Time comes into being
if two different three-dimensional spaces meet

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Abstract Time comes into being if two *different three-dimensional* spaces meet. This is the definition of time in the space-matter theory. Two different three-dimensional spaces exist if their elements have *actions* at different scales. The actions have their minimum and maximum values in the given dimensions which cannot be changed without loosing the given dimension. Space can be converted into matter and matter can be converted into space, but space and matter have two different ranges of actions. Time is the meeting point of space and matter.
The space-matter model allows us to find the common root of space, matter and time. In space-matter model matter causes space waves. Solely through the use of space waves, we can express spatial distance, time and energy. It is possible to express all these phenomena in eVolt, so meter can be converted into second or into kg and vice versa.

Keywords: time, space-matter, wave of time, wave of space, conversion of dimensions

1. SPACE-MATTER MODEL

1.1. Time and space

The modern models of physics needs space and time that are independent dimensions. But what is space and what is time? Theoretically they aren't matter but "something else"; in our reality both originate in matter. Why? Because of their measuring.

What is time? Today’s physicists claim that time is what we measure as time.
What does the phrase "what we measure" mean? Just energy and mass are measurable. The physics' concept of measuring time is derived from two "bodies" acting upon each other, where the "bodies" can only be matter – for example, the Earth’s rotation in relation to the Sun, the

motion of a spring inside a wall clock, or atomic vibration powering an atomic clock. The essence is always the same. One matter moves in relation to another matter.

One second is defined as a changing character of the caesium 133 atom[1] we can measure. One second has its start and has its end we measure. The main element of time is the change. If there is no change, there is no time. We measure changes of matter measuring time.

Can we measure space? Measuring space, we measure matter. The meter is the length of the path travelled by light in a vacuum during a given time interval[2]. We can measure neither time nor space at all. We measure only matter. Do we measure all matter? No. Heisenberg's Uncertainty Principle gives us a limit we can measure[3]. From now on I refer to matter as 'measurable matter'. I suppose in the following, there is nothing else—just space and measurable matter. This is very likely not true since even Heisenberg's Principle doesn't mean, that there is "nothing" below the measurable limit, it means only that we cannot measure.

1.2. Action-reaction of space and matter

We know from quantum mechanics that particles of matter are in constant vibration. It is a physical impossibility for matter to come into contact with space without its vibrations having an effect. Based on the Casimir Effect[4] and other physical phenomena like gravity waves[5, 6], we can state that space exists in waves and vibrations.

1.3. Viewpoint of space

In modern physics, every *non-space* frame of reference is equivalent according to Einstein's space-time model of the special and general theory of relativity[7, 8, 9, 10 11, 12, 13]. Einstein's special theory of relativity describes how the mass of an object increases with its velocity relative to the observer. The increasing velocity of mass decreases the spatial distance. When an object is at rest, and both the object and the observer are in the same inertial frame of reference, the object has a 'rest mass' (m_0). The rest mass is the smallest value of mass in the given inertial frame of reference which is connected with the longest spatial distance s_0. The observer is always matter and the object is always matter.

What if the observer is space itself? Can we describe a model of a moving mass from the viewpoint of waving space? Yes, we can[14].

If an observer "made out of space" was able to measure the wavelengths of space wave λ, it would find the shortest wavelengths (λ_0), if the mass is at rest, that is, the mass does not move in space, $v_0 = 0$. From the viewpoint of space, the 'rest mass' is possible, since the vibration of the space wave is much faster than the vibration of mass. See later.

If the mass moves in space $v_1 > v_0$, the wavelength of space wave is longer ($\lambda_1 > \lambda_0$). Knowing λ_0 and λ_1, we know when the mass moves in space. The space waves also show if the mass accelerates. If $\lambda_{i+1} \neq \lambda_i$ and $i = 0, 1, 2...$, then the acceleration of mass $a \neq 0$. i represents time. If $\lambda_{i+2} = \lambda_{i+1}$, then $a = 0$, that is the object continues to move at a constant velocity from the viewpoint of space. Newton's First Law of Motion can be given as $\lambda_{i+1} = \lambda_i$.

Since space is always given, we can use it as a general observer. Space always has a common framework with every mass. Saying this, space is an absolute entity behind the relativity.

It sound like an old aether model, doesn't it? No, it doesn't.

1.4. No aether, but space waves

Aether theories propose the existence of a substantial medium, the so-called aether. Aether is a space-filling substance, and a transmission medium for the propagation of gravity forces (and even the electromagnetic force) according to physicists at the end of the 19th and the beginning of the 20th century. The works of Lorentz[15, 16] represent the theory.

In the aether model, time is a "local time" that connects systems at rest and in motion in the aether.

In my model, there is no aether. The space waves and the changes in wavelengths of space waves represent the re/actions that the re/actions of matter cause. And there is no "local time". The definition of time makes a big difference between the space-time model and the aether model. In my model, there is neither "local time", nor space-time.

In the next chapter I'll show we can use a new aspect holding the results of the space-time model.

The new model is the space-matter model.

2. SPACE-MATTER MODEL: SPATIAL DISTANCES AS SPACE WAVES

2.1. Wavelength and spatial distance

If the mass of the object is at rest relative to the (non-space) observer, then the given spatial distances of the object and of the (non-space) observer can be given as the sums of the wavelengths of space waves: $s_{observer} = \sum_{1}^{n} \lambda_{observer}$ and $s_{object} = \sum_{1}^{n} \lambda_{object}$,

where

$$s_{observer} = s_{object} = \sum_{1}^{n} \lambda_{observer} = \sum_{1}^{n} \lambda_{object} . \qquad (1)$$

If the object moves relative to the observer $v_{object} > 0$, then the observer will realize

$$s_{observer} > s_{object} . \qquad (2)$$

Equation (2) shows the values we calculate using the theory of special relativity. But behind the curtain is Eq. (3).

$$\sum_{1}^{n} \lambda_{observer} < \sum_{1}^{n} \lambda_{object} . \qquad (3)$$

That is,

$$\sum_{1}^{n} \lambda_{observer} = \sum_{1}^{p} \lambda_{object} , \qquad (4)$$

where n>p. The same *s* spatial distance can be made out of $n \times \lambda_{observer}$ and out of $p \times \lambda_{object}$. The observer's wavelength of space wave doesn't change, but the object's wavelength of space wave does, $\lambda_{observer} < \lambda_{object}$. In other words, the spatial distance $s_{observer}$ is built out of more waves of space than the s_{object}. The object will travel the *s* spatial distance using its own space waves, that is, the spatial distance for the object is really shorter, now *p* pieces long instead of *n*.
The $\lambda_{observer} < \lambda_{object}$ is a real phenomenon, not the viewpoint of the observer. Behind the relativistic length contraction is a real difference of wavelengths of observer and object.

2.2. Calculation of the change of wavelength of space wave

The calculation is based on the Lorentz-transformation of the special theory of relativity. The known formula of the length contraction is this:

$$s' = s(1 - \frac{v^2}{c^2}), \quad (5)$$

where *v* is the velocity of the object with mass. So the change of wavelength of every space wave is

$$\lambda' = \frac{\lambda}{1 - \frac{v^2}{c^2}}, \quad (6)$$

Of course, the model can be more precise using Newton's Law of Gravity that makes different lengths of wavelengths of space waves. The differences of wavelengths of space waves depend on the distance between space wave and mass. In this study I use the two-dimensional cosine model, because it is more simple.

If the wavelengths of space waves are given in a three-dimensional model, where they depend on the distance between mass and space wave, this leads us to a new form of the general theory of relativity, where the metric tensor doesn't describe the curvature of space, but the wavelengths of space waves. This new model is the space-matter model.

3. SPACE-MATTER MODEL: TIME AS SPACE WAVES

The space-matter model is a surprising model, where space has three spatial dimensions and time has no dimension. In the space-matter model, time comes into existence when mass and space meet. Also, whenever mass and space meet, the result is time. Time is the action-reaction phenomenon (or mutual effect) of matter and space, and appears as space waves.

What does this imply? If we have matter and space, we have time. Time is not the fourth dimension. It is a phenomenon. It is a spatial wave, a series of signals with properties.
It has characteristics like speed, frequency and action that can be calculated[17].

On the other hand, space has time, too, since the actions of matter can be used as time impulses in the case of space. The question of time of space is very complex; I shan't go into details here.

3.1. Time as spatial wave

Can time have waves? In some models, time may have waves, cp. references[18, 19, 20].

If time does exist, and it is not just our human production, it must have effects on matter and the matter must have effects on time. Knowing the theory of relativity, this statement is not new. But there is something missing. The theory of relativity doesn't describe the reactions of space caused by actions of the vibration of particles (matter).

If there is matter in space, there is a (set of) waving spatial signals, that cannot be "switched off". Space waves always exist when matter exists. Every wave has its "effect" on matter. The "effect" has its start and end. So, we can produce one second using (a set of) space waves. We can describe time as waves of space caused by matter, where the space wave has its effect on matter. Saying this, space and matter produce time; time is not an independent phenomenon.

According to modern physics, only mass changes the space waves via causing gravity. Accepting this, our time is the action-reaction of mass and space that exists as space waves. This is not the only space wave, that is, not the only time, just our time. In other words, everything creates space waves, that is, everything creates time. We use in our life (and models) the time of mass, but "non-mass" objects may use different space waves as time.

3.2. Time wave and time unit

The matter-space vibrations, from the point of view of matter, can vacillate between strong and weak. It oscillates. The change is periodic, and one period is one unit of time. This unit of time has two parts:

a) the hit, when space acts upon matter most strongly; and
b) the period between hits, when the force of space acts less strongly upon matter.

FIG.1 shows the *naive* model of the hits of space on matter.

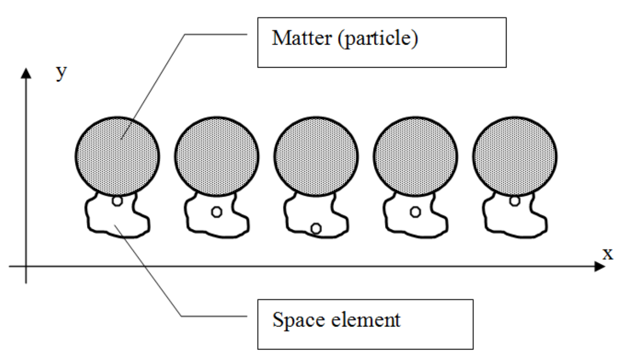

FIG. 1. Time impulses as hits of space on matter. Two-dimensional model, x and y are spatial distances, not proportional. The white shape illustrates an element (a range) of space. The grey circle illustrates a particle of matter. Note the space element is a phenomenon with structure. The elementary particle of matter also has structure.

The FIG.1. illustrates the different states of vibration of one space element (space particle) pictured as a small, white ball. The vibration can be given as a cosine function, where a) equals the positive amplitude of the cosine function. The first and the last space element show this state. Every other value of the function is b). That is, time is created by space and matter. In my cosine-model a pulse of time exists, if $\cos(x) = 1$. The time impulse is followed by a lack of time pulse, when $\cos(x) < 1$.

3.3. Space waves vs. time waves

Every non-space object produces space wave. Light, too. According to modern physics light has no time. This is not possible according to the space-matter model, but now I accept this axiom. A time wave is a wave of space produced by mass and "sensed" by mass. A time wave is the result of a space action followed by matter's reaction and vice versa. Our time wave is a set of space waves, where the set contains one or more waves of space, where the amplitude is given as $\cos(x) = 1$. Every non-space object generates space waves, so there can be many unknown space waves with many different amplitudes. In our lives (and in our models), we use the time of mass, but a "non-mass" object will use different time waves.

3.4. Lajtner-burgers

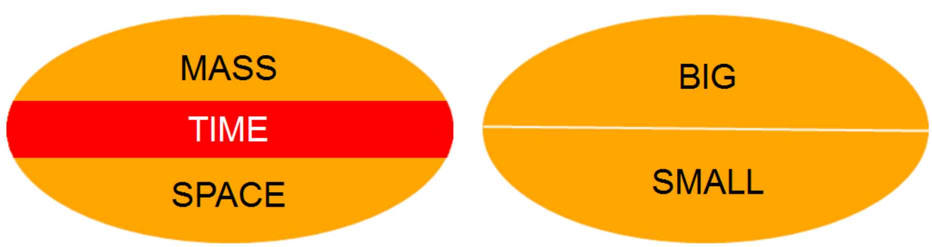

FIG. 2. Space-matter model displayed as Lajtner-burgers.

FIG.2. shows there is no way to put together space and mass without time coming into being. Time is the result of the action-reaction of space and mass. The wavelength of the space wave gives us the spatial distance; the frequency of space waves give us time - if mass is in space.
The second illustration of Fig.3. shows the same in a more complex approach. Here space appears as *space and time* for matter (SMALL), and matter appears as *matter and time* for space (BIG).

3.5. Time's new definition

Using BIG and SMALL we can give a new definition of time. Time combines our three spatial dimensions and the three spatial dimensions of space. Are they not the same? Three spatial dimensions are three spatial dimensions, aren't they? In mathematics yes. In physics, no. The *actions* of their buildings elements are at different scales. And the actions cannot change their given dimensions.

FIG. 3. There are two different three-dimensional spatial dimensions depending on the actions of the objects (model, not proportional).

FIG. 3. shows there is an essential difference in the scale (of actions) of space and matter (SMALL and BIG). Both exist in three-dimensional space, but matter is fundamentally incapable of entering the 3-D world of space. Similarly, space is unable to exploit the opportunities of the matter's 3-D world. The picture above illustrates how space cannot span two bars, while matter cannot fit between them.

From the above statements, a new definition of time emerges. Time is the meeting of "bodies" that exist in two three-dimensional spaces that have different scales. Or in other terms: time comes into being if two different three-dimensional spaces meet.
Our time merges three different things: the three-dimensional spatial world of space, our three-dimensional spatial world of matter, and their actions and reactions. In our normal life we cannot

sense the three spatial dimensions of space, therefore we can figure with one time dimension. This *dimension* is *our* action/reaction.

4. PITCH OF SPACE-MATTER MODEL

Matter causes waves in space. Solely through the use of space waves, we can express spatial distance, time and energy. Why? Because space waves have the shortest wavelength, the fastest speed, and the smallest energy expressed in our terms.

- Every spatial distance can be expressed using the wavelength of space waves.
  In our physics terms: This is the shortest unit of distance.
- Every unit of time can be expressed using the periodicity of space wave.
  In our physics terms: This is the shortest unit of time.
- Every amount of action (energy) can be expressed using the value of the action of space wave.
  In our physics terms: This is the smallest unit of energy.

See the calculated values using a simple two-dimensional cosine model as space wave in the next chapter.

5. CALCULATED VALUES IN SPACE-MATTER MODEL

5.1. How can we derive our time units from the space wave?

If we wish to express the time function of space waves in terms of physics' units of time, we may do so. If we take as our unit of time one second, the space waves show us how to divide that unit into the smallest possible parts of time. The time appears as the frequency of the space wave, or in other words, the action of the space wave. One second is as long as the space wave expresses $E_{\sec}$ energy. It is calculable according to the model of space-matter.

$$v_{TIME} / \lambda_{TIME} = f_{TIME} . \tag{7}$$

In Eq. (7) λ_{TIME} is the Planck-length[21] and

$$v_{TIME} = \frac{\mathrm{c}^2{}_{\mathrm{meter}}}{\mathrm{t}_{\mathrm{Planck}}} , \tag{8}$$

where t_{Planck} is the Planck time[22] and $c^2{}_{meter} = (2.997 \times 10^8)^2$ meters derived from $E = m \times c^2 = F \times c^2{}_{meter}$, where $c^2{}_{meter}$ is the distance around the mass, where mass and its modifications of wavelengths of space wave expressed as F are one entity within one time unit, that is, without time. In a closed system, the total momentum is constant according to Newton's Second Law of Motion. Using this law in a wider context, the mass and the given portion of space build a closed system.

Using the values mentioned above, the speed of time wave (space wave) is $v_{TIME} = 1.667 \times 10^{60}$ meters/sec. The *c* speed limit of the matter is not valid in the case of space and time waves. These waves spread in the texture of space. The measurement of gravitational waves by LIGO doesn't change this statement. See later.

$f_{TIME} = 1.031 \times 10^{95}$ $(\sec^{-1})$, using a simple cosine function to calculate the frequency of the time wave. The frequency of the time wave cuts one second into 1.031×10^{95} time-pieces. So, if we stress the *frequency of the space wave*, we are speaking about *time wave*.

h_{TIME} can be calculated supposing a theoretical photon, where $\lambda_{photon} = \lambda_{TIME}$, and using the Planck law[23] as a pattern that light has adopted from the wave of time.

$$f_{photon} \times h = f_{TIME} \times h_{TIME} \quad (9)$$

$$\frac{c}{\lambda_{photon}} \times h = \frac{v_{TIME}}{\lambda_{TIME}} \times h_{TIME} \quad (10)$$

$$h_{TIME} = h \times \frac{c}{v_{TIME}} \quad (11)$$

So, seconds can be expressed as energy. $E_{\sec} = 1.956 \times 10^9$ Joules, that is, 1 second represents $E_{\sec}$ energy, according to the cosine model.

Time waves (space waves) are not any kind of matter, but it's "action", it's "energy" can be described with our physics units of matter. We have to be very careful with expressions like "action of time wave", "energy of time wave" etc., because action and energy etc. are the characteristics of matter. (To make the difference clearer, I suggest using *L*action (Low Action), *L*energy (Low Energy) etc. in the cases of time and space waves.)

5.2. How can we derive our spatial distance from the space wave?

If we wish to express our terms of physics' units of distance using the characteristic of space wave made by mass, we may do so. If we take as our unit of spatial distance one meter, the space waves show us how to build that unit from the smallest possible spatial parts. The shortest spatial distance is given by the wavelength of the space wave. $1\ \text{meter} = k_{TIME} \times \lambda_{TIME}$, where k is the wave number of space wave (time wave). Using waves that have energy, we can give one meter as energy, too.

5.3. Meter, kg and second expressed in eVolt

Using the action of time waves (space waves), we can express mass, energy, time and spatial distance in the same dimensions, for example in eVolt.

First see the well-known value[24]:

$$1\ kg \text{ represents } 5.61 \times 10^{35}\ eV \tag{12}$$

Now let's see the new results using the cosine model:

$$1\ meter \text{ represents } 7.32 \cdot 10^{-33}\ eV\ , \quad (13$$

$$1\ second \text{ represents } 1.22 \cdot 10^{28}\ eV\ . \tag{14}$$

There is one more surprising conclusion: time, spatial distance and energy can be given in meters and in seconds, too. For example:

$$1\ second \text{ represents } 1.66 \times 10^{60}\ meters\ . \tag{15}$$

The values come from the cosine model. If the model is more accurate (for example it is a three-dimensional model accepting the changing values of gravitational force), the above mentioned values will change, but the principle remains the same.

The above written is surprising, but it has old roots. There must be a way to convert – for example – spatial distance into mass and mass into spatial distance, since the special theory of relativity shows the connection of mass and spatial distance using:

$$s' \cdot m' = s \cdot \sqrt{1 - \frac{v^2}{c^2}} \cdot m \cdot \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} = s \cdot m = \text{constant}_{\text{s m}} \tag{16}$$

The transformation of kg into meter was meaningless, but we can now express both in eV.

The conservation of energy means more than just the metamorphosis of matter and energy. It has a wider meaning. It also exists in the relation of matter and space.

5.4. Step into the void

The above mentioned statement seems to lead us into the mystery. If space has energy, then space is a matter-like phenomenon. Even more, we may say, space is a *special* kind of matter with very little actions. Is the whole World made out of matter? How many forms of matter do exist? How many different three-dimensional spatial dimensions do exist? See FIG.4.

We know at least three different ones depending on the actions of the objects that use the given three-dimensional spatial dimensions. Our bodies live in one of these. Our thoughts exist in a different one[25]. And there is the great void of the Universe with dark matter and dark energy we hardly know.

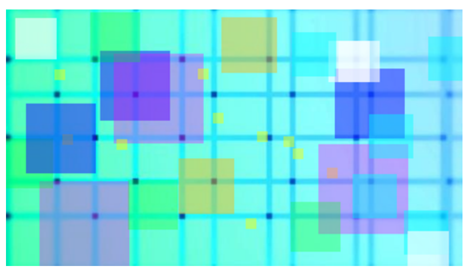

FIG. 4. There are more different three-dimensional spatial dimensions depending on the actions of the objects. (Illustration, not proportional.)

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