
<td>Subjective means the personal view of an individual.</td>
</tr>
<tr>
<td>Supernova SN 1987 A</td>
<td>On February 24, 1987, the brightest supernova was observed in recent history, located on the edge of the Tarantula Nebula in the Great Magellanic Cloud. A galaxy with a diameter of 14,000 light years and a satellite system of our galaxy. It was also the first supernova known for its star to explode. A star charted in 1970 by the Romanian-American astronomer Nicholas Sanduleak, known as GSC 09162-00821. The star is also called Sanduleak's star. A blue-white super giant with a diameter 40 times that of our sun, at a distance of about 168,000 light-years. So in fact the star exploded some 168,000 years ago, even before Homo Sapiens made his appearance on earth. The image in chapter 7 is an artist-impression based on observations of low-frequency radio waves from ALMA, the largest radio telescope in the world, visible light through the Hubble Space Telescope and high-frequency X-rays from NASA's Chandra X-ray Observatory. These observations revealed for the first time a three-dimensional image of the distribution of the expelled material. In the middle is the central, expanding debris cloud, the remnant of the violent star explosion. The origin of the two curious rings is still a mystery.</td>
</tr>
<tr>
<td>tessaract</td>
<td>A tessaract is a four-dimensional object, a hypercube.</td>
</tr>
<tr>
<td>Thermodynamic dissipation theory for the origin of life</td>
<td>The in 2014 by Jeremy England published theory that assumes in nature arbitrary groups can organize themselves to molecules to absorb and dissipate the heat from the environment more efficiently. Nature would be able to arrange molecules to distribute energy more efficiently. This would be the mechanism behind evolution.</td>
</tr>
<tr>
<td>vector</td>
<td>In mathematics, a vector is an element of a vector space and hence a non-specific understanding. Vector spaces are generalizations of our ordinary three dimensional space, in which three points proposed by their coordinates x, y and z. Such points, understood as arrows from the origin to the point (x, y, z) were the first one to call vector. Such an arrow in the geometry and physics a greatness for both size and direction, such as displacement, velocity, acceleration, force and such. Only the zero vector has no direction.</td>
</tr>
<tr>
<td><strong>Warp-technology</strong></td>
<td>The warp technology is a fictional technology from the TV series <em>Star Trek</em> to move a spacecraft with greater speed than the speed of light. The principle on which this drive should work is the contraction (to warp, distort) the space before you in front of you, so that the actual travelled distance becomes smaller and you have an effective displacement that is faster than the speed of light without violating the Special Theory of Relativity.</td>
</tr>
</tbody>
</table>
Annex 1  Einstein's thought experiment with mirrors

In 1923 (9), the postulates describing the Special Theory of Relativity by Einstein, Lorentz, Minkowski and Weyl in *The Principle of Relativity* are expressed as follows:

1. ... the same laws of electromagnetism and optics shall be valid for all reference systems for which the equations of mechanics apply.
2. ... light always propagates through the vacuum at a fixed speed c, which does not depend on the state of movement of the emitting body.

To show that time is relative and would almost come to a standstill if we approach the speed of light, Einstein later often used the example of a clock consisting of two vertical mirrors (instead of lightning strikes). Between them a beam of light bounces back and forth. Every time the light hits a mirror, the clock 'ticks'. So if the distance between the mirrors is one meter, the clock ticks 300 million times per second (the speed of light is 300,000 kilometers per second).

Now suppose the clock is in a fast moving train. What does Einstein, standing on the platform, see on the train with the clock passing by? For Einstein, the light not only moves in a vertical direction, because in the time that the beam of light moves from one mirror to another, the train travels a distance. Einstein on the platform sees the light go up and down in a zigzag form (for Einstein the mirror in the train is in motion, see picture above). For Besso (which is in the middle of the train near the clock), the light only moves up and down (for Besso, the mirror does not seem to be in motion, but at rest, see picture above). But because the speed of light is the same for everyone, the clock in the train for Einstein on the platform has to tap more slowly (in other words: So Besso in the train ages less quickly, while Besso itself doesn't notice that).

According to Einstein, this example shows that space and time do not form a fixed framework in which we live, as Isaac Newton thought. Space and time form one whole that forms itself according to your perspective. What you see, where you see it and how fast you see it are all determined by the movement you have. In other words: time and space are relative.

However, we see here that Einstein again does not tell the whole story. Einstein measures the time on the platform with an exact same clock (two mirrors with an interval of one meter) than Besso measures the time in the train. In the example Einstein 'forgets' for convenience that the information he gets about the clock in the train travels the same way to get to his eye than the vertical distance in the zigzag clock in the train. In other words, he must add the time the light travels to get off the train to his own clock. What appears then? Both clocks keep ticking at the same speed. In other words, time passes equally fast for both Einstein and Besso, so there is no time difference!

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We must describe the time independently of the observer. Einstein would say that we should only consider the light clock in the train. When the train is stationary, the light goes up and down. When the train starts moving, the light goes up and down in a zigzag movement, so the clock goes slower than when the train is stationary. When the train reaches the speed of light, the light clock also stops. Precisely according to Einstein's Special Theory of Relativity. Here too, however, something goes wrong. In this case we measure time by a specific distance, linked to seconds (speed of light in meters per second). Nowadays we measure time using atomic clocks (for example in cycles of the radiation that belongs to the transition between two energy states of the isotope 133H). In this case, the distance travelled at a speed in meters per second does not play a role. Of course, it remains that we have measured time dilatation (see chapter 2).
Annex 2 Circle reasoning

As described in chapter 2, relativistic formulas prove themselves, they are self-fulfilling prophecy (or circular reasoning; it is so because it is so). This will be shown below by means of a muon.

Time dilatation has already been confirmed decades ago, by observations of 'elementary particles' ¹⁰, which have very small masses (usually $10^{-30}$ to $10^{-27}$ kg) and therefore require little energy to be accelerated to speeds near the speed of light. Many of these elementary particles are not stable and decay to lighter particles after some time.

In the laboratory the lab technician measures a speed of the muon $v = 0.6 \, c$, or $1.80 \times 10^8$ m/s. The lab technician measures an average life span of $2.8 \times 10^{-6}$ s and he measures a distance of 500 meters before it expires.

The Special Theory of Relativity says that the average life span of a muon at a speed of 0.6 c gives an average life span of $2.2 \times 10^{-6}$ s. When this lifetime is multiplied by the speed $1.80 \times 10^8$ m/s we get a traveled distance of 400 meters. This is shorter than the measured distance. Since the time runs slower for the muon at a speed of 0.6 c, it travels a distance of 1.25 times 400 meters = 500 meters. Exactly what was measured in the laboratory!

However, when I recall Einstein's words: "... light always propagates through the vacuum at a fixed speed c, which does not depend on the motion state of the transmitting body", I see that the addition "which does not depend on the motion state of the transmitting body" also applies to measuring the speed of a muon. In this case we measure the actual life span of the muon at the moment of origin until the end, independent of the motion state of the transmitting body.

We measure a speed 0.6 c of the muon, an average life span of the muon of $2.8 \times 10^{-6}$ s and a covered distance of the muon during its average life span of 500 meters, before it expires. Exactly what was measured in the laboratory!

Annex 3   Time dilation

As described earlier, time is a sequence of events. Time elongation or time dilatation is in conflict with a stretching of sequence of events. However, time dilatation is not about stretching the sequence of events, but about stretching the observation of sequence of events. The observation of sequence of events takes place by means of atomic clocks. It strongly seems that with an increase of energy level in the Higgs-field around mass a change in cycles of the radiation belonging to the transition between two energy states of the isotope $^{133}$H takes place, causing time dilation. My earlier explanation with regard to kinetic energy (see part II: Gravity is energy) could also give possible explanations (because of the rotation of the earth) in observed time differences with planes flying in opposite directions around the earth.

Time dilatation or time elongation (dilatation = stretching) is the phenomenon that according to one observer the time of another observer is slower. A distinction is made between time dilatation in connection with movement (kinetic time dilatation) and time dilatation in connection with gravitation (gravitational time dilatation).

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Time Dilation Effects on Earth

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Both gravitational time dilation and kinetic time dilation are influenced by the curved energy field around mass, as can be seen in the image above.

**Gravitational time dilation:**

If an object, which is placed in a (uniform) gravitational field with acceleration $g$, is $h$ meter ‘lower’ than any other object, the time there is a factor $(1 + gh/c^2)$ slower, or:

$$t = t'/(1+gh/c^2)$$

$t$ ... time indicated by clocks on earth
$t'$ ... time indicated by the clock in the spacecraft
$g$ ... acceleration (on earth approximately 10 m/s$^2$)
$h$ ... relative height relative to the earth

Stagnant at 300 km above the surface of the earth, for example, the time is 1 ms/year faster than on the surface of the earth. Far from the Earth it is 20 ms/year faster. In LEO (Low Earth Orbital), the time is 30 ms/year slower than far from the Earth, so 10 ms/year slower than on Earth; here, the effect of the speed is therefore much greater than the opposite effect of the gravity potential smaller in absolute value.

The above formula does not take into account time dilation based on the mass of an object (earth or for example a black hole). With a black hole the time will slow down much more than with the earth. This has to do with the Schwarzschild radius.

The formula for the Schwarzschild radius is proportional to the mass:

$$r_s = \frac{2Gm}{c^2}$$

which:
- $r_s$ is the Schwarzschild radius, in [m];
- $G$ is the gravitational constant, it is $6.67 \times 10^{-11}$ [Nm$^2$/kg$^2$];
- $m$ is the mass of the object, in [kg];
- $c$ is the speed of electromagnetic radiation, which amounts to 299 792 458 [m/s].

When the above formula for gravitational time dilation takes into account the Schwarzschild radius (mass of an object) we change $c^2$ in $2Gm/r_s$.

The formula for gravitational time dilation then becomes:

$$t = t' / (1 + gh_{rs}/2Gm)$$

$t$ ... time indicated by clocks on earth;
$t'$ ... time indicated by the clock in the spacecraft;
$g$ ... acceleration (on earth approximately 10 m/s$^2$);
$h_{rs}$ ... relative height with respect to the earth;
$r_s$ ... the Schwarzschild radius, in [m];
$G$ ... is the gravitational constant, it is $6.67 \times 10^{-11}$ [Nm$^2$/kg$^2$];
$m$ ... the mass of the object, in [kg].
**Kinetic time dilation:**

As can be seen in the image above, time dilation would occur (Orbital speed slowdown). Theoretically, the possibility exists that the Net orbital time gain is equal to gravity speedup. Assuming that motion indeed causes a time dilation, it could only be calculated with a comparison between speed of the object and the speed of electromagnetic radiation with the formula $t = t' / \sqrt{1 - v^2/c^2}$.

$t$ ... time indicated by clocks on earth  
$t'$ ... time indicated by the clock in the spacecraft  
$v$ ... relative speed of the spacecraft relative to the Earth  
$c$ ... speed of electromagnetic radiation

When the above formula for kinetic time dilation takes into account the Schwarzschild radius (mass of an object) we change $c^2$ in $2Gm/r_s$.

The formulas for kinetic time dilation then becomes:

$$t = t' / \sqrt{1 - (v^2r_s/2Gm)}$$

$t$ ... time indicated by clocks on earth  
$t'$ ... time indicated by the clock in the spacecraft  
$v$ ... relative speed of the spacecraft relative to the Earth  
$r_s$ ... the Schwarzschild radius is, in [m];  
$G$ ... is the gravitational constant, it is $6.67 \times 10^{-11}$ [Nm²/kg²];  
$m$ ... the mass of the object, in [kg];

Note that the kinetic time dilation in 'deep space' due to the lack of gravity and therefore the Schwarzschild radius is zero, the kinetic time dilation is nil (even if kinetic energy is added by acceleration). Traveling faster than the light is indeed possible!

*Time dilation no proof of Special Theory of Relativity:*

When time dilatation with the help of atomic clocks was actually measured, this was seen as the ultimate proof of the correctness of the Special Theory of Relativity. As can be seen from the above, however, it is quite possible that time dilatation consists exclusively of gravitational time dilatation. The displayed net orbital time gain is then the Gravity speedup. Smoothing off the Orbital speed slowdown then corresponds to reduced influence of gravity.
Annex 4  The Michelson-Morley experiment

To prove the existence of ether, Michelson and Morley developed an experiment in 1887. With the help of an interferometer they wanted to prove the existence of ether as a medium for light waves. Since the earth moves through that ether, the speed of light waves relative to the ether should be different depending on whether the earth rotated with or against the ether.

We can see what this arrangement looks like in this photo from 1887.
Here is a schematic setup of the test:

![Diagram of experiment setup](image)

The ball on the left represents a light source that emits light on a half silvered mirror S. This has the property that it also transmits light and does not reflect everything. The light coming through this mirror S goes to mirror B and reflects back. The length of this piece is l. The light that is reflected by mirror S goes to mirror A over the same distance l, where it reflects back and, together with the light from mirror B, goes to the observer. If this construction is stationary, v = 0, the light must of course arrive at the same speed. The distance is the same. But the device is put in constant motion over SB (over an imaginary x-axis) with velocity v. The light from S to B has to deal with Ether wind and slows down with c - v. On the way back it has the Ether wind, and then the speed becomes c + v.

**Difference in time?**

We will now calculate how much the difference in time is. The time, indicated by \( t_1 \), to go from mirror S to B and come back is...

\[
\frac{t_1}{c-v} + \frac{t_1}{c+v} = \frac{2l/c}{1-v^2/c^2}
\]

Now we are going to see what the time is to get from A to S and back. Here the time will be longer, because the mirrors move and the light is slanted. This looks something like this:
where $S_1$, $S_2$ and $S_3$ represent the mirror $S$ in motion, the same applies to $A$. The distance from $S_1$ to $S_2$ is the simple half of $S_1$ to $S_3$ and thus $0.5v t^2$, in which $t_2$ is the time in which the light travels the distance $A$ to $S$. We now calculate these with the Pythagorean theorem:

$$ (S_1A_2)^2 = (S_2A_2)^2 + (S_1S_2)^2 = t^2 + \frac{1}{4}v^2 t^2 $$

Here the root of and that times 2 (the light also has to go back), makes ...

$$ 2\sqrt{\left( t^2 + \frac{1}{4}v^2 t^2 \right) } $$

Because we now have the distance and also the speed ($c$), we can calculate $t_2$, namely ...

$$ t_2 = \frac{2\sqrt{\left( t^2 + \frac{1}{4}v^2 t^2 \right) }}{c} = \frac{2t}{c} \sqrt{1 - \frac{v^2}{c^2}} $$

If we compare $t_2$ with $t_1$, we find ...

$$ t_2 = t_1 \sqrt{\frac{1 - v^2}{c^2}} $$

t_2 is therefore only $t_1$ when $v = 0$.

*The conclusion was that Ether winds do not exist!*  

Nevertheless, every measurement $t_2 = t_1$! Thus no movement with respect to the Ether could be established. After George F. FitzGerald had already reached the concept of length contracting, the Dutchman Hendrik Antoon Lorentz could calculate it with the formula:

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