

**Conscious spacetime
Consciousness beyond the brain and faster than the light.
Towards a science of the soul**

When the Gods had created our world they pondered on how to make the human evolution to a greater adventure by hiding the Truth. One God said- In the deepest ravine, –No they will soon fall down in it, – On the highest mountaintop – No they are so restless and ambitious so they will soon climb it, – Deepest in the ocean or on the back of the moon- Better, but yet just the same searching out there in the world, – No said the wisest God, we shall hide the Truth where she will look last, in herself, in her heart. And to make the adventure even greater we shall create The Grand Illusion that she can find the truth in the brain.

The heart in this tale is of course not the heart muscle but the Self or Soul with its Knowledge, Wisdom and Love.

But the Grand Illusion about the brain has been materialized more than the Gods could have foreseen. Today it is constantly spoken about the brain. All is in the brain, God, sex, empathy, mirror neurons, thoughts, wisdom, memories, all experiences, in short all of our consciousness. You can hardly open a newspaper or listen to TV/radio without the news that some says they have found an explanation by finding it in the brain, what happens in the brain, “we are the brain”, the brain do this or do that etc. The term neuro-cultural imperialism has amply been put on this kind of superficial talk about all that the brain can do which have no ground in real science. Even at the conference on coaching and excellence, which presented many very effective procedures for mental training, it was much talk about the brain.

What I will show imply that for coaching and mental training talking about the brain is most often not necessary, for the most part based on *unproven and unverifiable beliefs*, which strengthen the illusion about what a human being is, instead of liberating us to develop more knowledge, wisdom and love which must be the goal, not least for coaching and mental training for excellence.

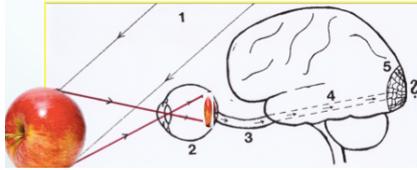
When we learn to dance we in the beginning must think about every step. But if we continue to think about our feet we will never enter the flow of the dance. And even worse if we had to think of all that happens in the brain when we move our feet we would loose the contact with our dancing partner and could not move at all. Fortunately we don't have to think at all about what happens in the brain.

And if everything is in or produced by the brain, what about life after death, or as Lars-Eric Uneståhl better name it, life after life? Uneståhl argue, and I agree, belief in life after life is a positive factor for creating excellence in this life before death. So

What can a brain *really* do?

At the start 1994 of Towards a Science of consciousness (TSC), the greatest ongoing yearly international multidisciplinary conference, gathering all leading researchers on consciousness, the young unknown philosopher David Chalmers became famous over a night by differing between the easy problems and the hard problem. (1) The easy problems mainly behaviour and cognitive function, can be explained by the brain. (Well not quite: we know what (muscular) effect an electrical impulse in the brain will have but we don't know how our will can start such an impulse). The hard problem concerns our conscious experience such as the audial experience of a clarinet or the visual experience of a red apple. Of course we know the physics of light reflected from the red apple and how it create an upside down image of the apple on the retina and how the light energy changes chemicals in the cells in the retina and then, through processes in the brain, reaches the visual cortex as a complex electrochemical signal, at the back in the brain. And? What happens there? Even those brain researchers who

believed (Crick who has left this life) and still believe (Koch) that the brain produces conscious experience have to admit no one has a clue:



“No one has produced any plausible explanation as to how the experience of the redness of red could arise from the action of the brain.” (2)

Alva Noë professor in philosophy at Berkeley Institute for Cognitive and Brain Sciences writes:

“It would be astonishing to learn that you are not your brain. All the more so to be told that the brain is not the thing inside you that makes you conscious because, in fact, there is no thing inside you that make you conscious.”(3)

David Chalmers, now professor in philosophy writes:

”There is nothing that we know more intimately than conscious experiences. But there is nothing that is harder to explain.”(4)

Antti Revonsuo professor in psychology and cognitive science writes:

“Why is consciousness considered a 'mystery'? After all we know consciousness intimately from the inside, it is the most natural thing there is for us and it is ever present in our lives. Of course in that sense there is no mystery at all about consciousness. In fact, there is nothing in the world that we would be acquainted with better than the subjective experience vividly present for us all the time. The problem, the absolute mystery, is elsewhere: *we do not know how to fit consciousness together with the world-view of science*” (my italics). (5)

How can it be that science, which has been so successful, still has nothing to say about the explanation of our conscious experience? Or is it that mainstream science has made some great mistake?

Let us look for ourselves:

You are reading on a screen/paper. Where is the screen/paper located? I think you will agree that the screen/paper is some decimetres in front of your nose. Please close your eyes and forget everything you have heard about this and when after taking a deep breath open your eyes and answer your question: “Where is my visual experience of the screen/paper located?” Take time to look. If you say “in my brain or in my eyes”, I must ask you how you then know that there is a screen/paper out there in front of your nose?

But those answering “in my brain” are in seemingly “good company”. Georg von Békésy, physicist and Nobel Prize winner in physiology, claims that this “Projection of a sensation outside the body ... is of great importance for survival ... This external projection has probably been learned early in life;”(6) Of course a survival value! If all we can eat, mate with and the dangerous tiger, which we must flee from, are pictures in the small space where our brain is it would be chaos and we would not survive very long. But **how** learnt? The neurophysiologist Benjamin Libet wrote that “Subjective localisation of a sensory stimulus (visual images) in space...still mysterious...” (7)

But is it really so mysterious?

I have never ever had any sensory experience that has been located in the part of the space where my brain is located. All my sensory experiences are outside the brain. I have feelings in my body, smell in nose, taste in mouth, I can feel touch on my body, I can see my body but

most what I see is outside my body even far away from my brain. And so even what I hear. This is the best example I know of about the emperor's new clothes. I am not an alien. I am convinced every one of us has their sensory experiences outside the brain. But few speak about it as we have learnt that it must be in the brain.

I suggest we take our experiences at face value and that all sensory experiences are in space outside the brain and identical with material objects in the space. (8) But why is the view so strongly held that consciousness is localised in the brain and identical with matter in the brain? (or at least created by the brain?)

Correlations

We have a lot of correlations between brain processes and experiences. But correlations are by itself never a sufficient cause or an explanation. This is clear if we compare with a TV-set. If I change program with my remote control of course there are correlations between what happens in the remote control and in the TV-set and the picture I see on the TV screen. A Neanderthal with a Volt meter and an Ampère meter could get a huge number of exact correlations between the voltages and currents in the TV-set and the picture on the screen and could have formulated a scientific hypothesis that the picture on the screen is created in the TV-set. But we now know better. Without TV waves, that is the broadcasted electromagnetic waves coming from the studio in the space outside the TV-set, there will be no program at all just "snow" on the screen.



So correlation between voltages and current in the TV set and the picture does not prove that the TV set is sufficient. It actually does not even prove that the (specific) TV-set is necessary.

Because if the TV-set is broken we can chose another one



or even go to the studio at Skandinaviska Ledarhögskolan in Örebro and see Lars- Eric alive.



When we closed our eyes we didn't see the screen, which we see when we open our eyes, so affecting the sensory organs and the brain affects our sensory experience, yes there are correlations. And due to all new techniques to measure on a living brain (fMRI, pet scan etc.) we have a huge amount of correlations between experiences and brain process. But the example with the TV-set shows that it is a faulty logic that correlation proves cause. It proves neither sufficiency nor even absolute necessity. So in spite of all correlations between brain processes and conscious experiences this cannot prove that consciousness is created in the brain. It cannot prove that the brain is sufficient for conscious experiences and actually not even prove that the brain is absolute necessary for conscious experiences.

But mental experiences?

What, *seemingly*, supports, or even *seemingly* proves, that brain produces experiences are our mental experiences - thoughts, dreams, fantasies, hallucinations, illusions and memories. We can have dreams, which we cannot differ from reality and as we are asleep when we don't see the physical world. We can think about objects that do not exist. But Ludwig Wittgenstein

said, “One of the most dangerous ideas for a philosopher is that we think with our heads or in our heads.” (8b) Perhaps, but we can remember what happened before and which does not exist now. “This must be created in brain”, so most scientists say.

Let us look for our memory.

You are now at time t_2 at place B. For some while ago at time t_1 you were at another place A which you still can see. Where is the memory of the event when you, your body, were at place A at time t_1 , where is that memory located? I suppose you don't see your body at place A now.

So, where could the memory be besides hidden in your skull where the brain is? But how?

Well, Aristotle's, or perhaps first Plato, said memory is impressions wax. Then came the tape recorder, then the computer that has huge memory, and brain as a computer is a popular picture.

But now we have the cell phones. With a sim card and a code we have access to a huge amount of information which is not stored in the cell phone's small memory but in the cloud. That is on big servers at other places in the space all over the world.

In analogy I claim that our memories are not stored in the brain. Actually our memories don't have to be stored at all! Because as Einstein and Minkowski showed - all that has happened still exist in the (at least) four dimensional spacetime. So, I claim that a species, which in the Darwinian evolution learn to use this objective always existing very great four-dimensional spacetime will have an advantage over a species which have to store everything in the brain. Because for the one who use the “spacetime library” the brain will be free to do what the brain is good at and should do: control our actions, at first for fight and flight, now better for creative cooperative work and for excellence in life for the individual and the planet.

A huge problem is that very few, if any, brain researcher has understood what Einstein-Minkowski's revolutionary discovery of the objective four-dimensional spacetime really means. But as deep knowledge about consciousness has existed long before any mathematical physics existed, I am sure it is fully possible to understand the meaning in what follows about more dimensions and consciousness without training in physics, even if my own way to this insight was through studies and discoveries in mathematics and physics. For those who are interested in that I will give a short introduction to Einstein-Minkowski's discovery that reality is, at least, four-dimensional in appendix 1.

Experiences of the four dimensional spacetime

I claim that memory is an experience of events in spacetime and not in the brain. So, as consciousness can be extended in space and our sensory experiences are identical with objects in space so consciousness can extend in time and our memories are identical with earlier events in spacetime. Also, when we listen to music we don't hear one chord and then next chord and then next chord. We experience a whole bar, a whole theme at once. This is the musical experience. And therefore music is so important because it brings us in contact with what we are in four-dimensional spacetime. And this is even more pregnant in near-death experiences.

Near-death-experiences (NDE)

It is nowadays well known that persons who are physically near-death, if they recover, sometimes tell about how they experienced as if they left their bodies, float up above their own physical body and could see what happened, which sometimes has been reported to be correct, and also see “another world” where they can meet dead relatives and a being of light. Most of them who have had a NDE change their worldview to believe in an afterlife and also

to see a deeper meaning in this life before death as growing in knowledge and love. Many who still believe that the brain can produce consciousness dismiss this as just a lack of oxygen creating hallucinations in a dying brain. But as no one has shown how a brain could produce *any* normal sensory experience, to stretch their belief to explain even these extraordinary experiences, is to stretch their unproven belief very far, too far. On the contrary we are fully entitled to take these experiences at face value and see if they can teach us something new and perhaps solve what main-stream science still claim is the mystery of consciousness.

Anita Moorjani has written about her cancer, which progressed, and she came to the hospital and all, even the doctors, was sure she would die. But she didn't. She had a near-death-experience in which she among many other things experienced this:

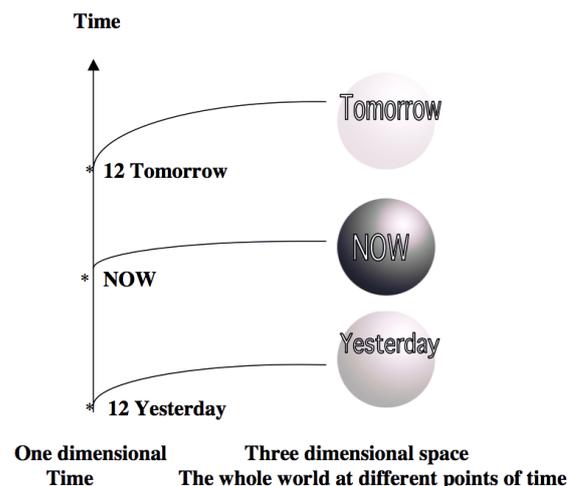
"I began to feel weightless and to become aware that I was able to be anywhere at any time... It felt normal, as though this were the real way to perceive things." "Time felt different in that realm, too, and I felt all moments at once. I was aware of *everything* that pertained to me – past, present and future – simultaneously." (ital. In org. (9) p. 63,67)

This is a very good description how it would be if we could experience the four dimensional spacetime. So, as a physicist, I will argue that this experience support that Einstein-Minkowski's four dimensional spacetime is a reality and that it also can be experienced in an altered state of consciousness, when the brain is not functioning as usual in a physical near-death situation, so our consciousness can include more of the spacetime than in ordinary awake state.

We cannot draw four dimensions, but this is a symbolic picture of four-dimensional spacetime. Every point on the time axis is a full three dimensional universe at that time (defined by one observer (10)).

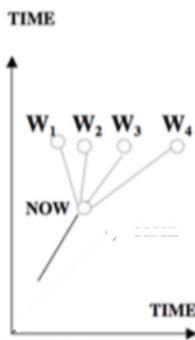
But this picture evidently has certain major drawbacks.

1. If all events, past, present and future, exist at once as in the four dimensional spacetime, as a block universe, how can we experience change, which is fundamental for human experiences?
2. If all future events already exist the future is, seemingly, predetermined, which contradicts quantum theory, which describe many possible futures.
3. It also contradicts our strong, and for moral life necessary, experience that we can and has to choose between possible actions.
4. How about fantasies and dreams about the future, which never became realised? Must they still not be in brain?



I claim and will show how all these problems seem to be possible to solve in an extension of Einstein-Minkowski's four-dimensional spacetime to a six dimensional spacetime with three space and also three time dimensions. To show the rational for this extension to six dimensions I again must go back to Einstein's theory of relativity and how Einstein missed velocities faster than that of light, see appendix 2.

Consciousness in six dimensional spacetime (11)



In analogy with the picture above of 4D spacetime where every point on the time axis is the whole universe at that time, now using two time dimensions as a “time surface” we can solve the problems stated above. **Every point in the two-dimensional time surface is a whole possible universe with its full three dimensionality.** There are many possible futures and which possibility, which become a manifested real world is not predetermined and thus in accordance with quantum theory. Which possibility that becomes a manifested real world depends on the choices of all intentional beings (12) as the simplified picture indicates and thus is in accordance with our experience that we can make choices about the future.

		A: s Choice	
		HOME	CONCERT
B: s Choice	HOME	WORLD 1	WORLD 2
	CONCERT	WORLD 3	WORLD 4

I now claim that we can give a better description/explanation of consciousness in terms of this six dimensional spacetime.

Sensory experiences are in the now and identical with material objects in the now, in the physical body and in the space outside the body, but not in the brain. (13)

Mental experiences are outside the now, in time. Memories are earlier realised events in spacetime outside the now. Thoughts, visualizations about the future are possible events in possible future worlds in spacetime. Fantasies, dreams, wrong memories, hallucinations are any possible world, which is not a materialised real world.

I also claim there are support for this six dimensional view of consciousness in near-death-experiences.

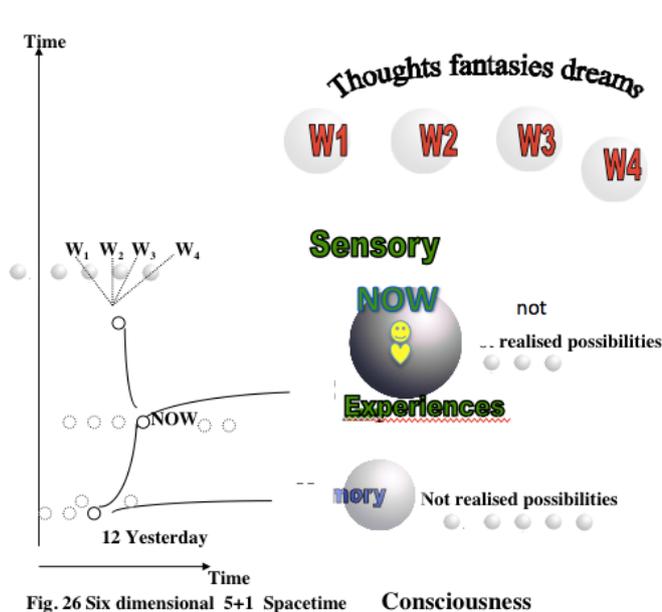


Fig. 26 Six dimensional 5+1 Spacetime Consciousness

Example. 1 A woman with an extra uterine pregnancy came to a hospital and had a profuse bleeding and lost her consciousness. Fortunately she survived and afterwards told about her experience: She felt she left her body and she saw her body from above. She also saw a nurse and a young doctor. She said she could **hear** the nurse saying ‘You must get help from a specialist doctor’. But she said she **saw how the nurse thought** ‘You idiot cant do anything right’. (14)

My **interpretation**: When the woman was unconscious and her brain was not functioning as usual she could experience more of the six dimensional spacetime. She experienced the physical sound waves in the now as hearing. But she could also experience the possible world where the nurse said ‘you idiot’. But that she didn’t hear but only saw. A thought is a possible speech, which exists in a possible future, but you can think it without saying it, as a possibility that is not actualised in real material world. And the nurse was polite not to say ‘you idiot..’ just think it.

Example 2. My colleague, dr. Göran Grip, an anaesthesiologist, has written about his own near-death experience. (15)

”Time was not passing in the usual way... an entire episode its beginning, its middle and its end stood out as a unit. ... “

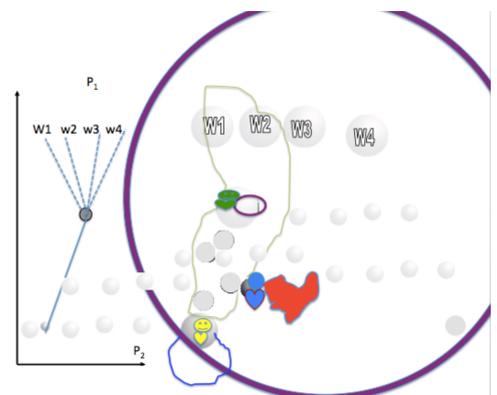
“What we ‘saw’ was actions, all the actions of an episode, ‘simultaneously’ with a sound track.”

“It was as if we were able to wander about, back and forth, in a static landscape the features of which were actions, words and emotions.”

“When I revengefully hit him, I not only experienced my own feelings of glee and triumph, but also my brother's physical pain and despair.”

My **interpretation**, which also dr. Grip thinks is possible: *Experiencing an entire episode beginning, middle and end* is an experiencing of past, present and future, that is an experience of a part of the four dimensional spacetime where time is experienced as a fourth space dimension. Also *all the actions of an episode, ‘simultaneously’* support this interpretation.

“To wander about, back and forth, in a static landscape the features of which were actions,” I interpret as that he was walking back and forth between earlier episodes and later episodes in his life, as his life was experienced as an extended four-dimensional reality. And walking take time so I interpret that this experience supports there is an extra time dimension besides the ordinary time of past, present and future. He also experienced his brother’s physical pain when he hit him. In intimate relations we can more or less share thoughts and feelings, but usually not when we hit someone. But in the six dimensional spacetime all experiences exist objectively, (on the two-dimensional time surface) even if our brain mostly limits our experiences to our own (thoughts and feelings). But in a near-death experience when the brain doesn’t function as usual we can experience more of all possibilities in spacetime, even other’s pain. (NB animation of this interpretation, see references).



Example 3. Anita Moorjani in her NDE also experienced this: “I seemed to just know and understand everything – not only what was going on around me, but also what everyone was feeling, as though I were able to see and feel through each person.” (9, p. 61)

Also this experience supports that what a person sees and feels are *objective events in spacetime*, which can be experienced even by others whose consciousness is less limited by their brain and instead expands to experience more than usual of the objective spacetime. So

My best scientific explanation of consciousness is:

There exists ONE GREAT CONSCIOUSNESS, which, to some extent, it might be much greater, can be described to include all possible events and all possible worlds in a six dimensional spacetime. Our individual consciousness is a part of this ONE CONSCIOUSNESS and it is our body and brain, which limits our consciousness to our individual part. We share with others the real material world which is our sensory experiences. Some are our (more) private mental experiences. So the brain does not produce consciousness, but limits it to our human experience and I think for a good reason.

What I here have presented is a possible explanation of consciousness as I claim there are no scientific facts telling against it. I also do believe it is true. Of course this is not a new idea. I

think it is expressed in the ageless wisdom in many spiritual teachings. My claim here is just that even natural science can and ought to reach the same conclusion.

We can choose

At least we have two different views held by natural scientists:

Brainmaterialism claiming that consciousness is created by, caused by, emergent from, and nothing more than the brain. OR

Conscious spacetime where there exists ONE GREAT CONSCIOUSNESS greater and far beyond our brains and the brain limits it to our individual consciousness.

Is there any scientific way to know which view is true or at least the best? Or do they differ only about the possibility of life after death?

It is not so easy, as it seems that both views are impossible to falsify. (16)

One can never disprove the existence of a greater consciousness beyond the brain as one can, for logical reason, not prove non-existence, and thus, according to Popper's falsification criteria, such a view is not scientific but counts as belief.

But exactly the same hits brainmaterialism.

Whatever we experience when we are in or out of our body, we are in the body when we tell about it, and a brainbeliever can, as they actually do, say - Oh that must be something in the brain. Thus even brainmaterialism is just and first a belief. Anyone who doesn't agree I must ask to give just one example of an experience, which is *possible* in this life before death, which they must accept as a falsification of their brainmaterialistic belief. And this must be described in detail and with consensus in the camp of mainstream materialistic science, so they have no option to change their position after we have presented proof of such a case, as they very often, if not always, usually do.

But I have a mathematical conjecture, which seems to be relevant to this question. It is based on a thought experiment in Flatland where there are only two space dimensions length and breadth but no height: It is conceivable that a magician in Flatland with some trick can get a flat cat from a flat hat. But it is not conceivable that, even if you are a magician in Flatland, you with a trick can get a real three dimensional cat from a flat hat. For that trick you need a three dimensional hat which cannot exist in Flatland.

So my mathematical conjecture is: From 2 dimensions you cannot create, produce emerge, 3 dimensions, from 3 you cannot get 4 and from 4 not 5 etc. In short:

A N dimensional structure can in no sense create, produce emerge a N+1 dimensional structure. (17)

Our brain is a three dimensional structure extended in the four dimensional spacetime, that is, our brain actually is a four dimensional structure. But if the mathematical conjecture is true a four dimensional brain cannot create structures of 5 and more dimensions. And I claim that dr. Grip's experience and the other two examples above are best explained as 5 or 6 dimensional and could not then be created by a 4D brain. So, if the mathematical conjecture is true, there exist at least some experiences, which cannot be created by a brain and also there exist more dimensions than four in our world.

But we don't yet know if this conjecture is true or even if it is possible to prove that is true even if it is true. (18)

But we have no time to wait and we need not and should not wait.

We are free to choose an explanation of consciousness, which is in agreement with all scientific facts. And I suggest we choose the explanation, which gives us the best goal picture for creating a world in excellence for all human beings and our beautiful planet.

The choice is ours. We can choose now. The future starts now.

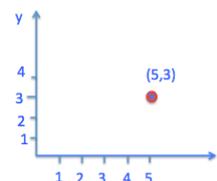
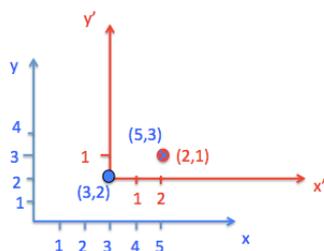
Appendix

In the appendices is used mathematic and physics to describe the important and revolutionary discovery which Einstein and Minkowski did of the **fourdimensional spacetime**, and my path to discover a possible mathematical extension to a **sixdimensional spacetime** which can describe phenomena faster than light and consciousness as part of ONE GREAT CONSCIOUSNESS. But as the knowledge about ONE GREAT CONSCIOUSNESS has existed in thousands of years in the spiritual wisdom long before any mathematical physics was known to mortal beings it is clear that mathematics and physics are not necessary for understanding the essence of consciousness. But as most natural scientists claim that the *materialistic interpretation* of natural science, which include the *belief* that consciousness is in or at least created by or emerged from , the brain , is the truth, I urge you: don't believe what they say is true or the only possible scientific explanation of consciousness. If you trust your experiences, e.g. that your sensory experiences are not in your brain and does not let materialistic belief limit you, fine. But if you believe that the materialistic interpretation of natural science is true, I do urge you to read these appendices. If you think you don't have mathematical skills enough and that you can't understand my very short presentation, I will ask a question and give a promise. Do you really understand the *materialistic belief* any better? Does it really resonate true deep in you? Or is it just that this is what you have heard, as in the tale of The Emperor's new clothes?

Here I will appeal to your skills as coaches and mental trainers. Don't let any thoughts that you can't understand mathematics and physics hinder you. Einstein said what couldn't be explained for a six year old child is not true. Of course it is a pedagogic challenge as Einstein-Minkowski's fourdimensional spacetime goes against a lot of our preconceived stereotypes of reality. But as Joseph O'Connor said – the main work of a coach is to challenge mental models. So, if it can be of value for you, let me now challenge your view of space and time. And I promise you that I can coach anyone of you to understand *all* that I understand. Of course it can need more than my short presentation here and it can take more or less time depending on where we start. I will be happy to answer any questions, (pilotti.jan@gmail.com) and I am also now writing a more extended book, which will be easier to follow. And even more if what I have shown about consciousness, which I believe is true, that there actually exists just ONE GREAT CONSCIOUSNESS, which we all are part of, you already know all that I will say deep in yourself, even if not, yet, as active knowledge. But as you know as coaches, training is always necessary. Of course not everyone have to train to be active mathematicians, but enough to not get cheated by the materialistic interpretation of natural science. So please relax, go in to your mental room, open your mind, and read what I want to say. (Later you can listen to my talk and my PowerPoint, see references)

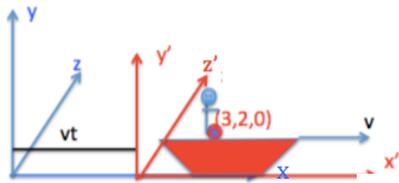
A crash course in Einstein-Minkowski's spacetime physics

In physics we describe where objects are located and to that end we use a coordinate system where every place or point could be named by numbers e.g. in two dimensions $(x, y)=(5,3)$ in S. Mathematics is democratic so we can chose another system S' where same point has another name $(x', y') = (2, 1)$



And it is easy to see how to translate the names from one system to the other knowing that Origo in system S' has name (3, 2) in the first system. This is called a transformation between S' and S and we see that $x = x' + 3$ and $y = y' + 2$.

Our space has length, breadth and height so we need a three dimensional system with (x, y, z) to name a point in space. In physics it is also important to describe what happens in moving systems so we need transformations to such systems. And we see that



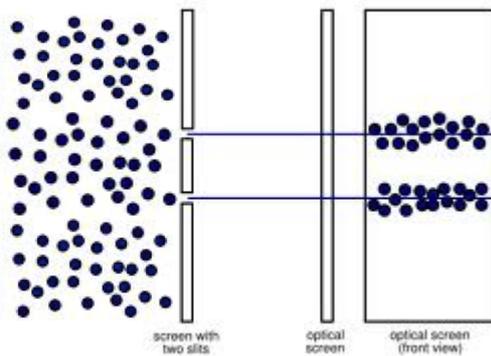
$$x = x' + vt$$

$$y = y'$$

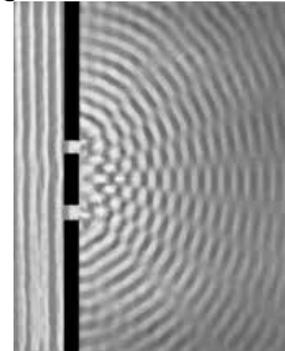
$$z = z'$$

which is the transformation Galileo used Newton added the important belief that time is absolute as given by God and the same for all, that is $t = t'$.

Physics studies particles which when hitting a wall just go through where there is a hole



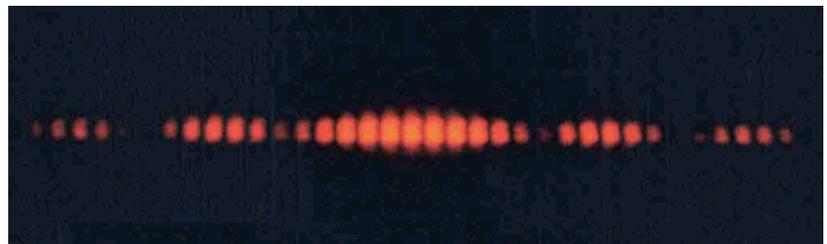
but for waves we get an interference pattern as the two holes act like dropping two stones in water



So, this is a way to differ particles and waves.
Einstein's theory of relativity is much about light.

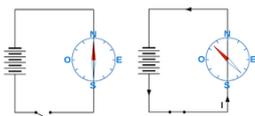
But what kind of phenomena is light?

In 16-1700th century they didn't know. Huygens thought light was a wave but Newton thought light was particles. It was not until 1802 Young showed that light was a wave by noting an interference pattern when light passed two narrow slits.

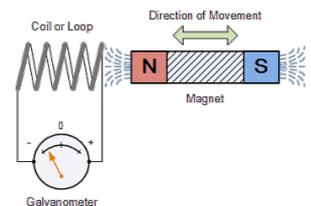


But what kind of wave?

Magnetism and rubber electricity was discovered 500 B.C. During sailings in 15-1700th centuries it was registered that a compass needle was affected by a thunderbolt. And Benjamin Franklin caught a thunderbolt with a kite and saw it charged an



electroscope. So, the thunderbolt was both magnetic and electric. Then Ørsted 1820 showed that electricity created magnetic force and Faraday 1832 showed that a changing magnetic field created an electrical current.



$$\nabla \cdot \mathbf{B} = 0$$

$$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$$

$$\nabla \cdot \mathbf{\dot{E}} = \frac{\rho}{\epsilon_0}$$

$$\nabla \times \mathbf{B} = \mu_0 \mathbf{j} + \epsilon_0 \mu_0 \frac{\partial \mathbf{E}}{\partial t}$$

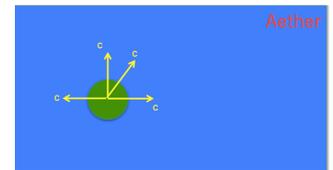
And that is how we create electrical current in our power plants.

This and many other experiments showed that magnetism and electricity are deeply connected. This was beautifully captured in Maxwell's equations.

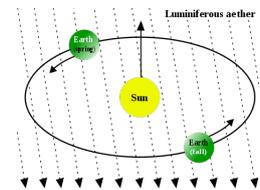
Solving these equations (for vacuum without currents and charges) gave expressions for interconnected electric and magnetic fields like $E=f(x-vt)$ $B=g(x-vt)$. This is recognized as mathematical expressions for something moving in space, like waves, with velocity v . From the two constants ϵ_0 and μ_0 , which was measured in pure electrical experiments resp. in pure magnetic experiments, was found a new constant $\frac{1}{\sqrt{\epsilon_0\mu_0}}$ which $=v$ and with the unit km/s, that is a velocity, and a very special velocity $\approx 300\,000$ km/s, which was recognized as of about same magnitude as the velocity of light which Römer had measured in 1660-ties. So now it was clear that light is an electromagnetic wave with the velocity 300 000 km/s, which now is a fundamental constant c .

But according to Galilee, Newton and their formulas as well, as in all experience of movement, velocity is relative, that is it is dependent on who measures it, from which system it is measured. E.g. when you sit still in a railway wagon your velocity relative the railway wagon is zero but your velocity relative the ground, the embankment, could be any number even very great.

But in what system does light have the velocity c ? This was not clear at all. Maxwell's equations do not tell in which system they are correct. So it was speculated that there existed some finer-grained matter called the aether, which prevailed the whole universe, as we could see distant stars, in which system Maxwell's equations were correct and in which the velocity of light was c in all directions. If the Earth was at rest in the aether the velocity of light would be the same in all directions.



But the Earth is moving around the Sun so the Earth could not be at rest relative the aether all the time. Therefore the velocity of light would have different velocities in different directions at different times of the year. But all measurement always showed that the velocity of light in vacuum always was the same c . This was in sharp contradiction to all that was known about relative velocity. There were some attempts to solve this shocking contradiction but it was Einstein's genius who gave the radical solution by saying: What is correct for all other velocities that they are relative is not correct for light. Light is very special. The velocity of light (in vacuum) is the same for all observers, is the same in all systems.

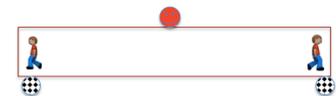


The velocity of light is absolute.

And this has huge implication for our understanding of space and time.

What is absolute and what is relative?

If two persons from the middle of a railway wagon go in opposite direction with same velocity relative the wagon they reach the ends of the wagon at the same time measured by a person on the wagon.



And of course, according to what seems self-evident, and in accordance with that Newton declared time to be absolute, $t=t'$, a person on the embankment seeing the train pass with high velocity v to the right, will still see that the two persons reach the ends of the wagon at the same time. Because the person going in the opposite direction of the train's movement will have a slower velocity relative the embankment, but also a shorter way to go, and the opposite for the person going in the same direction as the train is moving. So what is simultaneous in one system, the train, is, of course, simultaneous, in other systems, as that system used by the

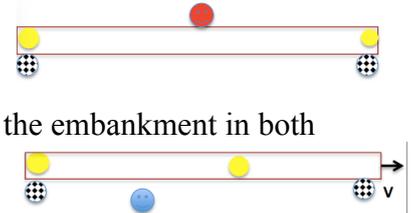


person on the embankment. Simultaneity is same for all, $t=t'$, simultaneity is absolute, and we have not experienced anything else.

But Einstein's radical insight that the velocity of light is absolute yet shows that this is wrong.

If sending light beams from the middle of the wagon it reaches the ends of the wagon at the same time for a person on the wagon.

But now according to Einstein the light beam seen from a person standing on the embankment will have the same velocity also relative the embankment in both direction, so the light beam going in the opposite direction than the train will reach the end of the train before the light beam in the other direction, because the distance will be shorter as it meets the movement of the wagon.



While the reaching the two ends of the wagon is happening at the same time t , they are simultaneous for a person on the wagon they are not happening at the same time t' , they are not simultaneous for a person on the embankment. So simultaneity is relative and time is not absolute as Newton said. But why don't we experience this?

That depends on that the velocity of light is so high 300 000 km/, that is 7,5 laps around the Earth in one second.

Einstein showed that instead of Galilei- Newton's transformations what follows when velocity of light is the same for all are other transformations, so called Lorentz transformations (19)

Galilei-Newton

$$x=x'+vt$$

$$y=y'$$

$$z=z'$$

$$t=t'$$

Einstein - Lorentz

$$x = \frac{x' + vt}{\sqrt{1 - \frac{v^2}{c^2}}}$$

$$y=y'$$

$$z=z'$$

$$t = \frac{t' + \frac{vx}{c^2}}{\sqrt{1 - \frac{v^2}{c^2}}}$$

which are more complicated. First it shows that it is not as Newton said that $t=t'$, but two observers measure different time for two events and that depends both on the velocity of one observer relative the other, v , and on the distance (x) in space between the events. So simultaneity is relative. Yet we don't, in daily life, experience that because our velocities v are so small relative c^2 so $\frac{vx}{c^2}$ and $\frac{v^2}{c^2}$ are almost zero and then Einstein's formulas, (actually called Lorentz transformations (19)) are almost the same as Galilei-Newton's. Einstein's formulas also show that a moving clock goes slow. But again this effect needs high velocity to be measurable but have been proven correct in high-energy physics, and with atom clocks, which can measure very small changes, mowing with jet planes.

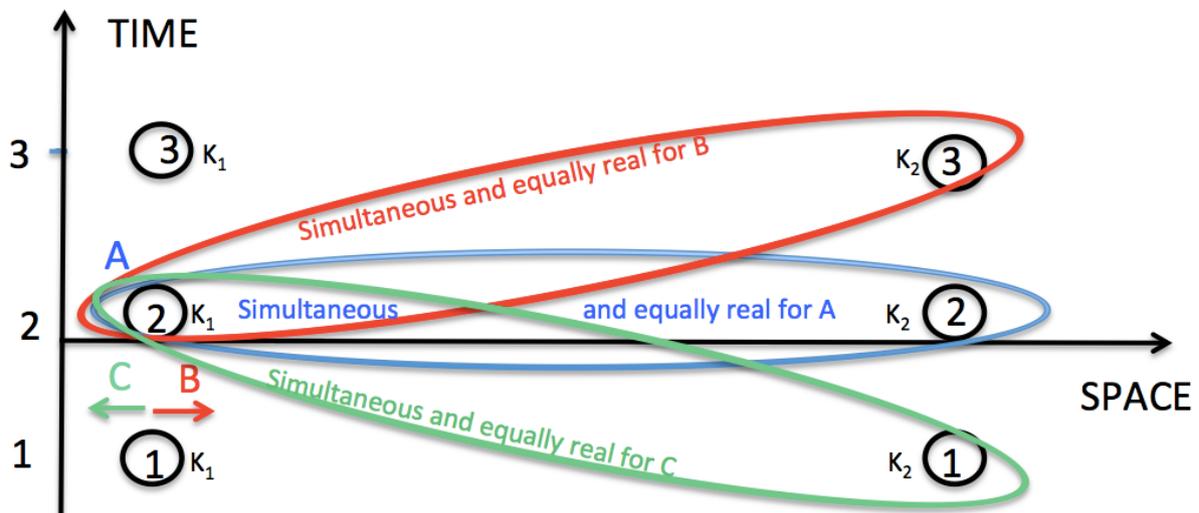
But now these formulas also affect our daily life! The GPS satellites have a velocity of 38000 km/h or 11 km/s, not very fast compared to $c=300\,000$ km/s, but fast enough that we need to correct our GPS measurements according to Einstein's formulas. Because without correction there will be an accumulating error of about 12 km in 24 hours making the GPS completely useless. So that the GPS works when using Einstein's formulas proves that the formulas are correct.

And as the same formulas show that **simultaneity is relative** this is accepted as a fact of reality.

That simultaneity is relative can be explained by that spacetime is (at least) four-dimensional and that all that has happened, all that happens now and all that will (or can) happen “still and already exist” “at once”. It is difficult in our language as our ordinary concept of time makes a difference between past present and future, but past, present and future are equally real in 4D spacetime. But that spacetime is objectively, ontologically (at least) fourdimensional can be derived from simultaneity is relative, if also accept the, for objective science basic, assumption, that existence is absolute, that is all observers must agree upon what exists, what is real.

For a person A, two clocks K_1 and K_2 at different positions in his system S show 2 simultaneously (if they are synchronised which is a possible physical procedure for all clocks in *one* system). But as simultaneity is relative, for a person B moving relative A in the direction towards clock K_2 , the event when clock K_1 shows 2 ($K_1=2$) is not simultaneous with the event when K_2 shows 2 but with the event when K_2 shows 3. And for a person C moving away from K_2 the event when K_1 shows 2 is the event when K_2 shows 1. This follows from Einstein's formulas which shows that simultaneity is relative (20).

The explanation for this relativity of simultaneity was first given by Einstein's teacher in mathematics Herman Minkowski in a famous lecture (21): He pointed out that for A $K_1=2$ and $K_2=2$ simultaneous and must be equally real. But for B $K_1=2$ and $K_2=3$ are simultaneous and thus equally real and for C $K_1=2$ and $K_2=1$ are simultaneous and equally real. As the three events $K_2=1$ $K_2=2$ and $K_2=3$ all, though for different observers, C, A and B, respectively, are simultaneous with and equally real as $K_2=2$, these three events $K_2=1$ $K_2=2$ and $K_2=3$ must be equally real and exist at once and K_2 must exist in all its history and all its future.



So Minkowski explain that simultaneity is relative with that the clock K_2 (and all other 3D objects) exists at all its time-events, past present and future at once as *one 4D object* in the absolute 4D spacetime. This is *valid for all 3D objects*, that is a three dimensional object exist in all its history and future at once. And all events exist at once. Spacetime is ontologically (at least) four-dimensional. So all events that have happened still exist, yes “eternally” exist, objectively in spacetime.

Thus I claim that a species who learn to use this objective four dimensional spacetime does not have to store memories of events in the brain, because all past events still exist in spacetime. And the same for future events they already exist in four-dimensional spacetime, which might be seen as a problem but which is solved in appendix 2.

Appendix 2

Einstein's mistake and velocities faster than that of light.

I think most people have heard that Einstein said velocities higher than that of light is impossible, as this is without any reservation repeated in both popular and academic science and presented as an absolute dogma in science.

But how did Einstein come to this idea? I think also almost all recognize what has been called the most famous formula $E=mc^2$. This is a formula for bad, problematic and good things. Bad as it is the basis for atomic weapon. Problematic as it is also the basis for nuclear power, fission, where we still has not created secure power plants, remember Harrisburg, Tjernobyl and Fukushima and not solved the problem of radioactive waste products. But also for very good - it is the explanation for how our Sun can produce the energy which is necessary for all life on this planet Earth.

But actually Einstein showed that the formula should be written

$$E = \frac{m_0 c^2}{\sqrt{1 - \frac{v^2}{c^2}}}, \text{ where } m_0 \text{ is the mass when the object is at rest, as also}$$

mass is relative and increase with increasing velocity and thus the energy needed to get high velocity increase as the graph shows and from which Einstein in his seminal paper 1905 concluded

“Velocities greater than that of light.... have no possibility of existence.” (22)

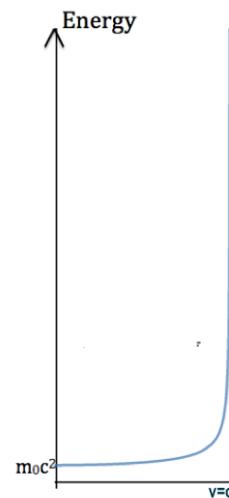
Very strangely it took almost 60 years until three well-reputed physicists published an article 1962 in the well-reputed American Journal of Physics (23) where they clarified that what Einstein has shown was only that it will take an infinite amount of energy to accelerate (that is start slow and increase the velocity) a material body up to the velocity of light. But acceleration is not the only means to achieve speed, which light itself amply shows. Light does not start slowly and increase its velocity but is born in a flying start with the velocity of light. **Therefore Einstein's theory cannot exclude that there are phenomena, which are born with and always move with a velocity higher than that of light.** It was speculated that this could be particles and they where given the name “tachyons” from Greek “tachy”=fast. This was taken seriously, which perhaps is not believable today as it is always repeated that superlight velocity cant exists. But there was done experimental search for tachyons. The first started in the mid 60-ties by three Swedish physicist at the Noble Institute for Physics in Stockholm. (24) They didn't find them but published an article about that 1968. (25)

When I as a young student in theoretical physics read that 1971 I was a bit surprised how they

used Einstein's formula $E = \frac{m_0 c^2}{\sqrt{1 - \frac{v^2}{c^2}}}$ which was seemingly only valid for velocities less than c

because for v greater than c , $v > c$, we get a negative number under the square root. (try $\sqrt{-1}$ on a calculator: either you get “error” or “Not a number”, which both are wrong. Yes not an ordinary number, but in mathematics so called complex numbers $a + i \cdot b$ where $i = \sqrt{-1}$ are very interesting and useful but a bit tricky to interpret in physics.)

But they had a clever way to handle that mathematically:



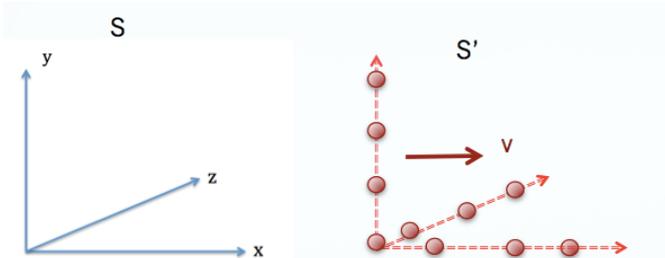
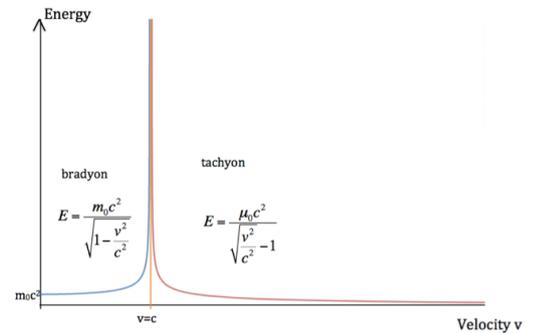
$$E = \frac{m_0 c^2}{\sqrt{1-\frac{v^2}{c^2}}} = \frac{m_0 c^2}{\sqrt{(-1)(\frac{v^2}{c^2}-1)}} = \frac{m_0 c^2}{\sqrt{-1}\sqrt{(\frac{v^2}{c^2}-1)}} = \frac{m_0 c^2}{i\sqrt{(\frac{v^2}{c^2}-1)}} \text{ as } \sqrt{-1}=i \text{ not an ordinary number but the}$$

imaginary unit in complex numbers. But as this is a bit tricky in physics they, correctly argued, that these tachyons can never go slower than the velocity of light so they can never be at rest relative our system so we can never weigh them thus never measure their mass at rest m_0 . So they argued, the rest mass of tachyons could very well be an imaginary number so $m_0=i\mu_0$ where μ_0 is an ordinary real valued number. So they got

$$E = \frac{m_0 c^2}{i\sqrt{(\frac{v^2}{c^2}-1)}} = \frac{i\mu_0 c^2}{i\sqrt{(\frac{v^2}{c^2}-1)}} = \frac{\mu_0 c^2}{\sqrt{(\frac{v^2}{c^2}-1)}} \text{ which is an ordinary}$$

number for E and a measurable quantity.

Possible but perhaps a little ad hoc. So more in the spirit of Einstein's theory of relativity where one postulate was that all systems having a constant velocity relative an ordinary system (an inertial system) was equally good, I thought that a bunch of tachyons moving with the same relative velocity relative an ordinary system would also be a valid system. Because at start there was no speed limit for the good systems.



v greater than c

So I wanted to find a transformation between our ordinary systems and systems moving faster than light. Fortunately at that time my textbook was Rindler's *Special relativity* (26).

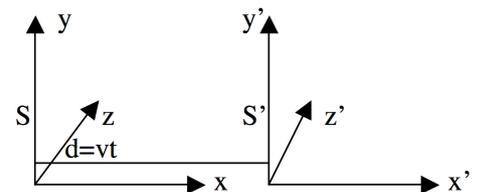
When he derived Einstein's formulas (the Lorentz transformations) he started with Einstein's two postulates

All inertial systems are equally good for formulating the laws of physics

The velocity of light in vacuum is absolute, the same in all systems

and from that derived (26 p.13-21) for the transformation between to systems where S' moves with the velocity v in S this mathematical expression

$$x^2 + y^2 + z^2 - c^2 t^2 = \pm(x'^2 + y'^2 + z'^2 - c^2 t'^2)$$



N.B. that Rindler here has \pm that is two alternatives: + and -. (26 p.) Rindler correctly argued that for velocities going to zero there must be +. And so he discarded the - sign.

But as I was looking for transformations with velocities greater than c, I tried the minus sign, at first with the usual simplification with just one space dimension x and time t and got

$$x^2 - c^2 t^2 = \pm (x'^2 - c^2 t'^2)$$

And now simple gymnasium calculation (26 p.13-21) showed that

+ sign gave Einstein's formulas (see 26)

$$x = \frac{x' + vt'}{\sqrt{1 - \frac{v^2}{c^2}}} \quad t = \frac{t' + \frac{vx'}{c^2}}{\sqrt{1 - \frac{v^2}{c^2}}} \quad \text{valid only for velocity less than the velocity of light } c$$

but - sign gave (27)

$$x = \frac{x' + vt'}{\sqrt{\frac{v^2}{c^2} - 1}} \quad t = \frac{t' + \frac{vx'}{c^2}}{\sqrt{\frac{v^2}{c^2} - 1}} \quad \text{valid only for velocities greater than the velocity of light } c.$$

I can assure you this shocked me and my whole, at that time, natural scientific materialistic worldview. From Einstein's postulates and simple calculations one gets formulas describing ordinary matter with velocities less than the velocity of light, and we have light and now also formulas describing something going faster than the velocity of light, a world beyond light? Whatever that was.

But this was not enough. As our real world has three space dimensions length, breadth and height we must use (x, y, z) and thus the full expression Rindler got

$$x^2 + y^2 + z^2 - c^2 t^2 = \pm (x'^2 + y'^2 + z'^2 - c^2 t'^2)$$

But I knew a proof in mathematics (28), which said that using the minus sign here again gave this imaginary numbers, which are tricky and which I didn't want. But the proof also showed a simple *mathematical* solution how the minus could be used with ordinary numbers if we had six dimensions: three space (x, y, z) and three "timelike" dimensions (t_1, t_2, t_3) like this

$$x^2 + y^2 + z^2 - c^2 t_1^2 - c^2 t_2^2 - c^2 t_3^2 = \pm (x'^2 + y'^2 + z'^2 - c^2 t_1'^2 - c^2 t_2'^2 - c^2 t_3'^2)$$

Of course at that time I had no idea what these extra dimension could be.

But to make a longer story short: I left theoretical physics without finishing my Ph.D. as I got no support for these ideas of six dimensional spacetime. This was before string theory so there was no interest in more dimensions at that time. After a while I changed my studies to medical high school and there also read about near-death-experiences (NDE), which gave the same strong feeling, as when I first saw the possibility of six dimensions, that there seemed to be something more in reality than was taught in natural science. And as people who have had NDE talk about more dimensions I thought there perhaps could be a connection. But most natural scientist, at least most brain researchers, said the NDE was just hallucination. But when I started to look for what we now really know about brain and consciousness I discovered what I presented at the start of this article: no one really had a clue. So I continued my work and also found that there had been published articles on 6D spacetime in peer-reviewed journals in physics (for a review and relevant references see 29) and now I claim that a six dimensional spacetime seems to give a possible solution to both problems in physics (29) and the mystery of consciousness.

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11. Pilotti, J., see not 8

12. Here is included all entities with consciousness, in a "panpsychic" meaning: humans, all animals, plants, elementary particles,. And even beings greater than humans.

13. The concept 'now' must be specified. The now in physics is the set of all events at a special time for a given observer. But this observer in *the experiential now* experience also what happened in an earlier physical now. So the experiential now is a larger set of events in spacetime including many physical nows. E.g. when I am sitting writing in my garden I see my body and my computer but even at the same time even events which happened earlier as the clouds and even the sun as it existed about 8,5 minutes before, an event which my consciousness is spread to include in my experiential now. So already my sensory experience includes many physical nows through direct physical contact as by e.g. light.

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<http://www.drpilotti.info/eng/conscious-spacetime.html>. See also ref. 16

18 Kurt Gödel chocked mathematicians and logicians in 1930-ties by proving that even in simple logical systems there exist true propositions which cannot be proven within that system, so called undecidable propositions. There are many mathematical conjectures where we still don't know if they are decidable or undecidable. See e.g. https://en.wikipedia.org/wiki/List_of_conjectures

19. Lorentz had found these, or very close to these, formulas, which now have his name, in an Attempt to explain the negative result of Michelson-Morley's. Einstein came to the same formulas but from another and more fundamental view expressed in his two postulates, see appendix 2.

20. The numbers 1 and 3 are exaggerated for normal distances. In the figure the time on the clocks K_1 and K_2 are shown in A:s system. B and C move along space axis and pass K_1 when $K_1=1$. As B and C are moving in A:s system they measure other events as simultaneous with $K_1 =1$, as $K_2=3$ resp. $K_2=1$. The difference between time on K_1 and time on K_2 measured by A is $\Delta T=vL/c^2$ where v is the velocity relative A:s system for a moving observer, and L the distance between K_1 and K_2 relative A:s system and c the velocity of light 300 000 km/s.

(N.B For A the time on K_2 and all other clocks are 2, they are simultaneous which is also captured in the formula for $\Delta T = vL/c^2 = 0$ for all finite L as $v=0$). As c^2 is a huge number about 10^{11} (measuring c in km/s) for a difference to be measurable, say 6 minutes for ordinary v say 90 km/h, is needed astronomical distances L about 10^{15} km (1 with 15 zeros.) It is therefore we don't notice the relativity of simultaneity in daily life, but yet the effect is real. In a comment to an article where some psychologist claim that precognition is not possible as the future does not exist, which it, as I have shown does in Einstein-Minkowski's spacetime. The question is though discussed in mainstream physics, which these psychologists seems to no nothing about. My comment will come on my homepage after publication, but I will here just mentioned that difference in time could be experienced for ordinary distances L if v is very high, which it of course can be in 6D which allows superluminal velocities. What move with superluminal velocities is the not ordinary matter more probable consciousness.

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<http://www.minkowskiinstitute.org/conferences/2018/>

My PowerPoint with my talk and the mathematical details at

<http://www.drpilotti.info/eng/sixdimensional-relativity.html>

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Physics <http://www.minkowskiinstitute.org/meetings/2019/>

Animation of TV analogy, dr Grips NDE and discussion of relativity of simultaneity See my PowerPoint from the conference at my homepage

<http://www.drpilotti.info/eng/conscious-spacetime.html>