https://www.youtube.com/watch?v=fHRqibyNMpw

The Origin of Matter and Time

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+ My comment in red 05.04.2022

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(01)- [MUSIC PLAYING] Einstein's theory of special relativity has shown us mass and time are not the concrete things we imagine them to be. In recent episodes, we started breaking apart our preconceived notions of these ideas. In this episode, we're going to rebuild our understanding and explore the origin of matter and time. What is a thing? No mystery there. It's just a chunk of stuff that's a self-contained hull. It has boundaries and various properties. Maybe color, shape, size, mass. This clock is a thing. You're a thing. I'm a thing. Galaxies are things. And of course, things occupy a location in space. For example, right here. And a location in time, typically right now. In recent episodes, we cast some doubt on the typical understanding of two of these properties. A thing's mass, and a thing's experience of time. It's really important that you're up on those episodes. So go ahead and watch them if you haven't yet.Today, we're going to bring together these ideas to explore what matter, time, and things really are. A while ago, we introduced the space time diagram.It's just a graph of position in space-- just one special dimension for simplicity-- versus position in time.In this picture, a thing ends up tracing a path through time and space. And we call that path its world line.In fact, thinking in four dimensional space time, a thing is its world line.So we define a thing as its complete spatial and temporal existence.Let's break it down.You put something-- say this clock-- on this diagram. And what's it do? If it's not moving in space, it'll just sit in the same spot on the x-axis.But it will move up at a nice steady space in time. There's nothing you can do about that. Time marches on. But let me give it a tap. Now, it moves both in space and time, because position is changing.That diagonal line tells you its speed isn't changing after the first push. Constant speed equals constant change in position x with time t. The slope tells you how much position is changing for each tick of the clock. So slope represents speed. This is a pretty steep slope. So not too much x for every t. It's a slow state.OK. Bad scientist.I didn't define my units. Let's make it easy and use what physicists call natural units, which just means that we take the speed of light equal to 1. Light travels 1 x tick for every 1 t tick. And x and t are whatever they need to be for that to work. For example, we could make the time divisions 1 second, and the space divisions 300,000 kilometers, because that's how far light travels each second.If we do that, then light speed things will always level a 45 degree diagonal path.Always. And nothing can ever go faster. So it's possible for something to travel one of these steeper paths.They're separated more by time than space. Sub light speed things can travel them. And we call them time light paths.These would be impossible faster than light paths.They're called space lag. There's not enough time for anything to travel that much space. And the 45 degree path, that's a light like path. But what does this look like if we replace our regular clock with a photon clock? Now remember, a photon clock marks time with a particle of light bouncing between two mirrors. Each back and forth bounce is one tick of the clock.Now we'll get back to why this is a good measure of the flow of time in a minute. Stationary, the world line of the photon clock looks like this.The clock travels smoothly

straight upward in time. But It is unmoving in space. However, the internal photon still has to travel those 45 degree light like paths, because photons can only travel at the speed of light.A second photon clock with a constant speed with respect to the first, travels a steeper time light path. This is where that whole invariant speed of light thing gets really interesting. Regardless of the speed of that clock, the internal photons always do those 45 degree paths back and forth. But check it out.On the timeline of the stationary clock, the ticks of the moving clock don't match up.The moving clock appears to tick at a slower rate.This is the same result that we saw in the episode on time dilation.And besides the invariance of the speed of light, the other fundamental principle of Einstein's special relativity at play here is the Galilean relativity of motion. There's no preferred inertial, or non-accelerating, reference frame.Now that means that in the frame of reference of the moving clock, it is stationary.And from that frame, the first clock appears to be moving. The whole space time diagram can be transformed to give the second clock's world line a constant location in space. Stretch these corners and squish these ones like this, and we're basically applying the Lorentz transformation, which we discussed a while ago.Our space and time axes shift. So the second clock is still.But the first clock is moving. But those 45 degree lines, and hence the speed of light, stay the same for everyone.And look.
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(01)- [MUSIC PLAYING] Einstein's theory of special relativity showed us that matter and time are not the concrete things we imagine them to be. In recent episodes, we've begun to break down our preconceived notions about these ideas. In this episode we renew our understanding and explore the origin of matter and time. what is matter? There is no mystery. But there is. And a good one. Matter did not come out of "nothing" as physicists believe. And even mass was not "distributed" to the elements of matter by some higgs-boson, which is said to have an infinite amount of it and therefore flies around the universe and distributes it as it comes. My HDV has a solution, a better one that makes sense and is totally realistic. It's just a piece of stuff that is a separate torso-shell. It has boundaries and different properties. Possibly color, shape, size, weight. Yes, the elements of matter as bundles of coiled dimensions have shapes, size, varying number of dimensions, and mass is then a property of matter. These clocks are a thing. You are a thing. I am a thing. ??? A clock is a mechanism for "trimming" intervals, which can be compared to intervals on the time dimension, which is "trimmed" by matter (field) by its movement-displacement through 3+3D space-time. Galaxies are things. A clock is not time, but Time is not the same artifact as matter and as Length, thus space of 3 dimensions of length. Duration and Time are phenomena of Being that are not "from something or from Nothing". But matter "from something" is, so it is a derived quantity. It is built precisely from 3+3 time-space dimensions http://www.hypothesis-of-universe.com/docs/c/c_052.jpg ; http://www.hypothesis-of-universe.com/docs/c/c_041.jpg
And of course, things occupy a place-position in space. For example right here. And a place in time, usually right now. In recent episodes, we've challenged the typical understanding of two of these traits a bit. A thing is matter and a thing is the experience of time. ?? It is really important that you watch these episodes. So go ahead and follow them if you haven't already. Today we will bring these ideas-assumptions together to explore what matter, time, space and things really are. A moment ago we introduced the space-time diagram. It's just a plot of position in space -- just one special dimension for simplicity -- versus position in time. In this picture, the thing ends up following a path = time dimension shift and length dimension shift, better three time dimension shift and three length dimension shift through time and space.
It is also necessary to realize that the Observer, who evaluates the Universe, must fit "at rest", i.e. build "his" 3+3D coordinate system. And to realize that even this system chosen with zero at the beginning "moves through the Universe both in time and in space, by the fact that 3L

space expands and 3T time also expands". And it is only from this position that we follow the development of physical changes, as the author says: "we follow the path of SOMEONE-SOMETHING through space and time" which changes, and the pace of the passage of time also changes - see PAGE And we call this path its world line. OK the world line observed from the observatory, which was passed to the "stop-state", i.e. to the stop-position and stop-time... because otherwise everything changes even for the Observer from the Bang by expanding both time and space. In fact, when we think in four-dimensional space-time, the thing is its world line. You physicists (not the Universe itself) have chosen space-time as 3+1 dimensional and thus you also follow the world line in such a space-time. You have never investigated whether space-time can have multiple time dimensions. http://www.hypothesis-of-universe.com/docs/f/f_020.pdf .So we define a thing as its complete spatial and temporal existence. Let's break it down. You put something-- say this clock-- on this diagram. And what does it do? If it is not moving in space, it will just sit in the same spot on the x-axis. But it will move up in a nice steady space over time. Unfortunately, I don't have the video in front of me for my comments... Nothing can be done about it. Time goes on. We run along time, along the time dimension and cut off intervals, time itself does not run... *but it is possible to distinguish two, at least two, tempos of the passage of time*:

a) during the expansion of the Universe, i.e. the expansion of the three temporal dimensions of space-time from the Bang, which leads to the "aging" of the Universe, e.g. here the auxiliary image → http://www.hypothesis-of-universe.com/docs/c/c_081.gif http://www.hypothesis-of-universe.com/docs/c/c_239.jpg (the three time dimensions cannot be seen here...but even Maruško from 6A can imagine spatial ones; http://www.hypothesis-of-universe.com/docs/f/f_047.jpg ;) a

b) the speed of the passage of time here on Earth during the 13.8 billion years since the Big Bang, about which we do not know (and probably won't know for a long time), how big that speed is compared to the "zero speed t_0" (*infinitely* large time interval) and " and by the "*unit* speed t_1" (chosen interval) on the photon, and t_z on the Earth (interval compared to the speed "c", i.e. 1/0.000000003335640929);... $\mathbf{c = 1/1 = x_1/t_1 > w = x_1/t_z > u = x_1/t_0}$; http://www.hypothesis-of-universe.com/docs/c/c_048.jpg ; Are you firmly convinced that the speed of time is the same everywhere between galaxies and clusters of galaxies? and that "now" even 5 billion years ago? http://www.hypothesis-of-universe.com/docs/c/c_362.jpg I'll put an image here for the eyes for "time rates" from my earlier work building Lorentzian transformations →

Dostávám se k vysvětlování své konvence :

$$1 = c > w = w > u$$

rychlost uúú je pak taková, kde současně klesá čitatel a roste jmenovatel vůči céé

$$\begin{array}{ccccccccc} & & x_c & > & x_v & < & x_c & > & x_v \\ 1 & = & \text{-------} & & \text{--------} & & \text{---------} & & \text{--------} \\ & & t_c & = & t_c & < & t_w & = & t_w \end{array}$$

symbolicky uvedu číslo, které je tím číslem, ke kterému se veličiny blíží

$$\begin{array}{ccccccc} 1 & > & 0 & < & 1 & > & 0 \\ \text{-------} & & \text{--------} & & \text{--------} & & \text{--------} \\ 1 & = & 1 & < & \infty & = & \infty \end{array}$$

We do not know at all whether in "stop-time" at any time across the entire Universe, whether in every place of the Universe there is the same rate of passage of time as on Earth. **c)** ...and we definitely know about other "changes in the pace of the passage of time" see STR. And all three **a) ; b) c)** options lead to combinations,... and that is already a nice stew not only in the stop-state, but also in the course of the genesis of the Universe to date. But let me tap on it. It now moves in both space and time as the position changes. This diagonal line tells you that her speed does not change after the first press. Constant velocity equals a constant change in position x with time t. The slope tells you how much the position changes with each tick of the clock. So slope represents speed. That's a pretty steep slope. So not too many x's for every t. It's a slow state. OK. Bad scientist here. I haven't defined my units. Let's keep it simple and use what physicists call natural units, which means we take the speed of light equal to 1. **c = 1/1** Light moves **1 x** tick for every **1 t** tick. And x and t are whatever they need to make it work. For example, we could make the time division 1 second and the space division 300,000 kilometers, because that is the distance light travels every second. If we do that, then things at the speed of light will always line up on a 45 degree diagonal path. Always. And nothing can go faster. So it is possible for something to go down one of these steeper paths. They are separated by more time than space. Things can travel through them at below the speed of light. And we call them temporal light paths. These would be impossibly faster than light tracks. They are called spatial delay. There is not enough time for anything to travel that much space. And a 45 degree path, that's a light-like path. But what does it look like when we replace our regular clocks with photon clocks? Clocks are not time. The clock = the "ticking" mechanism only "steps" intervals on the time dimension.

Now remember that photon clocks tell time by particles of light bouncing between two mirrors. Each jump back and forth is one tick of the clock. Now back to why this is a good measure of the flow of time per minute. The photon clock world line, standing, looks like this. The clock moves smoothly straight up in time. The clock is an "interval machine" (time), then you can move the interval machine "in time", on the time-space network-grid so that the machine not only ticks (cesium) but also ticks in a 3+3D network - yarn np intervals , but *what's the point?* for a clock with "its time" to move "after another time"?, I don't understand... But it doesn't move in space. However, the inner photon still has to travel those 45 degree light-like paths because photons can only travel at the speed of light. The second photon clock, with a constant speed relative to the first, moves along a steeper time path of light. This is where the whole constant speed of light thing gets really interesting. Regardless of the speed of that clock, the internal photons always make that 45 degree back and forth. But look at it. On the stationary clock timeline, the ticking of the **moving clock** does not match.

However, therein lies "your" problem. The clock ticks the same everywhere, in the entire universe the same, everywhere, (it is set to some tempo of the passage of time), but **from the point of view of the "stationary" Observer**, he sees a change in the tempo of the passage of time on an object, to him a change in the tempo of the passage of time appears on the object, on to a rocket that moves either with uniform or accelerated motion, see STR a change in the rate of passage appears to the basic Observer, although no change in the rate of passage of time (according to the same set clock) occurs on that object. The moving clock appears to be ticking more slowly. It appears to a "standing" observer who "calculates" the rate of passage of time on a rocket on paper according to STR. And the physicists did not understand that the STR is only a manifestation of the rotation of the systems, the system (on the warp of curved space-time) of the object in motion and the system of the basic Observer. This is the same result as we saw in the episode about time dilation. And besides the invariance of the speed of light, it is another basic principle Einstein's special theory of relativity, which plays a role here, the Galilean relativity of motion. There is no preferred inertial or non-accelerating frame of reference. This means that it is stationary in the reference frame of a moving clock. And from this system the first clocks seem to move. The entire space-time diagram can be transformed so that the world line of the second hour has a constant position in space. Stretch these corners and squeeze them like this, and we're basically applying the Lorentz transformation that we talked about a moment ago. Our space and time axes shift. rotate. So the second clock is still. But the first hours are moving. But the 45 degrees, and therefore the speed of light, remain the same for everyone. And look

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(02)- The now stationary frame sees the now moving frame as having a slower clock rate.That's totally weird. But it's the right answer. So what this means is that there's no single preferred vertical time axis, or indeed, horizontal space axis. We can draw that time axis along any constant velocity time-like path, and just Lorentz transform to get a valid perception of space time.This means that the flow of time is not a universal thing. It's defined locally for any observer, or indeed, thing. But there's no global rate of time flow that everyone can agree on. What defines that local time flow? First, let's think more carefully about what these clock ticks really are. We already covered the fact that real matter is comprised of massless light speed components confined not by mirrored walls, but by interactions with other particles and force fields. And that's an interpretation we can take even for the most elementary components of the atom, in which the familiar electrons and quarks are composites of massless particles confined by the Higgs interaction. Or be it on time scale shorter than the plank time.In this analogy, those clock ticks become interactions between the internal parts of our atoms and nucleons. At each interaction, particles exchange energy, charge, and other properties that result in change. In those particles, and in the configuration of the ensemble-- the object itself-- the internal machinery of the thing evolves. And on our space time diagram, our object becomes an impossibly complex ensemble of light speed world lines confined in equally complex ways. Just as with the photon clock, it's only the ensemble that can travel slower than light, or be still.Its most elementary parts can't do that. They have to travel at light speed.Now, a note of caution is important. We're extrapolating the validity of space time diagrams, and these tiny lifelike segments into the quantum realm.Even the Planck scale realm. But this picture is still a meaningful perspective on reality.It's a pretty wild view take on our understanding of our theme. It's not just a single world line, but an evolving arrangement of many light-like paths that only taken together, give us a sense of stillness, a sense of thingness, and a sense of time. That time manifests as the rate of change of its internal machinery. And the rate is governed by the speed at which that machinery can interact. Now here's something that seems to be a more concrete reality than the flow of time.Those interactions which proceed by causal connections. One of them-- a point on the space time diagram-- can influence another if a signal can travel between the two. Those causal time-like paths can be thought of as a series of light-like segments. Two infinitesimally nearby bits of the universe can affect each other at exactly the speed of light. This gives us an ordered sequence of cause and effect-- this, then that. Time traces that ordered sequence, and looks different from different perspectives. But the causal order looks the same to everyone. In this picture, time and mass and matter become emergent properties of the causal propagation of patterns of interactions between timeless, massless parts. But what defines the direction of the flow of time? And what is the nature of these most elementary causal interactions? Great questions for future episodes of "Space Time." For our recent episode on when time breaks down, you guys had some amazing questions. Kovacs asks, how can it be that if an elementary particle doesn't experience time, that they can still decay? So any particle that can decay, or even oscillate between states, like the electron's chirality flip, is experiencing time, which goes hand-in-hand with them having mass. However, quarks and electrons gain their intrinsic mass by interacting with the Higgs field. In fact, these guys are really composite particles. The familiar electron is really a composite of the left and the right-handed chirality electron and anti-positron, which on their own are massless. So when I say that elementary particles don't feel time, that's what I'm talking about. These basic vibrations of their quantum fields-- the time that the electron or quark feels-- is felt by the composite particle, not by their components. OK. So a lot of you independently realized that the time dilation of special relativity seems to generate a paradox. What happens when an astronaut does a round trip at a large fraction of the speed of light, and returns to compare her clock to one left on Earth? From both perspectives, the other clock was moving, and so should have ticked slower. But which clock has the time lag when they get back together? This is a famous problem call the twin paradox. You have a pair of twins. One takes a fast trip around the galaxy. The other stays at home.

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(02)- The now stationary frame sees the now moving frame as having a slower tempo. That's totally weird. But it's the right answer. So that means there is no preferred vertical timeline or even horizontal space axis. We can draw this timeline along any time-like path with constant speed and only get a valid perception of space-time with a Lorentz transformation. This means that the flow of time is not a universal thing. It is defined locally for each observer, or indeed thing. But there is no global rate of passage of time on which all observers agree. What defines the flow of local time? What defines the pace of time? The most unfolded fabric of 3+3D space-time is where in the macro-universe there is an "empty place without matter" between clusters of stars, matter, i.e. c = 1/1. Everywhere else, i.e. in smaller and smaller localities, space-time is more curved, thus also time, the time dimension. For any location in the universe (starting with a galaxy and ending with some solar system) it is impossible to determine why its local rate of passage of time is such-and-such. Then, from this local system, the Observer can declare that "his rate of passage of time is the fastest, and everywhere else from it for bodies in motion the rate of time is slower, see time dilation STR. First, let's think more carefully about what these clocks really are they are.!! We have already discussed the fact that real matter consists of immaterial components of the speed of light, which are not limited by mirror walls, but by interactions with other particles and force fields. And that's the interpretation we can accept **??** even for the most elementary parts of the atom, in which the known electrons and quarks are composed of massless particles constrained by the Higgs interaction. Or it is on a time scale shorter than the plank time. In this analogy, these clocks become the interactions between the internals of our atoms and nucleons. With each interaction, the particles exchange energy, charge, and other properties that result in change. In these particles and in the configuration of the whole - the object itself - the internal apparatus of the thing develops. And on our space-time diagram, our object becomes an impossibly complex set of light-speed world lines bounded in equally complex ways. As with the photon clock, it is only an ensemble that can travel slower than light or be at rest. Its most basic parts cannot do this. They must travel at the speed of light. Now caution is important. We extrapolate the validity of space-time diagrams and these tiny living segments into the quantum realm. Even the Planck-scale realm. But this picture is still a meaningful view of reality. It's a pretty wild look at our understanding of our subject. It is not just one world line, but an evolving arrangement of many light-like paths that only connect to give us a sense of stillness, a sense of materiality, and a sense of time. That time manifests itself as the rate of change of its internal apparatus. And speed is governed by the speed at which these machines can interact. Now there is something that seems to be a more concrete reality than the flow of time. Those interactions that take place through causal connections. One of them - a point on the space-time diagram - can affect the other if a signal can travel between them. These causal

time paths can be thought of as a series of light-like segments. Two infinitely close parts of the universe can interact with each other at exactly the speed of light. This gives us an orderly sequence of cause and effect--this, then that. Time follows an orderly sequence and looks different from different perspectives. But the causal order looks the same for everyone. In this picture, time, matter, and matter become emergent properties of the causal propagation of patterns of interaction among timeless, immaterial parts. But what determines the direction of the flow of time? Unpacking the dimensions of the universe since the big-bang.
In the macro world, this is the unwrapping of the curvatures of the "boiling foam" dimensions from the Bang to the opposite end, i.e., smooth flat space-time. And what is the nature of these most fundamental causal interactions? Great questions for future "Space Time" episodes. For our recent episode on When Time Collapses, you had some amazing questions. Kovacs asks how is it possible that if an elementary particle does not experience time, it can still decay? So any particle that can decay or even oscillate between states, such as flipping the chirality of an electron, experiences a time that goes hand in hand with having mass. However, quarks and electrons acquire their intrinsic mass by interacting with the Higgs field. In fact, these people are really composite particles. The familiar electron is actually a composite of a left-handed and right-handed chiral electron and an anti-positron, which are themselves massless. So when I say that elementary particles don't feel time, that's what I'm talking about. These fundamental vibrations of their quantum fields—the time that an electron or quark feels—are felt by the composite particle, not its constituents. **?!** OK. So many of you have independently realized that the time dilation of special relativity creates a paradox. What happens when an astronaut makes a round trip at a large fraction of the speed of light and returns to compare his clock with that left on Earth? From both perspectives, the second clock was moving, so it should have ticked more slowly. But which clocks have a time delay when they are put back together? This is a famous problem called the twin paradox. You have a pair of twins. One takes a quick trip around the galaxy. The other stays at home.
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(03)- When they get back together, which appears older? So, nice work if you came up with this independently. The resolution is that there is no such thing as a paradox. If you see an apparent paradox, it means that you're missing something. In this case, it's that special relativity doesn't fully describe the scenario here. In order to compare clocks, the astronaut has to turn around at the end of the journey and come home. That change in motion is an acceleration. And special relativity only describes the relative effects on time and space due to a constant relative motion. To account for the effect of acceleration, you need to use general relativity. GR tells us that accelerating reference frame feels a slower passage of time. So the answer is that the astronaut's clock, or the traveling twin, has experienced less time. Ectoplasm2369 asks whether you'd feel time dilation in a warp drive. That's actually a great question. So for the Alcubierre warp metric, there's actually no time dilation either due to motion or acceleration. Your timeline remains synced to the timeline of your point of origin. Bruno JML would like to know in what reference frame Pink Floyd's "Dark Side of the Moon" syncs to when time breaks down. So in order to fit the whole album into the episode, you need to slow your clock by accelerating uniformly from rest to 99% of the speed of light by the end of eclipse. The start of the song time should sync with the appearance of the photon clock.
12:22
[MUSIC PLAYING]
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(03)- When they get back together, who looks older? So good job if you figured it out independently. *The solution is that there is no such thing as a paradox.* If you see an

apparent paradox, you are missing something. In this case, the point is that special relativity does not fully describe this scenario. In order to compare the clocks, the astronaut must turn around at the end of the journey and return home. That change in motion is acceleration. And special relativity only describes relative effects on time and space due to constant relative motion. O.K. To account for the effect of acceleration, you need to use general relativity. O.K. GR tells us that a speeding frame of reference feels like time is passing more slowly. The accelerating rocket, i.e. its "own system" curves time and space, i.e. by accelerated movement the object (in the warp of space-time) rotates with respect to the "stationary" Observer, who "observes" dilation or contraction on the rocket (on the quasar), (it receives rotated information), but it is not there on the rocket !!!!, the system and therefore the intervals are rotated and so when comparing **appears** the rocket time interval extended-dilated. But in reality there is no overview! STR is therefore only a "theory" demonstrating the rotation of systems, not a change in the tempo of time. My opponents have never understood this and never will. I know the reason. So the answer is that the astronaut clock, or rather the traveling twin, experienced less time. No it's a mistake. As the rocket decelerates to Earth, the (dilated) rate of time goes back to Earth rate and...and both twins meet >same age< . Ectoplasm2369 viewer asks if you would feel time dilation in a warp drive. That's actually a great question. So for the Alcubierre warp metric, there is actually no time dilation due to motion or acceleration. Your timeline will remain in sync with the timeline of your starting point. Bruno JML would like to know in what frame of reference Pink Floyd's "Dark Side of the Moon" syncs when time breaks. So to fit an entire album into an episode, you have to slow down the clock by uniformly accelerating from rest to 99% the speed of light by the end of the eclipse. The start of the track time should sync with the appearance of the photon clock. 12:22 [MUSIC PLAYING]

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This video was titled "The Origin of Matter and Time". Unfortunately, the author did not get to the topic, i.e. the explanation and description of the origin of time and matter, **at all**.
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JN, com 04/05/2022. More detailed information on the topics discussed here can be found on my website in other "articles". Translated 16.02.2023