

Second Philosophy

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INTRODUCTION

The introductory essay by Jurica Palijan (Pun Couffer)

(A note: This text is intended for people of various educational backgrounds. For that reason, in some places, the text was intentionally simplified at the expense of perfect scientific validity.)

Space and time are things we've experienced since we were born, and are experiencing them almost every conscious moment. We have some sort of understanding of them, and have no practical need of analyzing them thoroughly. For that reason, most people have never thought about them much. However, ask yourself the following question: How would I precisely define what space and time are?

How can I measure time? How does an instrument for measuring time work? What is the logic behind its operation?

How can I measure distance, area and volume? How does an instrument that I'd use for those measurements work? What is the logic behind its operation?

One second is, by an international convention, defined as a time period in which a specific sort of electromagnetic radiation (electromagnetic radiation is very similar to light; light is merely the type of electromagnetic radiation that can be seen by human eyes) emitted by an isotope of Caesium at the temperature of absolute zero makes exactly 9192631770 periods at the point of detection (the period is the same, regardless of the position of the point of detection). In everyday life, we consider one second to be the time in which seconds' hand of a clock moves once.

We measure the duration of an event by comparing it to the number of times a seconds' hand of a clock moved. If the duration of an event is considerably longer than a minute, we'll probably express it by saying how many times the minutes', or the hours', hand of a clock moved. So, we can say that we express duration of an event by comparing its duration to another, rhythmical event, and saying how many times between the event's beginning and its end did that rhythmical event occur.

All we're doing is counting the number of times the rhythmical event occurred during the event whose duration we're measuring. Then, we're expressing the duration of that event in terms of the number of the rhythmical events. It's useful to notice that all measurements are basically a comparison to something else, that we're calling 'the unit' (e.g. the unit of time, or the unit of distance). If our unit for measuring time is 'a second', then we'll express duration of something in terms of how many 'seconds' fit between the beginning and the end of that event. If the duration of an event was twelve hours, it means nothing more than that the hours' hand of the clock moved twelve times.

Can time stop? What would mean that time stopped? How would we know that time stopped? Without time, there would be no changes in anything. Things wouldn't move, and they wouldn't change in any way. If we were a part of the region of the universe where time stopped, we wouldn't even notice that time stopped. If time stops, and someone notices it, that implies a change (an electrochemical change in that person's brain), and that's impossible if time stopped for that person, as well. So, in a way, time is a measure for change, or at least time and change are mutually dependent.

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What if time slowed down, or sped up, equally everywhere in the universe? Would it be possible to notice it, then? Would there be any change in the course of events in the universe, or in our perception of it? If time slowed down, or sped up, equally everywhere in the universe, would it even make sense to say that time slowed down or sped up? And what would it mean that time slowed down or sped up anywhere, anyway?

Let's say that time started going twice as fast everywhere in the universe. Hands of clocks are moving twice faster. Planets are moving twice faster around the Sun. Earth is rotating twice faster. Light is moving twice faster. People are talking twice faster. Processes in people's bodies are happening twice faster. Wouldn't the following happen? Since Earth would rotate twice faster, a day would be twice shorter. But, since the clocks are moving twice faster, it would compensate for Earth's faster rotation, and a day would still be 24 hours long. Earth would complete one orbit around the Sun in twice shorter time, but it would still be 365 days, because Earth is rotating twice as fast (thus, one day is twice shorter). People are talking twice faster, but it still looks the same to people who are listening, because body processes related to listening are also happening twice faster. People would age twice faster, but since a year is twice shorter (Earth is orbiting the Sun twice as fast), they'd still live the equal amount of years. So, if time slowed down or sped up equally everywhere in the universe, there'd be no change in anything. And since second has become twice shorter, the duration of any event, expressed in seconds, is the same as it was before time started going faster.

Is there a shortest event in nature? Is there an event which is so short, that no shorter event is ever possible? For the light going from your monitor, it takes about two billionths of a second to reach your eyes. There certainly are events in nature which take even shorter amount of time. Is there a limit to how short an event can be?

Is it possible that the universe changes step by step, in a way similar to how the computer performs its operations, frequency of those changes corresponding to the frequency of the processor? Is it possible that universe is frozen between two subsequent changes in its state, and that changes in it don't happen continually, but rather in leaps? Does 'one second' perhaps mean 'that many billions of billions of billions of billions' of changes of the state of the universe? If that is so, what would it mean that time sped up or slowed down?

One experimentally discovered property of the speed of light in vacuum has lead to Einstein's special theory of relativity, which, along with Einstein's general theory of relativity, which he worked out about a decade later, has lead to a revolution in entire physics. This property of speed of light in vacuum was experimentally discovered at the end of 19th century. No matter how fast you go, and in which direction you go, you see that all light that moves through vacuum travels at exactly the same speed, which is about 300 thousand kilometers per second. In 19th century, that property was surprising even to the physicists, because the physics of that time, and everyday life, taught us that nothing behaves that way. If we're standing in a forest, no trees are moving relative to us.

If we start walking, we'll see some trees 'moving' toward us, and some trees 'moving' away from us. If we start walking faster, trees will 'move' toward or away from us faster. However, with light, it doesn't matter if we're moving or not, or if we're moving as fast as a car, or as fast as rocket being launched into space, or as fast as the Earth is orbiting the Sun, or even if we're moving at 95 % of the speed of light - in all those cases, we'll see all lightbeams which are travelling through vacuum moving at exactly the same speed - all lightbeams moving toward us will move toward us at about 300 thousand kilometers per second, and all lightbeams moving away from us will move at about 300 thousand kilometers per second.

Light is like a car which will always be approaching you, or moving away from you at the same rate, no matter how fast your own car is going. The discovery of this property of light lead to equations which said that time seems to be passing slower for the object moving relative to the observer (dilation of time), and that the object moving relative to the observer looks shorter to him (Lorentz contraction).

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However, it's interesting that if we have two observers in spacecrafts, moving toward one another at some great speed, or moving away from one another at some great speed, both observers will see that time is going more slowly for the other observer (for instance, by looking at the other observer's clock), and that the length of other observer's spaceship has contracted. Their own spaceship and clock will look normal to them. Has time slowed, and length shortened in both spaceship? In neither of them? What really happened? Different interpreters offer different explanations, and there doesn't seem to be a consensus, even among physicists.

Anything that has absolutely no mass (e.g. light and neutrinos) moves in vacuum at the speed of light, and can never be at rest. Nothing that has mass can move at the speed of light, but can move at any speed lower than the speed of light. Nothing at all can move faster than the speed of light. These conclusions come from observations, experiments and equations. But why are these things as they are?

With the core equations of special theory of relativity (Lorentz transformations), we can predict only what happens in the cases where neither the observer, nor the observed object, are changing their speed. Equations of general theory of relativity predict what happens in all possible cases, even those where change of speed is present.

Is there a length in nature which is so short, that nothing can ever be shorter than it? Why would a length shorter than that length be impossible?

Perhaps space is similar to your monitor, with its tiniest building blocks being a sort of three-dimensional pixels? Perhaps one meter is merely the length you get when you put billions of billions of billions of billions of billions of those small three-dimensional pixels in a line? Then, it's absurd to try to define length within one such pixel, because all properties of that pixel merely define how it interacts with neighboring pixels.

This Sunday, our discussion will be related to the branch of physics called 'philosophy of physics'. Hopefully, this text has given you some knowledge that will help you discuss some of the topics of the discussion, and has given you some material to think about. See you on Sunday, and I hope we'll all enjoy the discussion.

** AN ADDITION TO THE INTRODUCTORY ESSAY **

I've written this addition to the introductory essay, because I've realized some concepts of special theory of relativity, which will be important for our discussion, weren't explained well in the original text. Hopefully, after reading this text, all of you will know what you're talking about when we'll be discussing some phenomena which were predicted by special theory of relativity, and were experimentally proved. I don't want to underestimate anyone: I understand that most of us have great intelligence, and admirable knowledge of some subjects. However, many of us aren't very familiar with physics.

Let's first understand one amazing and puzzling property of light. If you aren't genuinely perplexed after hearing this story, you misunderstood it. However, the story tells about a phenomenon that has really been confirmed by numerous experiments over the past 100 years.

Let's first consider an everyday case with whose results all of you will agree. You and your friend are at the distance of 100 m from each other. You walk toward your friend and come to a spot in front of him. If both of you walked toward one another, you'd reach each other in a shorter period of time. If you're walking toward your friend, and your friend is walking away from you faster than you're going toward him, you'll never reach him, and the distance between the two of you will be becoming greater over time, and will increase each second by the distance equal to difference of your speeds (if you're going at 1 meter per second, and your friend at 3 meters per second, the distance will increase 2 meters each second).

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If this was going on in vacuum, and your friend was a lightbeam, these things wouldn't be true. It's not only that the numerical values would be different (a lightbeam's speed is always 300 thousand kilometers per second in vacuum); a much deeper difference would exist.

Let's now consider a case which includes light. At the initial moment, a lightbeam is 300 thousand kilometers in front of you and is going straight toward you. You're standing still. The lightbeam will cross the entire distance between you and itself in one second and reach you. If you're walking toward it, or by any means going toward it at extremely great speed, how much will it take for it to reach you, if the starting distance between you is 300 thousand kilometers - will it take more or less time? It will take -exactly- the same amount of time! What if you're going away from it at any speed, no matter how small or big that speed is? It will again take -exactly- the same amount of time for that lightbeam to reach you - exactly one second.

This is what physicists mean when they say 'speed of light is the same for all observers, regardless of their own speeds', or, more technically 'speed of light is the same in all reference frames'. Besides, all speed is relative - you can say that you're not moving right now, but you're moving along with the Earth at thousands of kilometers per second around the Sun. A speed can be defined and measured only from a point of view. Or, as physicists would say it: There is no absolute speed. Speed of light, however, is the same, from whichever point of view you measure it.

Let's now consider a case with two observers, which will probably be more acceptable to you. Let's say your friend and you are 300 thousand kilometers from each other, each of you in a spacecraft. Your friend's spacecraft shoots a laser beam straight at you (that probably means you're not friends anymore, but that's not important here). Note that laser beam is simply a very strong lightbeam, and will thus move at the speed of light. Your friend's spacecraft isn't moving, but your spacecraft is moving toward your friend's spacecraft at some great speed. Let's view this situation from both points of view.

In your friend's point of view, you're approaching him, and the laser beam is going toward you at the speed of light. The laser beam will hit you at some distance from him which lesser than 300 thousand kilometers, and the greater your speed, the smaller this distance will be. Because the laser beam will travel a distance lesser than 300 thousand kilometers, it will take less than a second to hit you.

In your own point of view, your friend is approaching you, and the laser beam is going toward you from the starting point which is 300 thousand kilometers away from you (the initial position of your friend's spacecraft). From your point of view, the laser beam is travelling at the same speed as in the first case - at 300 thousand kilometers per second, the speed of light. Since light needs to cross the distance of 300 thousand kilometers to hit you, it will hit you exactly one second from the moment your friend fired it at you.

So, in your friend's point of view, the lightbeam travelled at speed of light, and hit you in a time lesser than one second, while from your point of view, it travelled at the speed of light and hit you in exactly one second.

To make physics compatible with this sort of phenomenon, simple, commonsensical, approach to this problem which was mathematically expressed in equations known as 'Galilean transformations' had to be replaced by equations called 'Lorentz transformations'. Galilean transformations work for common situations like the one where your friend and you are walking toward one another, but don't work for the cases that involve light, or speeds which from the observer's point of view are close to the speed of light. Lorentz transformations work for all those cases. However, even Lorentz transformations don't work for the cases where the observer, or the observed object, is changing its speed (accelerating). Equations of general theory of relativity cover all possible cases, even those where the observer, or the observed object, is accelerating.

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Physicists checked what Lorentz transformations would imply for the behaviour of the universe, and they came to many amazing properties of nature which followed very easily from Lorentz transformations. Dilation of time, Lorentz contraction, and mass energy (expressed by famous Einstein's equation $E=mc^2$) are just the most famous of many examples. All of those consequences were experimentally proved.

Special theory of relativity tells us a lot about how nature behaves, but there is plenty of territory to explore regarding why nature behaves in that way, and what does such behaviour of nature mean. That is one of the things which we'll, hopefully, be inspired to discuss tomorrow.

QUESTIONS:

1. What would be the most accurate, and the clearest definition of time?
2. Same question, but for length.
3. Same question, but for space.
4. What would be the consequences of time slowing down or speeding up in a specific region of the universe? What changes in her surroundings would a person in that region of the universe see?
5. Can time stop?
6. Is time-travel possible?
7. What really happens in Lorentz contraction (see the above text)?
8. What really happens in time dilation (see the above text)?
9. Why is speed of light the greatest possible speed?
10. Why do all massless particles in vacuum always move at the speed of light?
11. Is there the shortest possible period of time? Why is a period of time shorter than it impossible?
12. Is there the shortest possible length? Why is a length shorter than it impossible?

Feel free to ask yourself, and the others at the discussion, any question related to time, space, or theory of relativity which you find interesting.

REFERENCE:

Albert Einstein: The Special and General Theory (1920) Available for free download at:
<http://www.gutenberg.org/etext/5001>

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DISCUSSION:

WindWalker: For me space is the environment in which objects exist and time is the measurement between changes of objects. Time only exists for the observer...outside the observer time does not exist. Time travel is possible... we move forward through it every day.

Boudica: perhaps time travel will be more obvious so in the future than what you mention Wind

Oswy: Not sure what is meant by time only existing for the observer?

Pun: I agree that time-travel is possible in that sense. But, science fiction often claims that time-travel in broader sense is possible - entering the time machine and going back a couple of centuries back, and changing events of the past.

Dar: if time only exists for the observer, why would space exist independently?

Boudica: there's a movie called "Future" a documentary, which also discusses this

Shingles: If time moved at a different rate, I don't think we would perceive the difference because we are part of the space-time too, that difference would operate in us as well

WindWalker: outside the observer time doesn't exist... time is our awareness of changes... like a movie film strip.. it all is there but our awareness is what changes from frame to frame

Oswy: Surely the fact? Of change is time and it never stops?

Pun nods to shingles, "I agree there"

Reflection: it does seem as though we are prisoners of the instant of the present, and that other dimensions of reality might exist in which this was not a limitation

Dar: space is also awareness of changes

Oswy: It never stops for anyone either?

Shingles nods to Oswy 'I agree there'

Dar: if there were no difference between what is here and what is there, we would have no perception of space

WindWalker: "Time is only and reality for the observer... in reality it is an illusion..

Simulat: I wonder if time exists for photons?

Boudica: time as we do understand it exist only for the individual

Dar: the same would hold for space, Windwalker

WindWalker: yes Dar

Shingles: well, there is distance; undoubtedly, it's just that the relationships between things are not limited to their Locality, Dar

Pun: Simulat: Lorentz transformations can give us a sort of an answer there. Hang on, and I'll tell you what they say.

Patrick: Sim, I like that question

Boudica: Michio Kaku, he discusses this in a movie science type of way, terminology

Thoth: I would say effectively not, Sim.

WindWalker: if space can be folded...as scientists believe, then space itself is an illusion as all points ultimately are in the same location

Shingles: surely it does, Thoth

Oswy: If the photon can change in any way then it must be in time.

Thoth: from the perspective of a photon, as soon as it came to be it would cease to be.

Shingles: even if that change is just its position

Oswy: Windwalker why do you think time is an illusion?

Shingles: 'Travelling without moving'

WindWalker: the photon is an interesting phenomena.. all it is, is a bundle of energy.. no different from any other type of energy except in function

Thoth: 'it' could not be aware of any change, shingles...

Patrick: If there is no cessation then I suspect time becomes irrelevant

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Pun: Well, it seems that entire universe seems to be frozen from the perspective of a photon, and that entire space is a plane which is perpendicular to its direction of movement. All space would thin itself to such a plane from its perspective.

Toth: even if it had a brain.

Boudica: why does US society rush so much, or is so rushed, compared to other society, or do we only envision it to be so?

Shingles: but a photon moves, and so is part of time, Toth

WindWalker: Right Patrick

Toth: again, shingles...

Oswy: To be in time and aware of the fact that you are in time are two different things?

Pun: And all things, including the photon itself, would exist in that plane, from the photon's point of view.

Toth: relativity...from the point of view of the photon

Simulat: photons seem to mediate interactions among other things - they are emitted by one thing and absorbed by another - so perhaps for the photon time is not present, that only the emission and absorption are relevant

Pun: From photon's point of view, all things experience infinite Lorentz contraction and infinite time dilation.

Toth: from beginning to end in an instant.

WindWalker: perhaps the photon is not what moves... perhaps it is our awareness that changes its perspective giving the illusion of movement

Pun: An interesting thought, WindWalker.

Simulat: yes wind - what a photon does is transfer energy from something to something else

WindWalker: Many of Einstein's ideas would lend credence to this and he bases his ideas on the perspectives of the observer

WindWalker: exactly Sim

Shingles: but our human awareness of time is very bound up in the human condition, how pebbles experience time is very much a straightforward, as they are weathered moved and so on, we have reflective thought so to talk of our 'experience of time' is more about our musings and reflections than to talk about our relationship to Time, Toth

Dar: what other perspective is there, Windwalker?

Elina: yes, we are limited by what we can now by our senses

WindWalker: if the perspectives are illusions there are none

Dar: that was the point of Einstein, breaking the notion of an absolute perspective

Wichard: Aren't we also tying time into our experiences of consciousness?

Toth: and I wouldn't say 'infinite' I think, pun. all that would be within the photon's horizon would be that which is in a cone, I believe, with a volume determined by $c \times$ how long it 'actually' existed relative to other things within it's cone...

Dar: dimension is dimension to me

Pun nods to Toth, "I guess I think similarly to you in that regard. Since universe seems to thin into a plane, and in that plane the starting and ending point of photon's way are in the same spot, the photon is simultaneously at its start and its end of trajectory."

Wichard: If the stone or the photon becomes conscious, what would be the experience we have of that consciousness and its experience of ours?

Dar: I experience change, and a dimension is that through which this change occurs

Elina: consciousness has no guarantee of time, any accident can easily destroy our concept of time accompanied by more natural ones like Alzheimer's, dementia and amnesia

Toth: it would be perhaps one tick of the Planck clock for the photon, though ... seemingly.

Pun: From its own point of view.

WindWalker: we are trapped as observers; we have no experiences outside the time element to be able to relate to

Boudica: no time element to relate to? What an interesting thought

Shingles: being an observer 'traps us?' I'm pretty sure that the reverse is true, Wind

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Wichard: And we have no experiences outside of existence with which to understand non-being

Thoth: Wind, as observers we are part of the universe and also create a system that includes whatever it is we are observing...

WindWalker: if you think of it like the movie film analogy... well all events are on the film and our awareness is what moves along the film it becomes easier to think of...past present and future all a single unit...ie the film reel

Thoth: no observer is 'outside' in reality.

Shingles: yes..

Reflection: it does seem Elina, that consciousness, like all of life, is a method through which the instant of existence is escaped from. That is, we sense future and past, even though they do not concretely exist for us, and yet we seem to progressively come to them (or away from them)

Thoth: nor even outside the system he is observing.

WindWalker: yes Thoth...which is why we are lousy observers; we are trapped in the sequences of the film

Thoth: in a sense. That's why we make instruments to help compensate ;o)

Simulat: I wouldn't tie time to consciousness - it seems that there are sequences of events that don't require consciousness - a rock that hits other rocks on a hillside and starts an avalanche causes a sequence of events, and that requires time and space, but it doesn't require consciousness

Wichard: So the system (=film) limits experiences, perceptions of time and consciousness

Thoth: and rely on more than one observer/observation - so we can compare.

Wichard: But the multiple observers are part of the same system

Oswy: Surely the point is that we can conceptualise Time say as being like a movie if that's what you want. It's the conceptualisation not the actual experience that is important.

Thoth: yes

Shingles: but in observing the thing that's observed takes on definite qualities, before an observation it retains its quantum probability

Thoth: but all their observations are valid, Wichard...

WindWalker: but the instruments have limitations... they are trapped by the speed of the electron 186,000 mps... they cannot detect anything beyond that range so we assume it doesn't exist

Thoth: ...and comparing them helps provide a better understanding.

Oswy: It seems absurd to me to say the universe reality is not in flux. If it is then it is in time as well. What's the problem?

Thoth: let's put it another way - if observation was useless, nothing would work and we'd likely never have existed. ;o)

Wichard: Thoth, the observations are valid within some system, i.e. the film

Shingles: bad plumbing perhaps, Oswy?

Thoth: it's not a film, though...

Dar: all perspectives are true

Reflection: well Sim, matter as such does transform, but DNA carries an imprint of the past into the future and so escapes the present in a way which inanimate matter does not (and learns from the past, carrying this forward). Consciousness takes this to a different level

Thoth: it's an inaccurate metaphor.

Shingles: yes, Dar

WindWalker: the problem is that if we look out far enough we can see into the past....

Dar: from some perspectives there is no space or time, and none of this is.

WindWalker: yes Dar

Dar: and, that is perfectly consistent with our perspectives; the trick is understanding how that is so

WindWalker: exactly

Oswy: You can argue about the metaphors but they all concern the concept of time as change movement flux.

Thoth: again, that is a misleading and mistaken metaphor of how the world works, Oswy...

Dar: what about space as change?

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Simulat: I agree about DNA Reflection - but it seems to me that systems like galaxies, and solar systems also carry imprints of the past into the future

Toth: that leads to mistaken reasoning.

Oswy: Toth what is misleading about the idea of flux?

Shingles: but there seems to be some kind of spontaneous complexification from the past to the future

Toth: film...

WindWalker: lol

Toth: I misread your last word, Oswy...sorry

Simulat: Oswy - do you mean by flux just that things change?

Shingles: its a condition of all existent things: That they are in flux

Wichard: perhaps the problem with the film metaphor is its linearity. But all the "frames" exist within a complex manifold that has more than 3 dimensions.

Oswy: Block Space time , A Series B series Presentism et c etc. There are dozens of models and metaphors non of then deny time as change?

Dar: ultimately, space, time, or any other dimension you can think of boils down to change; or difference

Wichard: Even if one can only experience one "frame" at a time

Dar: logical negation

Reflection: well, sim, maybe that gets at the "autonomy" issue, galaxies exercise no motive impulse to drive change, where as a paramecium does?

Toth: that's the problem, though, Wichard...

Dar: what is at position a is not what is at position b

Toth: there are no frames per se

Oswy: Sim, flux means change and I contend that if things change then there must be time.

WindWalker: change is predictable.. it behaves in accordance with the script... it exists for the observer... but the object exists in all states at once... (sorry for the time use reference to explain a non time event)

Toth: at least certainly no shared frames, even from different perspectives.

WindWalker: time it the measurement of change as we observe it

Shingles: but if there is no absolute perspective, don't you get a film watched from all those different perspectives and seen differently in each of them, then there seems to be no film other than that which is watched, Dar, Wichard

Oswy: Flux would go on even if we ere not here to observe it.

WindWalker: YES Shingles and that is what Einstein talks about with observes in time speed events

Oswy: I suspect time has gone on for a very long time indeed.

WindWalker: Einstein

Dar: well, there are two absolute perspectives imo, but neither of those perspectives contain any difference... so it's a moot point.

Shingles: I guessed ;)

Dar: it's the lack of difference that makes them absolute

Simulat: I agree Oswy - but there is the idea that space-time exists as a 4d object - that the past and the present exist all at once. We can move any direction we want in the space dimensions, but only one way in the time dimension

Shak: Oswy, could it not be that we experience events sequentially, and so time is constructed by our own consciousness?

Shingles: The Arrow of Time, Sim?

Oswy: Sim But from the hypothetical Gods point of view even in 4D the change of time would be observable.

WindWalker: Yes Shak

Simulat: or the ratchet of time Shingles

Dar: depends on the perspective of god Oswy

Toth: what ratchet, Sim?

WindWalker: which god???

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Thoth: every single particle has its own 'ratchet'.

Dar: metaphoric wind

Thoth: its own drummer.

Thoth: careful with metaphors or they eat you up ;o)

Simulat: Oswy - if we could see that 4d universe from outside - we would see the dimension of time - but the universe as a whole would not be changing

Oswy: Dar I wouldn't want to judge God he can observe whichever way he wants the point is he observes time. It the idea that time is an illusion that I don't agree with.

Shingles: but that's an interesting question: Can one observe something one is outside of? I would say 'no'. Sim, Oswy

Oswy: It's why I can't conceive of Time stopping as Pun suggested in one question.

Patrick: It seems that time is a construct that people tie to change. Change is real... stars are born, they burn then die...we use the revolution of the earth, the swing of a pendulum, the decay of an atom to measure these changes. What if our markers are not reliable?

Dar: well, if you want to get down to absolutes and make that your ruler, both space and time are illusions, they both depend on perspective, neither is absolute.

Wichard: But you need at least 6-dimensions to deal with time in each of the 3 spatial dimensions.

WindWalker: if there is an eternity and a god there can be no time... god would have to exist outside of it

Dar: its pretty useless calling them non-existent in their midst though

Oswy: Shingles Only God could. But we can pose the hypothesis that it could be done even if it is impossible.

Thoth: how so, Wichard?

Wichard: Then there are problems that can't be solved (mathematically) unless each of the dimensions is complex, so the dimensions really go up to 12

Shak: Patrick, the countryside changes as you go along in a train.

Wichard: A 12-dimensional space is difficult to conceptualize

Simulat: shingles - the concept doesn't depend on being outside to observe - it just requires that we consider that all of time is existing at once - that change is an illusion introduced by moving along the time dimension, but that the universe as a whole doesn't change

Pun: I wonder what we'd get if we took space-time, and changed the dimension of time with one of the spatial dimensions. Would we still get a universe where the laws of physics which we know work?

Shingles: A Supernatural entity that can defy the order of existence seems totally spurious, Oswy

Thoth: what problems?

Shingles: Then we are still at the Big Bang, Sim?

Wichard: Read Abbots' Flatland

Pun: That's something that can be worked out with equations, actually. However, I wonder what the results would be.

WindWalker: we have enough trouble with 3 dimensions we don't understand

Thoth: I have, Wichard...

Dar: the laws would be radically different, like a polymorphism of our world

Thoth: but what problems were you talking about?

Pun nods.

Oswy: Shingles I agree and God is spurious. But our model or conceptualization isn't. Even if we conceptualise in 4D as Sim is saying from everyone's and everything's point of view there is time.

Dar: yes, time exists in many perspectives; just like space does

WindWalker: the key Oswy is "POINT OF VIEW"

Simulat: not still at the big bang Shingles - but the big bang might mean that the 4d universe has a distinct shape

Dar: neither are absolute

Shingles: but I'm saying that to observe outside of time is impossible, Oswy

Oswy: I don't happen to think the 4D model is very good. I am a presentist. I spit and flame on relativity thus.

WindWalker: agree shingles... we cannot have an observer outside time, unless it is a God

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Shingles: but there isn't one, Wind

Dar: why not Wind? Maybe this is like flatland, and to some other perspective we are some odd static object?

Thoth tries to fish his tongue off this crazy surface and wonders why sharp and soft tissue should evolve so close together...

Wichard: Why does god need to come up?

Oswy: Forget about God he is not important, his theoretical view is.

WindWalker: because we are tripped on the film... time.. our awareness is part of it... we cannot look at our own face... only a reflection of it; trapped

Wichard: We can build models that allow us to talk about the nature of existence and nonexistence through mathematics of multidimensional manifolds (spaces embedded in other spaces).

Dar: but wind, in our perspective what we experience now differs from what we experienced then. In our perspective, time exists. You cannot get about that.

Patrick: Those shadows on the cave still haunt us as they did thousands of years ago :)

Pun: 4-D representation of our universe would be something that's frozen, because past, future, and present in all parts of the universe are depicted there. However, I wonder if parts of that 4-D representations could be changed. If so, how would our consciousness perceive such changes, and when?

WindWalker: through out history scientists have built many models... from time to time one or two work out right

Dar: whether you liken it to running an eye across a landscape or frames in a film, it matters not. Time exists in this perspective

Oswy: Our sense of time in the Iron Block Universe is very clear. It has to be it can't be anything else?

Pun: Consciousness.

Teleo: There aren't any instruments that actually measure Time as far as I can tell, they all measure space and then convert it to a theoretical past of future... Time is a translation of space imo.

Shingles: since the Universe decided to inflate we are still carried on that wave of inflation, the precedent of time moving in one direction is about the most ancient and profound that there is

Wichard: And the models we build become metaphors or theories that get some testing so they are supported or discarded.

WindWalker: Oswy.. to a man dreaming in a Coma many things may seem clear.. but they are not

Wichard: The ones that work stick around longer

Pun: Teleo: Well, I don't see why we can't say that clocks measure time.

Dar: a translation, or difference over what Teleo? Space cannot translate itself with respect to itself

Wichard: Ahhh, we return to Descartes dream

Shingles: good to see you, I wondered where you'd been hiding yourself, Teleo

Teleo: they don't as such measure anything called Time Pun, the interesting thing is that they translate space... is what I mean

Thoth: Teleo...time is a translation of state change. Any 'movement' in space represents relative change in state more fundamentally.

Elia: The Buddhists believe that for the universe to exist a sentience with the potential to be aware of it must also exist.

WindWalker: ultimately everything will come down to space, time and dreams

Pun: Could you, please, clarify, Teleo?

WindWalker: Agreed Elia

Elia: They seem to be saying that time and space are interdependent with sentient awareness.

Oswy: Windwalker in your model everyone and everything is in a coma. Whence comes the experience of time?

Thoth: and any state change results in 'passage of time'... (hence the famous arrow)

Teleo: a watch doesn't contain any phenomena called Time for instance.. it all seems to me to be a spatial translation...

WindWalker: Yes Oswy... and all is but a dream

Second Philosophy

Pun: Did you read the part of my introductory essay which deals of measurement of time, and do you disagree with what I wrote there?

Elia: Windy can be cynical. Thus the coma theory.

WindWalker: lol

Pun nods to Teleo.

Dar: time is a dimension, not a phenomena

WindWalker: it was to show a point... not a proof

Shingles: In an extreme of speed or gravity a clock will not move at its regular pace, so it DOES measure the time of the location in Space-Time, but not Time everywhere else, Pun, Teleo

Dar: same with space

Oswy: If all is a dream then the dream is as good as reality?

Wichard: Why is time a single dimension?

Thoth: then the dream IS reality, Oswy, no?

Elia: Why is it a dimension at all?

Dar: because I have no reason to consider it many dimensions in this perspective

Reflection: sure, Elia, it seems that sentient awareness breaks up reality into component parts like space and time (but we might use different differentiations later)

Dar: because I experience difference from moment to moment

Oswy: Thoth How could you tell the difference? So yes?

Dar: a dimension is that through which difference is experienced

Elia: I don't think they are referring to differentiation, Free.

Thoth: Elia, a dimension is not really a 'thing' or a 'place' - it's more of a 'context' in which we measure relative change...

Teleo: in extreme speeds, atoms are known to compress and expand .. maybe that accounts for the differences.. it is possibly the physical atomic structure, altering.. it may impede the spatial motion of matter.. speed impedes.. I mean

Thoth: whether you call it space or time.

Pun: Shingles: extreme speed would fall under special relativity, while gravity would fall under general relativity. In the case of extreme speed (without acceleration), an observer which perceives the clock moving at the extreme speed would see that clock going very slowly. However, someone who's perceiving the clock not to move (for instance, a person who's in the same spaceship with that clock) would see it going normally, and would see the first observer's clock going very slowly.

WindWalker: I think we over complicate time but trying to visualize it... space is easier

Elia: So, Thoth, in that abstract sense it can be thought of as a dimension. Whatever it really is.

Thoth: if anything, it's more of a 'pair' of directions; sure

Pun: Regarding the case which involves gravity and acceleration, I can't say anything, because I don't understand general relativity, and you probably understand it better than I.

Shingles: of course, it's a communication, not a single measurement for all to see (hits self on head), Pun

Reflection: well, Elia, I think they are saying that reality is Undifferentiated actually, and that the mind creates differentiation which is illusion (rigorously speaking)

Simulat: it seems to me that contemporary physics is dealing with space-time in a way that is very different than the relatively simple space-time idea of Einstein - for instance string theory treats space-time as a really convoluted 11 dimensional object that is vibrating - and I think that quantum loop gravity treats space-time as a multidimensional cellular automaton

Elia: Pun, I understand how the first observer sees the moving clock slow down and the 2nd (moving) observer sees it normally. But I don't understand how the second observer sees the first's clock slow down.

Wichard: And dimensions in the Cartesian sense are human constructs to regularize measurement and labelling of locations.

Shingles: But because of Entanglement, wouldn't that differentiation be reflected elsewhere in each case in the Universe, Reflection?

Second Philosophy

Dar: well, if I were sitting on the surface of say a much more massive planet, my i would sense my watch to tic at the same rate it did on earth. If it sent out light beams to you on earth each second, you would think my watch were running slow

Pun: Elia: Yes, that's the perplexing thing about it.

Elia: Is there experimental evidence for that theory, Pun, or is it derived out of the math?

Seaplane Jonson: snow building on power lines, causing brownouts ... sorry will have to log out ... thanks for fascinating topic

Pun: But, Elia, the situation is actually symmetrical.

Pun: Yes, there's experimental evidence, Elia.

Elia: Right. I see that, but I don't see how.

Teleo: the thought experiment example which are generally used for understanding the effects and phenomena of speed and time, seem to me to always be cumbersome. it is mostly based on a visual example. Light is visual etc. the examples seem to wish to extrapolate a visual light effect and then, place it in a sensible realm of matter to me, that's where it starts to be easily misinterpreted.

Dar: relativity makes accurate predictions, including space-time dilation; space-time dilation is observable fact

Oswy: Pun, just a thought If everyone and everything in the universe were travelling at or very near the speed of light what would our experience of time be?

Pun: I'll post the introduction to special theory of relativity soon. If it's still unclear to you after the introduction, I'll try to clarify things better.

Thoth wonders how quantum entanglement snuck into the discussion....

Elia: ok

Thoth: at the speed of light relative to what, Oswy?

Pun: Oswy: Depends on the direction of speed. If everyone was travelling at that speed in exactly the same direction, it would be as though nobody was travelling at the speed of light.

WindWalker: can we go slower than the speed of stop?

Dar: everything is moving at the speed of light relative to light, in a sense; we're already there, lol

WindWalker: yes Dar.. and that is a clue

Dar: so, be just like things are now

Elia: That is common sensible.

Pun: It would seem to us that things are going at the right speed for us and all people who're nearly not moving from our point of view, but would seem to go slowly for all people who're, from our point of view, moving nearly at the speed of light.

Elia: Makes intuitive sense that relative speed is what is observed.

Oswy: So if we all got a move on and travelled in the same direction we could stop worrying about time problems. I think we need legislation on this.

Elia: Moving both towards or away from us?

Dar: both

Thoth: there's an idea, Oswy. a democratic universe... let's vote on the laws! But I suspect if humans got involved, it'd make a LOT less sense than it does now.

WindWalker: who will enforce the light speed limit??/ Light Police?

Teleo: it has to be massless to move at the speed of light, right?

Thoth: Homeland Relativity, I think

Dar: red shift is actually traffic tickets, and energy fine

WindWalker: ROFL

Second Philosophy

Pun: Here comes the introduction to special relativity.

* LIGHTSPEED AND SPECIAL THEORY OF RELATIVITY *

This text was published on Second Philosophy's Facebook page as an addition to the original introductory essay. It is intended to give the participants of the discussion enough knowledge to sensibly discuss some phenomena related to the special theory of relativity.

Let's first understand one amazing and puzzling property of light. If you aren't genuinely perplexed after hearing this story, you misunderstood it. However, the story tells about a phenomenon that has really been confirmed by numerous experiments over the past 100 years.

Let's first consider an everyday case with whose results all of you will agree. You and your friend are at the distance of 100 m from each other. You walk toward your friend and come to a spot in front of him. If both of you walked toward one another, you'd reach each other in a shorter period of time.

If you're walking toward your friend, and your friend is walking away from you faster than you're going toward him, you'll never reach him, and the distance between the two of you will be becoming greater over time.

In this case, the distance will increase each second by the distance equal to difference of your speeds (if you're going at 1 meter per second, and your friend at 3 meters per second, the distance will increase 2 meters each second).

If this was going on in vacuum, and your friend was a light beam, these things wouldn't be true. It's not only that the numerical values would be different (a light beam's speed is always 300 thousand kilometres per second in vacuum); a much deeper difference would exist.

Let's now consider a case which includes light.

At the initial moment, a light beam is 300 thousand kilometres in front of you and is going straight toward you. You're standing still. The light beam will cross the entire distance between you and itself in one second and reach you.

If you're walking toward it, or by any means going toward it at extremely great speed, how much will it take for it to reach you, if the starting distance between you is 300 thousand kilometres - will it take more or less time? It will take -exactly- the same amount of time!

What if you're going away from it at any speed, no matter how small or big that speed is?

Elia: Cause for you time is different at speed.

Pun: It will again take -exactly- the same amount of time for that light beam to reach you - exactly one second.

This is what physicists mean when they say 'speed of light is the same for all observers, regardless of their own speeds', or, more technically 'speed of light is the same in all reference frames'.

Besides, all speed is relative - you can say that you're not moving right now, but you're moving along with the Earth at thousands of kilometres per second around the Sun. A speed can be defined and measured only from a point of view. Or, as physicists would say it: There is no absolute speed. Speed of light, however, is the same, from whichever point of view you measure it.

Second Philosophy

Let's now consider a case with two observers, which will probably be more acceptable to you.

Let's say your friend and you are 300 thousand kilometres from each other, each of you in a spacecraft. Your friend's spacecraft shoots a laser beam straight at you (that probably means you're not friends anymore, but that's not important here). Note that laser beam is simply a very strong light beam, and will thus move at the speed of light.

Your friend's spacecraft isn't moving, but your spacecraft is moving toward your friend's spacecraft at some great speed. Let's view this situation from both points of view. In your friend's point of view, you're approaching him, and the laser beam is going toward you at the speed of light. The laser beam will hit you at some distance from him which is less than 300 thousand kilometres, and the greater your speed, the lesser this distance will be. Because the laser beam will travel a distance less than 300 thousand kilometres, it will take less than a second to hit you. In your own point of view, your friend is approaching you, and the laser beam is going toward you from the starting point which is 300 thousand kilometres away from you (the initial position of your friend's spacecraft).

From your point of view, the laser beam is travelling at the same speed as in the first case - at 300 thousand kilometres per second, the speed of light. Since light needs to cross the distance of 300 thousand kilometres to hit you, it will hit you exactly one second from the moment your friend fired it at you. So, in your friend's point of view, the light beam travelled at speed of light, and hit you in a time less than one second, while from your point of view, it travelled at the speed of light and hit you in exactly one second.

To make physics compatible with this sort of phenomenon, simple, commonsensical, approach to this problem which was mathematically expressed in equations known as 'Galilean transformations' had to be replaced by equations called 'Lorentz transformations'. Galilean transformations work for common situations like the one where your friend and you are walking toward one another, but don't work for the cases that involve light, or speeds which from the observer's point of view are close to the speed of light.

Lorentz transformations work for all those cases. However, even Lorentz transformations don't work for the cases where the observer, or the observed object, is changing its speed (accelerating). Equations of general theory of relativity cover all possible cases, even those where the observer, or the observed object, is accelerating.

Physicists checked what Lorentz transformations would imply for the behaviour of the universe, and they came to many amazing properties of nature which followed very easily from Lorentz transformations.

Dilation of time, Lorentz contraction, and mass energy (expressed by famous Einstein's equation $E=mc^2$) are just the most famous of many examples. All of those consequences were experimentally proved. Special theory of relativity tells us a lot about how nature behaves, but there is plenty of territory to explore regarding why nature behaves in that way, and what does such behaviour of nature mean. Let's now go into the uncharted regions of special relativity, where things are unclear to science, and where even physicists themselves feel lost. These are some of the questions we can ask ourselves:

1. Why is speed of light in vacuum always the same, regardless of our own speed?
2. What really happens in Lorentz contraction (this phenomenon is described in introductory essay)?
3. What really happens in time dilation (described in introductory essay)?
4. What really happens in the case of two observers in spacecrafts travelling toward each other, which was described in the introductory essay (both observers see time dilation and Lorentz contraction in the other spacecraft)?

Second Philosophy

Elia: I am totally lost.

Pun: Sad to hear that.

Dar: I'd have to go into my metaphysic, and peeps didn't come here for that.

Shingles: In answer to question 1, is it only the factor of mass that affects speed?

Oswy: Mind boggling indeed. It has always struck me that there is a lot riding on the observation about the speed of light. Is it really solid?

Thoth: totally, Oswy.

Kore: Actually, it may be interesting to say that the complete Einstein equation is not $E=mc^2$, but $E=mc^2/\sqrt{1-v^2/c^2}$

Elia: It's the absolute speed regardless of the frame of reference that is puzzling.

Dar: yes, only a Luddite can still believe that the speed of light is not a constant. Flat earther types

Pun: Kore, that's true, but mass energy is expressed by the shorter version.

Kore: When particles are not at rest

Kore: Ok

Pun: The long version includes both the mass energy, and the kinetic energy. It's the sum of both.

Dar: $e=mc^2$ is the rest mass simplification

Shingles: What's mass energy, Pun?

Thoth: part of that is because of how light exhibits properties of both particle and wave...

WindWalker: I've seen articles recently that indicate the speed of light in a vacuum can be changed and IS not constant... so I am skeptical in that area

Elia: The energy contained in mass at rest.

Kore: But what's interesting is this circle equation too, $\sqrt{1-v^2/c^2}$

Pun nods to Elia.

Shingles: okay

Thoth: the articles you showed me before, Wind, were not light in a vacuum, but some intervening medium. Unless you have seen different ones.

WindWalker: there are other ones Thoth...

Oswy: Is an element of doubt about light speed present here?

Kore: Wind: speed of light? Which one? Phase speed or group speed?

Thoth: no, Oswy; an apparent one, but not a real one. ;o)

Dar: light does refract through materials at different rates; it can even be indexed through a medium with a refraction index less than that of space; so seem to move faster than light in a vacuum

Thoth: there HAS been some speculation that SOME cosmological 'constants' may seem to be changing... but a lot of that is also thought to be due to observational/measurement issues...

WindWalker: not sure Kore... I just read the article about 5 months ago... there were two separate experiments using different methods... one slowing light the other speeding it faster than 186,000 mps

Oswy: The other thing that disturbs me is that there must be something wrong at present with the picture Physics is painting ie the Macro and the Micro theories can be linked. Ie Relativity and Quantum Mechanics don't fit unless you use some hugely speculative theories. There is no unified theory?

Thoth: ...and lack of understanding of some fundamental interactions.

Kore: Wind: I think it was about phase speed then, and it's compatible with relativity

Simulat: the propagation of light even in a so called vacuum like interstellar space is a pretty complex process - the photon emitted by a star is not the photon that gets to our eye

Dar: light can be out rode on a bicycle when it's refracted through an Einstein-Boseman condensate

Kore: Oswy: are you talking about gravitation?

Thoth: the problem there, Oswy, is our understanding, and the key problem is that the mathematics for relativity allows for infinities... and QM does not.

Oswy: Sim, could you develop that?

Simulat: instead the photon is absorbed and a new one emitted many times along its trajectory

Teleo: yes Dar, light is constant in a vacuum only.. it seems

Second Philosophy

Pun: Apparent speed of light (or measured speed of light) going through something other than vacuum will, as most of us know, be smaller than 300 thousand kilometres per second, or, precisely, 299792458 meters per second. But that's because of its interaction with matter (about which I don't know much, actually).

Teleo: it's just a baseline measure

Thoth: the thing is, infinities do not exist in reality... they are mathematical 'monsters'.

Patrick: Oswy, I have just finished reading a book by Michael Brooks, "Thirteen Questions Scientists cannot explain" in which he points to some research that suggests that some of the Physics constants may not be constant with regard to location in space and time. One that he points to is G the gravity constant another is alpha a constant used in measuring lights from stars

Dar: I'm all for 0 and infinite on some things Thoth

Kore: Simulat: you would not get a picture as clear as telescopes get if all photons were reemitted, some are absorbed but they are deflected or converted to heat

Oswy: Kore I am not a scientist but I read New Scientist every week. I also read Lee Smolins book which is all about the fissure at the heart of physics. No grand unified theory.

Pun: Through some materials, light will go a little slower than 299792458 m/s, while through some, much slower.

Thoth: zero, sure. But not infinities... not in 'reality'

Kore: Oswy: yes, this is because we don't have a quantic theory of gravity yet

Thoth: no infinite densities/temps, for example; simply because there is a finite amount of matter and energy in the universe, for starters.

Pun: Patrick: this alpha constant is known as the 'fine structure constant'.

Thoth: and there is also a minimum size things can be compressed to, so, those together preclude infinities in those ways; yet relativistic math allows for them.

Oswy: Sim what is doing the absorbing and emitting along the way?

Dar: from certain perspectives the quantity of discrete packets of activity changes

Patrick: right pun

WindWalker: if there are limits to matter and energy... what exists beyond?

Kore: Thoth: unless energy is relative too, to a zero point field

Dar: Thoth, that minimum size assumes that you know the nature of the underlying matter

Simulat: it's a mind bogglingly complicated process in fact - and i can't describe it properly - been trying to find a reference to it

Thoth: it assumes QM is correct, Dar, so far as we understand it.

Kore: Sim, are you referring to the hypothetical quantic foam?

Oswy: All the scientists have gone silent. I think they are plotting?

Kore: Everything is simpler is relativity if one considers light of speed as the maximum speed of information transmission The group speed becomes the CPU clock of the universe

Thoth: and remember that the laws apply down to elementary particle level...

Oswy: Kore I can see that but why simpler?

Thoth: and we and ALL objects are just collections of such particles.

Kore: Because you deduce contraction/dilatation from it, Oswy

Patrick: It seems to me that everywhere physicists have to use a constant to make a mathematical relationship work there is something left unexplained :)

Pun: Elia: I'm not even sure if special relativity can make perfect sense, from the point of view of common sense. However, it's weird enough, for a start (at least from my point of view) that speed of light is the same from all points of view. Lorentz transformations, and all examples with light which I described in my introductory essay to special relativity, have to be so, or otherwise the speed of light is different for different observers.

WindWalker: Yes Kore... there is an error in that... using instruments limited to 186000 mps to detect something faster...

Second Philosophy

Thoth: that has an important impact on reasoning and understanding... especially for thinking about time and space.

Kore: Wind: what about interferometry?

WindWalker: any result you get will tell you all you have in energy

Simulat: no - hmm - let me try to give a flavour of the process - but I'll probably make mistakes - as light propagates it is continuously being absorbed by atoms along the way. When it is absorbed it changes the electromagnetic properties of the atom, which causes a change in the atoms around it - which stimulates them to emit light too - the wave front from all those emissions reinforces in the direction that the light was propagating but dissipates in other directions

WindWalker: your instruments will read speeds faster than 186000 mps as energy, and THAT is what they do, interferometry can work IF it is set up right and IS done; but no one bothers because they are so sure of their current theories

Pun: Elia: You can ask yourself this question - If I'm moving toward someone at $c/2$, and he's moving toward me at $c/2$, whose time will slow down? Will both times slow down equally, and we'll see each other's time as normal? Elia: And then, you can ask yourself, will we both see light moving at the same speed?

Kore: Wind: excuse me? No one use interferometry correctly? It was the basis for demonstrating the constant speed of light in vacuum. Michelson experiment??

Teleo: Sim, are you implying it is more like a soup of changing relative speeds and transformations itself. ?

Simulat: there is a distance for each medium where all the energy of the initial photon has been replaced by the energy from the surrounding atoms called the absorption distance

Pun: Michelson-Morley experiment is its correct name, by the way.

Kore: Right Pun, I make shortcuts too.

Pun nods - I try simplifying things for better understanding sometimes. That's why sometimes I sound more wrong than I would if I tried to be as meticulous as I can.

Dar: how can you not be moving towards someone at $c/2$ if they are moving towards you at $c/2$

WindWalker: yes, but it was set up to give the results they got... it was done to demonstrate one thing and one thing only

Simulat: in air, that absorption distance is very short - about a centimeter if I recall correctly

Dar: yes, refracting light is much different than light in a vacuum

Pun: Dar: Well, if you're both moving at $c/2$ from a fixed point of view toward one another, then your mutual relative speed actually isn't $c/2$.

Dar: right Pun, assuming an unstated reference can be misleading though, in relativity some things observed from different perspectives do differ; it's not about which perspective is correct

Pun shrugs. "The listener can understand that sentence in several different ways, which are pretty much different, but still can lead to a thought-experiment with the result I hoped for"

Dar: it's about understanding how the differences are consistent; how all the perspectives are correct

Pun: Right.

Oswy: Dar, none of that though denies the reality of Space or Time

Dar: I didn't, did I?

Oswy: As Ontological entities they are still there

Kore: Pun, are you comfortable with special theory of relativity?

Dar: in this perspective there is space and time, cant get about that

Pun: Kore: I guess so, yes.

Dar: space and time simply are not absolute; we don't live on Newton's infinite stage

Pun: I haven't used it much, but I think I understand the basic concepts of it, it's mathematics, and I believe I could work anything related to it out correctly, if given enough time.

Kore: Pun: how do you understand the fact that $\sqrt{1-v^2/c^2}$ is a circle equation and that speed of a mass may be understood as an angle change?

Oswy: Dar I am not saying that. I am saying in some sense they are real entities from an ontological point of view.

Second Philosophy

Pun: Kore: I haven't thought about it much. Let me think.

Dar: I agree with that Oswy; we don't have any disagreement there - take up that beef with wind or Teleo

Pun: Well, for starters, it doesn't seem like an equation to me. It's missing the equation mark, and something on the other side of that equation mark. Thus, I don't feel inclined to view it as an equation.

Teleo: Oswy I think it's true that in some important way Time is ontological.. less so space it seems to me, but even then who knows... to what degree even space is ontological is difficult to grasp.

Oswy: Dar I think your comment about consistency is important. Once we accept a minimal ontology then we can go modelling to get consistency. If we deny the basic features of an ontology then we can't even get started.

Pun: If we put 1 on the other side, we get the equation of a circle, though, with v and c being coordinates of a point. And radius being 1.

Dar: well, from some perspectives Oswy, there is 0 time; it wouldn't be accurate to say there is any time in such a perspective

Teleo: I think we tend to get started in spite of ontology..

Kore: Yes Pun.

Pun: So, we'd actually need any number on the other side, that number being the radius.

Pun: Kore, IMO, such interpretation is too imaginative, and doesn't mean anything. But, of course, I could be wrong.

Teleo: or the other way round... ontology occurs in spite of getting things done

Pun: Perhaps it's a potentially fruitful way of looking at it.

Oswy: Dar, isn't that perspective a boundary perspective? It is still engaging the ontological concept of time?

Dar: depends on the context; but, if in a context where you're considering the whole of time, yeah - course, you couldn't consider such a broad perspective from that perspective. A lot depends on context or perspective

Oswy: Dar, which perspective are you referring to? Just so I can be clear

Dar: well, a perspective where time dilates infinitely to the speed of light

Oswy: Which perspective where time = 0

Dar: either like a photon, or like at the event horizon of a black hole; and I'd agree, it is a boundary perspective

Oswy: Dar, is that saying there is no time or time stops? I think this is an important distinction obviously.

Dar: if time has stopped, how could you tell there is any time?

Oswy: All I am asking is that if it were possible to approach the speed of light would you observe time stopping in the thing you were observing?

Kore: Oswy: no, the opposite

Dar: if you were approaching the speed of light, and time stopped for you, and observation depends on time, you would not observe it

Pun: Oops. Sorry, Kore, I said something wrong about that equation of a circle. The radius wouldn't be exactly what's on the other side of the equation mark. Roughly, it seems to me that we'd actually get an elliptical shape in the general case. We'd get a circle if 1 is on the other side, but we'd probably get an ellipse if it's anything else.

Kore: Oswy: forget about I said, I'm mixing up everything

Pun: The circle would, of course, have radius of 1.

Kore: Pun: I just mean that if you make 'v' to vary linearly from 0 to c, $\sqrt{1-v^2/c^2}$ will be a quarter of a circle (if I'm not wrong)

Pun: Well, perhaps it wouldn't even be elliptical if the other side of the equation is anything negative. I can't say I have geometry in my little finger, but I could very likely work it out if given time.

Teleo: I suppose that's the thing to always remember, that we are always talking about light hitting the eye. And then trying to infer some corresponding effect on matter, when light is massless, so matter would not function the same, least as far as I can imagine.

Oswy: What I am trying to get at is the difference between the notion of time stopping and some observer witnessing that in some way. Is this really the same as saying there is no time. I would contend that the notion of time stopping already incorporates into an ontology the notion of time. So the notion of time being nothing does not make sense.

Second Philosophy

Kore: Teleo: unless matter is "just" light interfering with itself

Oswy: It's a philosophical ontological metaphysical issue.

Pun: Oh, I see now.

Dar: well, I never said time was nothing

Pun: If we put y on the other side, and consider the beta to be x, we do get the equation of a circle.

Kore: Yes Pun. And this makes me think that speed is actually an angle.

Dar: but, if I seriously consider a perspective where time has dilated infinitely to zero, i would not experience any difference from one moment to the next, so I'd have no basis to posit the notion of time.

Pun: That again seems to be too bold an assumption for me, but again, I could be wrong.

Oswy: OK I see your position.

Teleo: Kore, it seems that they are translation of the same thing.. Matter being slowed down light, or some transformational aggregation of energy/light... etc

Kore: Teleo: I think the speed is the same in the matter, except it's not speed in the usual directions, more something like a "inner" speed

Pun: Graphical representation of physical quantities doesn't have to mean that this graphical representation is exactly what reality is.

Kore: Like if it was a speed toward the center of the particle, it would be a general 'black hole' motion, introducing gravity too

Teleo: sure Kore, something is going on in that regard, energy maybe translating to some other exotic mode which we don't even comprehend yet...

Kore: Like, it could be speed in time and not speed in space

Oswy: Overall I see most of tonight's discussion as being in the area of epistemology ie how as you say can we make what we know consistent even if it is mind boggling and counter intuitive. It seems to me that the possible existence of space and time is a metaphysical issue. Can we conceive of any metaphysics without space and time in some sense? I don't think we can.

Dar: Oswy, actually, we can, and it has been; though I don't agree completely with it; the first proper metaphysic in my opinion was that of Parmenides

Kore: Oswy: one can consider time as a simple dimension, that' what we do for movies

Dar: and it concluded there were no time

Teleo: Kore.. to be honest, I don't think there is such a thing as Time.. in the normal sense of the term anyhow.. I think Time is a human composite and very much Ontological.. I think that's what Oswy maybe getting at too.

Dar: it never was and it never shall be for it is all here and now

Kore: Teleo: what you say can be applied to space too

Dar: then with melissus you got the contrary yet the same

Teleo: that's what I was getting at earlier Kore

Dar: it ever was and ever shall be... but, there was no variation whatsoever

Kore: Teleo: but we're talking about relativity here, so if you think there's nothing, I can't argue

Teleo: that particular idea has not been investigated mush as far as I know

Dar: so again, conceiving of time in such a perspective would be impossible; I'm more a synthesis of those two

Teleo: nods Kore

Kore: Teleo: actually I have a personal theory that everything = nothing in terms of information

Kore: Which is true, because if there is nothing at the same time, you can't distinguish anything so it's like nothing; But it provides a way to explain why there could be something, including us, but still being equivalent to nothing in terms of cost

Dar: like nothing and nothing are two completely different things though

Kore: Dar: it depends on the context of study

Teleo: Kor, you'll have to explain that to me sometime.. I understand that we are not talking about the philosophical aspects of the theory though... but it can sometimes clear up a little about what we know and don't know and what we are taking for granted.. ontologically

Kore: In terms of information communication for example, it can mean the same thing. Teleo: to explain what?

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Dar: no message received is different than nothing

Teleo: your idea; theory

Dar: with nothing, the possibility of receiving a message is impossible

Kore: Dar: that's because you're consider "message received" as an information already; But if you can't distinguish where starts or end the message, it's like nothing

Oswy: Dar and Others, I agree there are alternative Greek ontologies that postulate no time and no change etc. I used Heraclitus and his idea of flux tonight. I was thinking though more in terms of what modern physics was telling us.

Teleo: someone once said of the Medium of light, light is the only medium which contains no information..

Dar: well, I think modern physics tells us that there are perspectives where there is no time and no change, and that there are perspectives where there is time and there is change, and that all of these perspectives are somehow consistent with each other.

Pun: Teleo: Well, informations by transmission of light are being used. Information transfer by transmission of light, even. I don't understand what this person's thought meant. And we get about 90% of the information about our surroundings by catching light with our eyes.

Teleo: nods Pun... it is being used as a container; it has a power to transmit information. Human history is the history of its uses of Mediums... light is one of the latest.

