https://www.youtube.com/watch?v=yPVQtvbiS4Y

What Actually Are Space And Time?

Co jsou vlastně prostor a čas

My comment on the author's text will be here in red 12.06.2023

0:03
(01)- A hundred trillion years from now, the last of a great civilisation hides in the darkness. Throughout their glory days, their engineers worked entire star systems. They dismantled planets and asteroids to construct an immense interstellar empire. But now, in the twilight of their time, all of this is long gone. All around them, the universe is dying as the last of the stars are going out. Over countless millennia, the sky has continued to fade into an eternal night. The aging universe gripped by desolation and decay, And so, in the darkness, they wait for the end. Long before they had realized it was coming They knew that the universe was on a path of inevitable decline. Methodically they hunted for a final place to wait out eternity. And embarked on their last great feat of engineering. Around a lost and lonely black hole, they built a new home. With demolished worlds as raw material, they constructed a shell to completely enclose the darkness. And within this thin shell, barely withstanding the gravitational grip of their savior, They eked out their meagre lives. The dwindling light of dying stars rained down upon their final home, Whilst the swirling black hole was harvested to power their existence. But more than that, the black hole at their heart gave them greatest gift of all, For the black hole gave them time. No one remembered the name of the great scientist who had discovered the nature of time. But the astro-engineers knew that time was not the same across the cosmos. And here, within the immense gravity of the black hole, time trickled more slowly. Whilst many years passed outside, mere moments flashed by within the immense sphere. And so the last of the civilisation watched the future play out in front of them. But they knew that they had only delayed, not averted, their ultimate demise. And the darkness would inevitably envelop them forever and ever. Of course, this story is little more than speculation. But it is built on a scientific idea that changed our universe. It’s been more than a century since Einstein’s relativity shook up our understanding of time and space. But how does it really work? And what does it actually mean? Both time and space seem so commonplace, so obvious, so everyday. But beneath their ubiquity they hide a multitude of unanswered questions - questions to which Einstein's theories only begin to answer. What is space made of? Does time exist? And will hunting for their ultimate nature lead to sudden clarity, or will space and time just become more elusive? “Einstein offered them lunch, and they accepted. So he moved a whole bunch of papers from the table, opened four cans of beans with a can opener, heated them, stuck a spoon in each and that was our lunch." Albert Einstein was a busy man, and often missed lunch. And that was back in 1915 - in the century since our lives have only become more chaotic. And that is why a meal kit service like HelloFresh is so great. Hellofresh delivers fresh, high quality produce straight from the farm to your door, with more than 55 weekly meal options. Great for everyone - especially if you want to get or stay fit and healthy. I am a big fan of fitness and eating the right food - but in honesty sometimes there just aren't enough hours in the day and a microwaveable meal seems like the only option. Hellofresh has saved me from this tasteless horror. The kits are fool proof, genuinely really hard to get wrong, and that is coming from an absolute cooking disaster. And last but definitely not least, a recent survey has found their meals have been

found up to 72% cheaper than dining out or grocery shopping. Go to HELLOFRESH.COM and use code HISTORY16 for up to 16 FREE MEALS and 3 surprise gifts. 16 free meals! This is a great company, and a smart way to eat healthily - and the cherry on top is that they are also carbon neutral. A big thanks to HelloFresh for supporting educational content on YouTube. What Is Space? As the lonely world lingered on, Its beating heart warped the very fabric of the universe around it. The civilisation had done everything they could to keep going, to put off the inevitable. But try as they might, they could only bend reality. They could not break it. "Behind it all is surely an idea so simple, so beautiful, that when we grasp it - in a decade, a century, or a millennium - we will all say to each other, how could it have been otherwise? How could we have been so stupid?" What is space? The question seems almost meaningless. As children we learn to describe our surroundings as up-down, left-right, back-and-front. We call it three dimensional and are free to explore each dimension.

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(01)- In a hundred trillion years, the last of the great civilization is hiding in darkness. During their glory days, their engineers worked on entire star systems. They dismantled planets and asteroids to build a vast interstellar empire. But now, in the twilight of their time, all this is long gone. All around them, the universe is dying as the last stars fade. Over countless millennia, the sky continues to turn into eternal night. An aging universe gripped by destruction and decay, they await the end in darkness. Long before they realized it was coming, they knew the universe was on a path of inevitable decay. They methodically searched for a final place where they would wait for eternity. And they embarked on their last major engineering feat. They built a new home around the lost and lonely black hole. With the broken worlds as raw material, they constructed a shell to seal out the darkness completely. And in this thin shell, barely resisting the gravitational grip of their rescuer, they lived out their meager lives. The waning light of dying stars rained down on their last home as the swirling black hole was harvested to fuel their existence. But more than that, the black hole in their heart gave them the greatest gift of all because the black hole gave them time. A phantasmagoria for which I would receive dozens of spits from "my scientific critics"... Nobody remembered the name of the great scientist who |discovered the essence of time|. Is there any such scientist today? Who discovered the essence of time? But the astro-engineers knew that time is not the same throughout the universe. Apparently the author here is referring to the "pace of time passing"...nicht wahr And here, in the immense gravity of the black hole, time passed more slowly... from the point of view of an external observer who chose the x, y, z, t system ,.. and he fitted himself "to zero" in that system... didn't he? But the flow of passing and changing the pace of passing time, that is not an explanation about the "essence of time"!, While many years passed outside outside the black hole, mere moments flashed in the vast sphere. And so the last of civilization watched the future unfold before them. But they knew that they had only delayed, not averted, their ultimate demise. And darkness will inevitably cover them forever and ever. Of course, this story is little more than speculation. But it is built on a scientific idea that changed our universe. Thoughts don't change the universe… It's been over a century since Einstein's theory of relativity shook our understanding of time and space. So far you have only proposed to **"connect"** "scalar" (one-dimensional time with "vector" three-dimensional space... But how does it really work? And what does it really mean? Time and space seem so commonplace, so obvious, so everyday. But beneath their ubiquity they hide a host of unanswered questions—questions that Einstein's theories are only beginning to answer. What is space made of? Does time exist? And will the search for their ultimate nature lead to sudden clarity, or will space and time simply will they become more elusive? "Einstein offered them lunch and they accepted.

A tak přesunul ze stolu celou hromadu papírů, otvírákem na konzervy otevřel čtyři plechovky fazolí, ohřál je, do každé strčil lžíci a to byl náš oběd." Albert Einstein byl zaneprázdněný muž a často vynechal oběd. A to bylo v roce 1915 – ve století, kdy se naše životy staly chaotičtějšími. A proto je služba jídelních sad jako HelloFresh tak skvělá. Hellofresh dodává čerstvé, vysoce kvalitní produkty přímo z farmy až k vašim dveřím s více než 55 možností týdenního stravování. Skvělé pro každého – zvláště pokud se chcete dostat nebo zůstat fit a zdraví. Jsem velkým fanouškem fitness a správného jídla – ale upřímně řečeno, někdy prostě není dost hodin denně a Jídlo v mikrovlnné troubě se zdá být jedinou možností. Hellofresh mě zachránil před tímto nevkusným hororem. Soupravy jsou hloupé, opravdu je těžké se mýlit, a to pochází z absolutní kuchařské katastrofy. A v neposlední řadě nedávný průzkum zjistil, že jejich jídla jsou až o 72 % levnější než stolování nebo nakupování potravin. Přejděte na HELLOFRESH.COM a použijte kód HISTORY16 pro až 16 JÍDEL ZDARMA a 3 překvapení. 16 jídel zdarma! Je to skvělá společnost a chytrý způsob, jak jíst zdravě – a třešničkou navrchu je, že jsou také uhlíkově neutrální. Velké díky HelloFresh za podporu vzdělávacího obsahu na YouTube. Co je vesmír? Jak se osamělý svět zdržoval, jeho tlukoucí srdce pokřivilo samotnou strukturu vesmíru kolem něj. Civilizace udělala vše, co mohla, aby pokračovala, aby oddálila nevyhnutelné. Ale ať se snažili sebevíc, mohli jen ohýbat realitu. Nemohli to zlomit. "Za tím vším je jistě myšlenka tak jednoduchá, tak krásná, že když ji pochopíme - za desetiletí, století nebo tisíciletí - budeme si všichni říkat, jak to mohlo být jinak? Jak jsme mohli být tak hloupý?" co je prostor? Otázka se zdá téměř nesmyslná. Jako děti se učíme popisovat naše okolí jako nahoře-dolů, vlevo-vpravo, zezadu a zepředu. Říkáme tomu třírozměrné a můžeme volně prozkoumat každou dimenzi.
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(02)- But just what is it, this universal platform on which we play out our lives? It is a question that occupied the minds of the earliest philosophers. In the fourth century BC, Plato declared that space was the “The Nurse of Becoming”, a medium in which everything existed, but with no qualities of its own - and his student Aristotle agreed that an empty void was impossible. But it would be more than two thousand years before our concept of space was born. By the coming of the seventeenth century, modern science was crystallizing. The processes of the universe were being codified into physical laws. And the understanding of these physical laws was evolving from myths and stories, to the language of mathematics. Of course, Isaac Newton was at the forefront of this revolution. But before he enters our stage, we must first start with a boat. In 1632, Galileo published his seminal work “Dialogue Concerning the Two Chief World Systems”. He was in his mid 60s by this point, and had already had multiple run-ins with the Roman Inquisition for his assertions that the earth rotated around the sun. So he had decided to skirt controversy, and spend the intervening years quietly cementing his myriad ideas on space and the cosmos into a book. And at one point within this book, he muses on a boat. More specifically - the life of a sailor locked below deck in a windowless cabin. With plates and knives and a goldfish in a bowl on the table - a collection of birds, flies, and butterflies. Just what does the sailor experience? Tied up in port, the cabin is a picture of serenity, and all is calm as the goldfish swims happily in its bowl. On the table, plates and cutlery remain in their place, and the flying creatures happily flutter about. But finding itself in rough seas, the cabin heaves and falls with the ship. Plates and cutlery are wrenched off the table, water spills from the goldfish bowl. On calm seas with wind-filled sails, the ship would speed up. The sailor would feel this change, and see things sliding off the table. But when the wind finally drops, the ship sails smoothly on the glassy sea. Inside the cabin, all would be calm, serenity returning. For the sailor, it would be as if the ship was still in port and was not moving at all. A dropped plate would fall straight to the floor, and the sailor would sit comfortably in their chair. And it was here Galileo realised something. Without a window to reveal the truth, there are no experiments the sailor could do to reveal whether the ship was moving or not. He concluded that there must be no absolute concept of being at rest in space. Instead, everyone must experience any smooth, uniform motion in the same way. All uniform motion must feel like simply being still. Galileo declared, therefore, that any uniform motion is simply relative to any other uniform motion. And with this, the first theory of relativity had been born. Galileo´s sailor floats gently on their sailboat, on seas near the earth's equator - rotating at 1600 km an hour around the earth, which in turn orbits the sun at 67,000 km an hour, which in turn orbits the milky way at 720,000 km an hour, which in turn is travelling towards the Andromeda galaxy at 403,000 km an hour. And yet he feels nothing on his vast journey millions of kilometres from his starting point. Unfortunately upon publishing the book, Galileo once again fell foul of the Catholic Church - and was found guilty of heresy for his heliocentric view of the cosmos. The work was banned, and would not be removed from the church´s Index of Forbidden Books until 1835. Within a few decades of Galileo´s downfall, two of Europe's greatest minds were arguing about the nature of space. One of them, Isaac Newton, was born in England in 1642, within a year of Galileo's death. He needs little introduction, and is known now as one of the greatest thinkers of his age, perhaps one of the greatest of all time. Whilst not forgotten, his opponent, Gottfried Leibniz, is somewhat less well known today. Born in 1646 in what is present-day Germany, he was a leading thinker of his day, writing on mathematics and philosophy. He pondered deep metaphysical questions, including one that still haunts physicists and philosophers to this day - why there is something rather than nothing. It was in the development of calculus that the two men´s feud began. Whilst Leibniz published his work first, Newton claimed that he had stolen his ideas. As president of the Royal Society at the time, Newton set up a committee to investigate the dispute. Unsurprisingly the committee found in favour of Newton. And so this animosity carried over to their second disagreement. A simple question: What happens to a spinning bucket of water? Space, Newton declared, was a universal absolute, a rigid stage on which motion was played out. And both would exist in a universe devoid of matter to experience any motion.

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(02)- Ale co to je, tato univerzální platforma, na které hrajeme své životy? Je to otázka, která zaměstnávala mysl nejstarších filozofů. Ve čtvrtém století př. n. l. Platón prohlásil, že prostor je „Sestrou stávání se“, médiem, ve kterém vše existuje, ale nemá žádné vlastní vlastnosti – a jeho žák Aristoteles souhlasil, že prázdné prázdno je nemožné. Ale než se zrodila naše koncepce vesmíru, uběhlo více než dva tisíce let. S příchodem sedmnáctého století krystalizovala moderní věda. Procesy vesmíru byly kodifikovány do fyzikálních zákonů. A pochopení těchto fyzikálních zákonů se vyvíjelo od mýtů a příběhů k jazyku matematiky. Isaac Newton byl samozřejmě v čele této revoluce. Než ale vstoupí na naši scénu, musíme nejprve začít s lodí. V roce 1632 vydal Galileo své klíčové dílo „Dialog o dvou hlavních světových systémech“. V tomto bodě mu bylo kolem 60. let a už měl několik sporů s římskou inkvizicí kvůli jeho tvrzením, že Země se otáčí kolem Slunce. A tak se rozhodl vyhnout se kontroverzi a strávit roky, které uplynuly, tiše stmelováním svých nesčetných myšlenek o vesmíru a kosmu do knihy. A v jednom bodě této knihy přemítá na lodi. Přesněji – život námořníka zavřeného v podpalubí v kajutě bez oken. S talíři a noži a zlatou rybkou v misce na stole - sbírka ptáků, much a motýlů. Co zažívá námořník? Kabina uvázaná v přístavu je obrazem klidu a všude je klid, zatímco zlatá rybka spokojeně plave ve své misce. Na stole zůstávají talíře a příbory na svém místě a létající tvorové vesele poletují. Kabina se ale ocitne na rozbouřeném moři a zvedá se a padá s lodí. Talíře a příbory jsou strhávány ze stolu, voda se rozlévá z misky se zlatou rybkou. Na klidném moři s plachtami naplněnými větrem by loď zrychlila. Námořník by tuto změnu pocítil a viděl, jak věci kloužou ze stolu. Ale když vítr konečně opadne, loď hladce pluje po skleněném moři. Uvnitř kabiny bude vše klidné, vrátí se klid. Pro námořníka by to bylo, jako by loď byla stále v přístavu a vůbec se nehýbala. Spadlý talíř by spadl přímo na podlahu a námořník by se pohodlně usadil na židli. A právě tady si Galileo něco uvědomil. Bez okna, které by odhalilo pravdu, neexistují žádné experimenty, které by námořník mohl udělat, aby odhalil, zda se loď pohybovala nebo ne. Došel k závěru, že nesmí existovat absolutní koncept klidu ve vesmíru. Místo toho musí každý zažít jakýkoli hladký, rovnoměrný pohyb stejným způsobem. Veškerý stejnoměrný pohyb musí být prostě nehybný. Galileo proto prohlásil, že jakýkoli rovnoměrný pohyb je jednoduše relativní k jakémukoli jinému rovnoměrnému pohybu. A tím se zrodila první teorie relativity. Galileův námořník jemně pluje na své plachetnici, na mořích poblíž zemského rovníku - rotuje rychlostí 1600 km za hodinu kolem Země, která zase obíhá kolem Slunce rychlostí 67 000 km za hodinu, která zase obíhá kolem Mléčné dráhy ve vzdálenosti 720 000 km. hodinu, která se zase pohybuje směrem ke galaxii Andromeda rychlostí 403 000 km za hodinu. A přesto na své obrovské cestě miliony kilometrů od výchozího bodu nic necítí. Bohužel po vydání knihy se Galileo znovu dostal do konfliktu s katolickou církví - a byl shledán vinným z kacířství pro svůj heliocentrický pohled na vesmír. Dílo bylo zakázáno a z církevního indexu zakázaných knih bude odstraněno až v roce 1835. Během několika desetiletí po Galileově pádu se dva z největších evropských mozků dohadovali o povaze vesmíru. Jeden z nich, Isaac Newton, se narodil v Anglii v roce 1642, rok po Galileově smrti. Potřebuje málo představování a nyní je známý jako jeden z největších myslitelů své doby, možná jeden z největších všech dob. I když není zapomenuto, jeho protivník Gottfried Leibniz je dnes poněkud méně známý. Narodil se v roce 1646 v dnešním Německu a byl předním myslitelem své doby, psal o matematice a filozofii. Zamýšlel se nad hlubokými metafyzickými otázkami, včetně té, která fyziky a filozofy dodnes pronásleduje – proč existuje spíše něco než nic. Spor obou mužů začal ve vývoji kalkulu. Zatímco Leibniz publikoval svou práci jako první, Newton tvrdil, že ukradl jeho nápady. Newton jako tehdejší prezident Královské společnosti ustavil výbor, který měl spor prošetřit. Není překvapením, že komise dala za pravdu Newtonovi. A tak se tato nevraživost přenesla i do jejich druhé neshody. Jednoduchá otázka: Co se stane s točícím se vědrem s vodou? Prostor, prohlásil Newton, je univerzální absolutno, pevné jeviště, na kterém se odehrává pohyb. A oba by existovali ve vesmíru bez hmoty, aby zažili jakýkoli pohyb.

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(03)- To argue his point, Newton asked us to think of a bucket of water. If the bucket sits at rest, the surface of the water would be flat and level. But if we spin the bucket, the water spins too and its surface becomes curved. Newton asked “Just what is the water spinning with respect to?” Newton claimed that the acceleration of the spin was relative to an absolute space - something separate to the object itself - spinning a bucket in an empty universe would also curve the surface of the water. But to Leibniz, space in an empty universe, devoid of any matter, simply made no sense. The properties of objects, Leibniz claimed, are essential in defining their meaning. Space only has meaning, in the relative locations of objects. And similarly, time only had meaning when discussing the relative motions of objects. Without matter Leibniz said, space and time simply have no role, and hence no existence. Sadly, Liebniz died in 1716, with the argument still in full swing - but it was Newton's ideas that stuck. “Absolute space, in its own nature, without relation to anything external, remains always similar and immovable, Absolute, true, and mathematical time, of itself, and from its own nature, flows equally without relation to anything external." This so-called “absolute space and time” would be the accepted science for nearly two centuries - but with the caveat of Galileo´s rejection of absolute rest. Absolute space may have won the debate - but absolute rest, a fixed point - was still an impossibility. Relativity was still part of the argument. But that only applied to space. Time was a totally different matter. With its implicit direction, time appeared totally distinct. For Newton and Galileo, everyone’s clock across the universe ticked with absolute synchronicity. A universal beat that ran through every event in the cosmos. A second on Earth the same as a second everywhere else. But is this true? Is time malleable or an unswerving metronome that drags the cosmos forward? Does it itself have properties or is it defined only by the events that run in its current? To answer these questions we must begin not with physicists wondering about clocks, rulers and motion. But with heat. What Is Time? In the distant future universe, around the aging black hole, our dying civilization sits and waits. For sitting and waiting is all they can do. With the passing of the stars, raw energy had become the most precious thing. To preserve what they had, they had slowed their very existence. Every aspect was focused upon survival, as their sleepy eyes watched the ever darkening skies. As total universal heat death crept across the cosmos, They realised that time was their ultimate enemy. "You may see a cup of tea fall off a table and break into pieces on the floor… …but you will never see the cup gather itself back together and jump back on the table." What is time? Like space, the nature of time occupied the minds of many ancient thinkers. In ancient Greece, Aristotle stated that time was simply the steps between before and after, whilst Hindu philosophers saw time as cyclical, from creation to destruction over four billion years. But it's true origin remained elusive. Like space, time seems to be something obvious, something that is just present. But it is clearly a different beast - we cannot freely travel through time. Unlike space, time has a direction - a distinct past and coming future. As with space, scientists can be pragmatic and not worry about the nature of time. Coupled with a ruler, a clock completes the experimenter’s toolbox. But it doesn’t mean we can ignore the question. And to understand time fully, we first have to think about horses and steam engines. The coming of the industrial revolution presented humanity with a problem. The original engines of civilization, draught animals like horses and cattle, were relatively simple things. Understanding how much to feed them and how much to work them was easy. A certain number of bales of hay could guarantee a day’s work from a well-fed animal. But what of new-fangled machines, such as a steam engine? How much work can you get out of a heap of coal? This was an important question from an economic standpoint. Do you replace a horse with an engine if it is going to cost more to feed it? And it was out of this conundrum that thermodynamics was born. Many minds wrestled over the question of the ultimate efficiency of engines. Indeed - at the time of thermodynamics inception, a typical engine only worked at 3%. In a physical steam engine, the heat of the fire is used to boil water, But some of the fire’s heat just radiates into the air. Metal scrapes against metal, screeching loud and hot to the touch - both forms of energy loss. In any physical steam engine, this loss of heat as waste is inevitable. Within the mathematics of thermodynamics, perfect efficiency was found to be an illusion.

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(03)- Aby argumentoval, Newton nás požádal, abychom mysleli na kbelík vody. Pokud bude kbelík v klidu, hladina vody by byla rovná a rovná. Pokud však kbelík roztočíme, voda se roztočí také a její povrch se zakřiví. Newton se zeptal: "Proč se ta voda točí?" Newton tvrdil, že zrychlení rotace je relativní k absolutnímu prostoru – něčemu oddělenému od samotného objektu – roztočení kbelíku v prázdném vesmíru by také zakřivilo hladinu vody. Leibnizovi však prostor v prázdném vesmíru, postrádajícím jakoukoli hmotu, prostě nedával smysl. Vlastnosti objektů, tvrdil Leibniz, jsou zásadní při definování jejich významu. Prostor má význam pouze v relativních umístěních objektů. A podobně čas měl význam pouze při diskuzi o relativních pohybech objektů. Bez hmoty řekl Leibniz, prostor a čas prostě nemají žádnou roli, a tudíž žádnou existenci. Je smutné, že Liebniz zemřel v roce 1716, s argumentem stále v plném proudu - ale byly to Newtonovy myšlenky, které zůstaly. "Absolutní prostor ve své vlastní přirozenosti, bez vztahu k čemukoli vnějšímu, zůstává vždy podobný a nehybný, Absolutní, pravdivý a matematický čas sám o sobě a ze své vlastní podstaty plyne stejně bez vztahu k čemukoli vnějšímu." nazývaný „absolutní prostor a čas" by byl uznávanou vědou po téměř dvě století – ale s výhradou Galileiho odmítnutí absolutního klidu. Absolutní prostor možná vyhrál debatu – ale absolutní klid, pevný bod – byl stále nemožný Relativita byla stále součástí argumentu. Ale to platilo pouze pro prostor. Čas byl úplně jiná záležitost. Se svým implicitním směrem se čas zdál zcela odlišný. Pro Newtona a Galilea hodiny každého ve vesmíru tikaly s absolutní synchronicitou. Univerzální beat, který proběhl každou událostí ve vesmíru. Sekunda na Zemi stejná jako sekunda všude jinde. Ale je to pravda? Je čas tvárný nebo neochvějný metronom, který táhne vesmír kupředu? Má sám o sobě vlastnosti nebo je definován pouze událostmi, které běží v jeho proudu? Abychom na tyto otázky odpověděli, nesmíme začít tím, že by se fyzikové zajímali o hodiny, pravítka a pohyb. Ale s teplem. Co je čas? Ve vzdáleném budoucím vesmíru, kolem stárnoucí černé díry, naše umírající civilizace sedí a čeká. Pro sezení a čekání je vše, co mohou dělat. S přechodem hvězd se surová energie stala tou nejcennější věcí. Aby zachovali to, co měli, zpomalili svou samotnou existenci. Každý aspekt byl zaměřen na přežití, zatímco jejich ospalé oči sledovaly stále temnoucí oblohu. Když se vesmírem plížila totální univerzální tepelná smrt, uvědomili si, že čas je jejich hlavním nepřítelem. "Můžete vidět, že šálek čaje spadne ze stolu a rozbije se na podlaze... ...ale nikdy neuvidíte, že by se šálek shromáždil a skočil zpět na stůl." Co je čas? Stejně jako prostor zaměstnávala povaha času mysl mnoha starověkých myslitelů. Ve starověkém Řecku Aristoteles prohlásil, že čas byly jednoduše kroky mezi před a po, zatímco hinduističtí filozofové viděli čas jako cyklický, od stvoření po zničení po dobu čtyř miliard let. Ale jeho skutečný původ zůstal nepolapitelný. Stejně jako prostor se čas zdá být něčím samozřejmým, něčím, co je právě přítomné. Ale je to zjevně jiná šelma - nemůžeme svobodně cestovat časem. Na rozdíl od prostoru má čas směr – zřetelnou minulost a nadcházející budoucnost. Stejně jako v případě vesmíru mohou být vědci pragmatičtí a nestarat se o povahu času. Hodiny ve spojení s pravítkem doplňují sadu nástrojů experimentátora. Ale to neznamená, že můžeme otázku ignorovat. A abychom plně porozuměli času, musíme nejprve myslet na koně a parní stroje. Příchod průmyslové revoluce postavil lidstvo před problém. Původní motory civilizace, tažná zvířata jako koně a dobytek, byly relativně jednoduché věci. Bylo snadné pochopit, jak moc je krmit a jak moc s nimi pracovat. Určitý počet balíků sena by mohl zajistit celodenní práci dobře živeného zvířete. Ale co nové stroje, jako je parní stroj?

Kolik práce můžete dostat z hromady uhlí? To byla důležitá otázka z ekonomického hlediska. Nahradíte koně motorem, pokud bude jeho krmení dražší? A právě z tohoto rébusu se zrodila termodynamika. Mnoho hlav se potýkalo s otázkou maximální účinnosti motorů. Skutečně – v době nástupu termodynamiky typický motor pracoval pouze na 3 %. Ve fyzickém parním stroji se teplo ohně používá k vaření vody, ale část tepla z ohně vyzařuje do vzduchu. Kov škrábe o kov, je hlasitý a horký na dotek - obě formy ztráty energie. V každém fyzikálním parním stroji je tato ztráta tepla jako odpadu nevyhnutelná. V matematice termodynamiky bylo zjištěno, že dokonalá účinnost je iluzí.

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(04)- Energy is always lost as heat flows from one place to another. The concentrated energy released from burning coal must be degraded as it flows through the engine and some must be lost into the surroundings. And so a new measure was introduced to account for this increase of decay and disorder. Entropy. And it is probability that dictates how this happens. As the early 20th century physicist George Gamow put it: "For exactly the same reason the room in which you sit reading this book is filled uniformly by air from wall to wall and from floor to ceiling, and it never even occurs to you that the air in the room can unexpectedly collect itself in a far corner, leaving you to suffocate in your chair. However, this horrifying event is not at all physically impossible, but only highly improbable." Gamow goes on to give the waiting time of such an event - trillions upon trillions times longer than the entire age of the universe. Disorder is always statistically far more likely. Through the new laws of thermodynamics physicists revealed an inexorable growth in entropy as the universe marches on - a future universe destined to be more disordered and decayed than today’s. Not only steam engines, but whole planets, stars, galaxies, filaments - all marching from order to disorder. It was in 1862 that the grim logical endpoint of these ideas was proposed, by Lord Kelvin, for whom the measurement unit was named:"... although mechanical energy is indestructible, there is a universal tendency to its dissipation, which produces…exhaustion of potential energy through the material universe. The result would inevitably be a state of universal rest and death, if the universe were finite and left to obey existing laws." And so, was this time? A constantly dying universe heading for inevitable heat death? Stars going out one by one in a steady march from potential energy to waste leaving the trillion year old universe dark and spent? One of the great minds to occupy themselves with entropy and the arrow of time was James Clerk Maxwell, the iconic Scottish nineteenth century scientist. His views on thermodynamics shaped our understanding of heat and gases - and he did all this with the assistance of a demon. Maxwell understood the implications of entropy. He knew that if he mixed two gases, one hot and one cold, the result would be warm gas. And he knew that the gas would stay warm and mixed rather than separating into two halves, with hot gas in one and cold in the other. But he wondered - what if we introduced a tiny demon who can sense each and every atom in the gas. This demon can turn around atoms, directing slow atoms to one side, and fast to the other. As the temperature of a gas is a reflection of the average speed of its atoms, The demon has effectively separated the warm gas into two unequal halves, one hot, and one cold. The demon seems to have broken the laws of thermodynamics. It has taken the disordered state, the warm gas, and created a more ordered state, hot and cold gas. And whilst only a thought experiment - arguments over the meaning of Maxwell’s demon have raged for over 150 years. Some have stated that the demon must be expending energy to sort the gas atoms, And so total entropy will continue to rise. However - some have proposed that it is not energy that is important, But the fact that the demon uses information, namely the speeds of the atoms, to do the sorting. Linking energy, entropy and information might seem a little strange, But over the last three-quarters of a century, This link has become stronger and stronger. And as any touch of a computer will tell you, processing information generates a lot of waste heat. But the situation is more complex than that. It is not simply the processing of information that leads to waste heat, but the forgetting of information. When we add three and two, the answer is, of course, five. But if I told you an answer was five and ask what two numbers are summed together, you cannot answer. In a computer, logic gates combine electronic signals to do the addition - Whilst two numbers are fed in, they are forgotten as the single answer is spat out. The calculation is irreversible, the inputs lost to the universe. And, in the action of forgetting, the logic gates heat up a little. Thermodynamics therefore provides us with the ultimate limit for forgetting. Called the Landauer limit, it is the inevitable release of energy from erasing a single bit of information. And at room temperature it is just over 100th of an electron volt. Proven experimentally in 2012, scientists believe that at present computer chips produce thousands of times more heat than this limit - but by 2035,

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(04)- Energie se vždy ztrácí, když teplo proudí z jednoho místa na druhé. Koncentrovaná energie uvolněná ze spalování uhlí se musí při průtoku motorem degradovat a část se musí ztratit do okolí. A tak bylo zavedeno nové opatření, které mělo tento nárůst rozkladu a nepořádku vysvětlit. Entropie. A je to pravděpodobnost, která určuje, jak se to stane. Jak řekl fyzik z počátku 20. století George Gamow: „Přesně ze stejného důvodu je místnost, ve které sedíte a čtete tuto knihu, zaplněna rovnoměrně vzduchem od stěny ke stěně a od podlahy ke stropu, a nikdy vás ani nenapadne, že vzduch v místnosti se může nečekaně shromáždit ve vzdáleném rohu a nechat vás udusit se na židli. Tato děsivá událost však není vůbec fyzicky nemožná, ale pouze vysoce nepravděpodobná.“ Gamow dále uvádí dobu čekání na takovou událost – biliony a biliony krát delší než celý věk vesmíru. Porucha je vždy statisticky mnohem pravděpodobnější. Prostřednictvím nových zákonů termodynamiky fyzikové odhalili neúprosný růst entropie, jak vesmír pochoduje dál – budoucí vesmír, který bude více neuspořádaný a rozpadlý než ten dnešní. Nejen parní stroje, ale celé planety, hvězdy, galaxie, vlákna – to vše pochoduje od řádu k nepořádku. Bylo to v roce 1862, kdy lord Kelvin navrhl ponurý logický konec těchto myšlenek, pro kterého byla měrná jednotka pojmenována: „...ačkoli je mechanická energie nezničitelná, existuje univerzální tendence k jejímu rozptylování, které způsobuje… vyčerpání. Potenciální energie prostřednictvím hmotného vesmíru. Výsledkem by nevyhnutelně byl stav univerzálního klidu a smrti, pokud by byl vesmír konečný a ponechán, aby se řídil existujícími zákony." A bylo to tentokrát? Neustále umírající vesmír mířící k nevyhnutelné tepelné smrti? Hvězdy vycházející jedna po druhé v neustálém pochodu od potenciální energie k odpadu a zanechávají tak bilion let starý vesmír temný a vyčerpaný? Jednou z velkých myslí, která se zabývala entropií a šípem času, byl James Clerk Maxwell, ikonický skotský vědec devatenáctého století. Jeho názory na termodynamiku formovaly naše chápání tepla a plynů – a to vše dělal s pomocí démona. Maxwell pochopil důsledky entropie. Věděl, že když smísí dva plyny, jeden horký a jeden studený, výsledkem by byl teplý plyn. A věděl, že plyn zůstane teplý a smíšený, místo aby se rozděloval na dvě poloviny, s horkým plynem v jedné a studeným v druhé. Ale napadlo ho - co kdybychom představili malého démona, který dokáže vycítit každý atom v plynu. Tento démon může otáčet atomy, směrovat pomalé atomy na jednu stranu a rychlé na druhou. Protože teplota plynu je odrazem průměrné rychlosti jeho atomů, démon účinně rozdělil teplý plyn na dvě nestejné poloviny, jednu horkou a jednu studenou. Zdá se, že démon porušil zákony termodynamiky. Vzal neuspořádaný stav, teplý plyn, a vytvořil uspořádanější stav, horký a studený plyn. A i když jde pouze o myšlenkový experiment – spory o význam Maxwellova démona zuří již více než 150 let. Někteří prohlásili, že démon musí vynakládat energii na třídění atomů plynu, takže celková entropie bude nadále stoupat. Nicméně - někteří navrhli, že to není energie, která je důležitá, ale skutečnost, že démon používá informace, konkrétně rychlosti atomů, k třídění. Propojení energie, entropie a informací se může zdát trochu divné, ale za poslední tři čtvrtě století se toto spojení stalo silnější a silnější. A jak vám řekne každý dotyk počítače, při zpracování informací vzniká velké množství odpadního tepla. Ale situace je složitější. K plýtvání teplem nevede pouhé zpracování informací, ale zapomínání informací. Když sečteme tři a dvě, odpověď je samozřejmě pět. Ale kdybych vám řekl, že odpověď je pět a zeptám se, jaká dvě čísla se sčítají, nemůžete odpovědět. V počítači logická hradla kombinují elektronické signály, aby prováděly sčítání - Zatímco jsou vložena dvě čísla, jsou zapomenuta, protože je vyplivnuta jediná odpověď. Výpočet je nevratný, vstupy ztraceny pro vesmír. A v akci zapomínání se logické brány trochu zahřejí. Termodynamika nám tedy poskytuje nejzazší limit pro zapomínání. Nazývá se Landauerův limit a jedná se o nevyhnutelné uvolnění energie z vymazání jediného bitu informace. A při pokojové teplotě je to něco málo přes 100 elektronvoltů. Experimentálně prokázáno v roce 2012, vědci se domnívají, že v současnosti počítačové čipy produkují tisíckrát více tepla, než je tento limit - ale do roku 2035

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(05)- they will most likely reach it. that tiny bit of waste heat inescapably increasing the entropy of the universe. Ultimately, across the universe, it is this irreversibility of calculations that drives entropy to increase. forgetting information is therefore an essential ingredient for defining an arrow of time. Does this mean that for yesterday and tomorrow to have meaning, we must forget? Is the existence of the future implicitly tied to our inability to remember? And it is now we can return to our lonely civilization on the brink of universal heat death, in the far distant future… When all useful energy is used up, and entropy is at maximum - would time even have any meaning? Fundamental physics does not yet have a definitive answer, but it is an intriguing possibility. But we have now reached a turning point. The foundations of time and space can only get us so far - and though they are useful, there is a revolution coming. A new order that will lead directly to the last days of our lonely black hole world. As we continue in our journey, we are going to have to explore new time, and new space.
New Space Within their black hole shell, many of the civilisation resigned themselves to their fate and dozed their way to the end. But a few curious minds, with their dwindling energy, still wondered about the universe. Great books that had existed for almost eternity told them how space could bend and ripple, Central to these books was the story of light. They knew that light's speed was immense, and had used it to help measure their empire. They knew that light was a limit they could never break, no matter how hard they had tried. And they knew that the speed of light had been the first step in the long journey to understand how the universe really worked. "When you are next out of doors on a summer night, turn your head towards the zenith. Almost vertically above you will be shining the brightest star of the northern skies-Vega of the Lyre, twenty-six years away at the speed of light, near enough to the point of no return for us short-lived creatures…for no man will ever turn homewards beyond Vega, to greet again those he knew and loved on Earth." The speed of light has always been mysterious. Early experiments in flashing lights back and forth had shown that it must be much faster than sound. So scientists wondered - was it infinite in speed? It was in

1676 that Danish astronomer Ole Romer finally found the answer. Romer was observing the moons of Jupiter as they circled the giant planet. And timing just when they entered the gas giant´s planetary shadow. He had assumed that the orbits ticked like clockwork, And so would be able to predict just when the eclipses of the moons would begin and end. But as he observed the moon Io throughout the year, his predictions got steadily worse, and then better again. It became clear that the accuracy of his predictions depended upon our distance to Jupiter, And he would need to include the extra time taken by light having to travel further. And so with Romer´s data fellow astronomer Christian Huygens calculated that light must move at more than 211,000 km every second, not far off our modern estimate of about 300,000 km per second. Romer's observations confirmed that light was fast and finite - but precisely what light was would have to wait for two centuries - for as well as the confusing implications of James Clerk Maxwell's demon, he is also famous for intertwining electricity and magnetism into a single idea - electromagnetism. Light, he found, was nothing more than a self-propagating combination of the two - and written too into his equations was light's blistering speed. But there was still a problem. Just what was this speed relative to? Maxwell's equations gave no answers, so physicists began to search for a solution. Perhaps, they hypothesised, light travelled in an invisible medium? A mysterious ether permeating the entire cosmos? But that would also imply an ultimate state of rest in the universe - a worrying thought, as that would break Galileo's relativity. The problem was severe - so whilst one group of physicists set out to measure the properties of this supposed ether, others took the evidence in front of them and made an even larger leap. And chief among them was a young Albert Einstein. Einstein wondered why electricity and magnetism would not obey Galileo's relativity. Why should experiments specifically using the flow of electricity or spin of a magnet reveal absolute motion? In a bold step he declared that they cannot. And with that, the special theory of relativity was born. On Galileo's ship, Einstein proposed, all experiments would yield the same results, whether the ship was secured in port, or smoothly sailing on a glassy sea. Throwing a ball would of course not reveal whether the ship was moving But neither would measuring the speed of light! The speed of light in a vacuum was constant - no matter the source.

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(nothing to comment here)

(05)- s největší pravděpodobností toho dosáhnou. ten nepatrný kousek odpadního tepla nevyhnutelně zvyšující entropii vesmíru. Nakonec, v celém vesmíru je to právě tato nezvratnost výpočtů, která pohání entropii ke zvýšení zapomínání informací je proto základní složkou pro definování šipky času. Znamená to, že aby včerejšek a zítřek měly smysl, musíme zapomenout? Je existence budoucnosti implicitně spojena s naší neschopností pamatovat si? A právě teď se můžeme vrátit do naší osamělé civilizace na pokraji univerzální tepelné smrti, v daleké budoucnosti... Až bude spotřebována veškerá užitečná energie a entropie bude na maximu – měl by čas vůbec nějaký význam? Fundamentální fyzika zatím nemá definitivní odpověď, ale je to zajímavá možnost. Ale nyní jsme dosáhli bodu obratu. Základy času a prostoru nás mohou dostat jen tak daleko – a přestože jsou užitečné, přichází revoluce. Nový řád, který povede přímo do posledních dnů našeho osamělého světa černých děr. Jak budeme pokračovat v naší cestě, budeme muset prozkoumat nový čas a nový prostor. Nový prostor Ve své skořápce černé díry se mnoho civilizací smířilo se svým osudem a zdřímli si cestu až na konec. Ale několik zvědavých myslí se svou ubývající energií stále přemýšlelo o vesmíru. Skvělé knihy, které existovaly téměř věčnost, jim řekly, jak se prostor může ohýbat a vlnit. Ústředním bodem těchto knih byl příběh světla. Věděli, že rychlost světla je obrovská, a použili ji k měření své říše. Věděli, že světlo je limit, který nikdy nemohou prolomit, bez ohledu na to, jak moc se snažili. A věděli, že rychlost světla byla prvním krokem na dlouhé cestě k pochopení toho, jak vesmír skutečně funguje. "Až budete příště venku za letní noci, otočte hlavu k zenitu. Téměř svisle nad vámi bude zářit nejjasnější hvězda severního nebe - Vega z Lyry, dvacet šest let daleko rychlostí světla." , dost blízko k bodu, odkud není návratu pro nás krátkověké tvory... protože žádný člověk se nikdy neobrátí domů za Vegu, aby znovu pozdravil ty, které na Zemi znal a miloval." Rychlost světla byla vždy záhadná. První experimenty s blikajícími světly tam a zpět ukázaly, že to musí být mnohem rychlejší než zvuk. Vědci se tedy divili – bylo to nekonečné v rychlosti? Bylo to v roce 1676, kdy dánský astronom Ole Romer konečně našel odpověď. Romer pozoroval měsíce Jupitera, když kroužily kolem obří planety. A načasování právě když vstoupili do planetárního stínu plynného obra. Předpokládal, že oběžné dráhy šlapou jako hodinky, a tak bude schopen přesně předpovědět, kdy zatmění měsíců začne a skončí. Ale jak pozoroval měsíc Io po celý rok, jeho předpovědi se neustále zhoršovaly a pak zase zlepšovaly. Bylo jasné, že přesnost jeho předpovědí závisí na naší vzdálenosti k Jupiteru a on bude muset započítat čas navíc, který zabere světlo, které musí cestovat dále. A tak s Romerovými daty kolega astronom Christian Huygens vypočítal, že světlo se musí pohybovat rychlostí více než 211 000 km za sekundu, což je nedaleko našeho moderního odhadu asi 300 000 km za sekundu. Romerova pozorování potvrdila, že světlo bylo rychlé a konečné - ale přesně to, co bylo světlo, bude muset počkat dvě století - stejně jako matoucí důsledky démona Jamese Clerka Maxwella, je také známý propletením elektřiny a magnetismu do jediné myšlenky - elektromagnetismus. Zjistil, že světlo není nic jiného než samo se šířící kombinace těchto dvou – a do jeho rovnic byla zapsána také rychlost světla. Ale stále tu byl problém. K čemu byla tato rychlost relativní? Maxwellovy rovnice nedaly žádné odpovědi, takže fyzici začali hledat řešení. Možná, předpokládali, světlo putovalo v neviditelném médiu? Tajemný éter prostupující celý vesmír? Ale to by také znamenalo konečný stav klidu ve vesmíru – znepokojivá myšlenka, protože by to narušilo Galileovu relativitu. Problém byl vážný - takže zatímco jedna skupina fyziků se pustila do měření vlastností tohoto domnělého éteru, jiní vzali důkazy před sebe a udělali ještě větší skok. A hlavním z nich byl mladý Albert Einstein. Einstein uvažoval, proč se elektřina a magnetismus neřídí Galileovou relativitou. Proč by experimenty konkrétně využívající tok elektřiny nebo rotace magnetu měly odhalit absolutní pohyb? Odvážným krokem prohlásil, že nemohou. A s tím se zrodila speciální teorie relativity. Einstein navrhl, že na Galileově lodi by všechny experimenty přinesly stejné výsledky, ať už byla loď zajištěna v přístavu, nebo hladce plula po skelném moři. Házení míče by samozřejmě neodhalilo, zda se loď pohybuje, ale ani měření rychlosti světla! Rychlost světla ve vakuu byla konstantní – bez ohledu na zdroj.

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(06)- This final statement seemed to fly in the face of the universe as laid out by Newton. In Newtonian mechanics you could simply add speeds together. And each observer would measure differing speeds dependent upon their own motion. But according to Einstein, this was not the case for light. Everyone would measure the same speed. Whether the ship was stationary, going at 50 knots, or 50,000. However if this was true, something else had to give - and the only freedom in the equations was the very nature of space and time themselves. To work, each observer must have their own measurement of space. And each observer must have their own measurement of time. With special relativity, it was the speed of light that was absolute - not space and time. Space and time were no longer the universal stage on which physics played out. And just as Maxwell had combined electricity and magnetism, Spacetime too was about to unite. “Gentlemen! The views of space and time which I wish to lay before you … They are radical. Henceforth space by itself, and time by itself, are doomed to fade away into mere shadows, and only a kind of union of the two will preserve an independent reality.” In 1908 Herman Minkowski, Einstein´s former professor, came up with an idea. In reaction to the revelations of special relativity in 1905, he had decided to explore the geometry of these new equations. In Einstein’s formulation, space was space and time was time, And to transform from one observer’s viewpoint to another, you needed to mix the two together. But Minkowski pointed out that it was simpler to mix space and time together - into spacetime. And to transform one observer’s spacetime to another through geometry. And so finally, combined spacetime was born. This new melding of the three dimensions of space and one dimension of time has come to be known as "Minkowski Space" - though Minkowski himself tragically died in 1909 before his idea had been fully embraced by the physics community. Newtonian space and time had been completely upended - but Einstein was still not happy. Though his ideas had revolutionized our ideas of space and time, they could not account for gravity. Newton’s gravitational equations needed the distance between masses And special relativity now told us that no one could even agree on what these distances were. So he went back to the drawing board and spent a decade thinking about gravity. What eventually emerged from these ruminations in 1915 was a solution that shocked physics to its core. Einstein took Minkowski’s geometric picture of spacetime, and made both space and time bendy and stretchy, the presence of mass and energy producing the curvature. Within his general theory, Einstein concluded that gravity, as a force, simply did not exist - the effects of gravity were encoded within the curvature of space and time. Newton’s picture of space and time was well and truly dead, for not only were space and time relative, they were flexible as well. The consequences of Einstein’s vision of relativity were quickly uncovered. In the special theory the relative tick of clocks depended on motion. And whilst everyone feels time passing at one second per second, Different clocks will tick off different amounts of time. With the coming of the general theory, time was shaken even more, As where you are also influences the tick of your clock. The presence of mass curves space and curves time, And so gravity can dictate the relative ticking of a clock. In 1916, Karl Schwarzschild solved the field equations of relativity for a spherical mass, and written inside his equations was a completely collapsed mass, squeezed into a point, Whilst it did not get its name for another fifty years, Schwarzschild had the mathematics for a black hole. Schwarzschild’s solution showed that black holes bend both space and time - and with this intense curvature comes intense gravitational pulls - not even light able to escape. In the vicinity of a black hole, where gravitational fields are immense, Time becomes more and more curved as you get closer to the centre. Compared to clocks in the distant universe, near the heart of darkness time ticks very slowly. And it wasn't just black holes that sprung from the new equations. In the century since Einstein’s gravitational insights, many more bizarre solutions have been found. Throughout the relativistic literature there are wormholes, warp drives and even entire curved universes. All built from the malleable nature of space and time. In 1919, observations of the deflection of starlight proved his theory and made Einstein a scientific superstar - and so scientists turned their attention to measuring the effects of general relativity exactly, to further cement the concept. One of the weirdest of these experiments was undertaken by Joseph Hafele and Richard Keating in 1971.

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http://www.hypothesis-of-universe.com/en/index.php?nav=home , thus, Einstein linearized non-linear gravity using the gravitational constant, which he attributed = assigned dimensions to "erase" the dimensional imbalance, the inequality.

From these considerations in 1915 finally emerged a solution that shocked physics to its core. Einstein took Minkowski's geometric picture of space-time and made both space and time flexible and elastic, the presence of matter and energy producing curvature. I think, rather the opposite: every warping of 3+3D dimensions produces matter or a physical field!! The presence of matter **affects** curvature, not **produces** . As part of his general theory, Einstein concluded that gravity as a force simply does not exist – effects gravity were encoded in the curvature of space and time. Yes, every change in the curvature of any 3+3 dimension of space-time leads to "effects", i.e. manifestations of the physical interactions of matter with matter, matter with space-time, and also space-time with cilia-space… Newton's picture of space and time was well and truly dead because space and time were not only relative, relativism is what? Space, respectively "Length" and Time", are quantities (Stoic) and only their dimensions can be "flexible", i.e. change their curvatures and thus the size of the intervals in the Observable, and it leads to a transformation of the forms of matter and physical fields but also flexible. The implications of Einstein's vision of relativity were quickly revealed. In a special theory, the relative ticking of clocks depended on motion. The ticking of the clock must not depend on the movement (of the clock), the ticking is the "set pace of the passage of time" and with the help of this "chosen" pace we will measure intervals and changes in intervals in the real world, including all physical (derived) quantities. I repeat: In the special theory, the pace of the passage of time in the physical environment changes, not the pace = ticking of the clock. A clock is a mechanism (e.g. cesium) that "produces - cuts its time", produces time intervals, and if we choose a unit interval, we compare it with the production of intervals of a mechanical or natural clock. (Even church clocks produce intervals that they "took over" from the Sun and the Earth).

And while everyone feels that time passes one second per second, different clocks tick different amounts of time. This is the "terminus-technicus" of those who do not know what Time is at all, what is the rate of passage of time on time dimensions and what is the curvature of time dimensions from the perspective of the Observer... With the advent of the general theory, time shook even more , because where you are also affects the ticking of your clock. Not. The clock **must not** change its ticking, its pace of cutting "its" intervals. The clock must, by its "constant setting" (setting by nature or by humans), measure changes in the rate of passage of time in physical processes. The pace of the passage of time changes around us, and we use those watches to measure changes in the pace of the environment..., etc., that would be a long explanation. And it is on my website. The presence of matter curves space and it curves time, sure, the presence of matter affects the curvature of spacetime and so gravity can dictate the relative ticking of clocks. No, gravity ***doesn't affect the cesium tick***, but it does affect the ***pace of time*** around us, around matter, around the earth. In 1916, Karl Schwarzschild solved the equations of the field of relativity for spherical matter, and inside his equations was written a completely collapsed matter, compressed to a point, while it did not get its name for another fifty years, Schwarzschild had mathematics in a few years. Black hole. Schwarzschild's solution showed that black holes bend both space and time - and with this intense curvature comes an intense gravitational pull - not even light can escape. Time bending must be understood as "curving the time dimension"... and not in the observer's observability, (in the observer's own chosen system), but in the own system of the tested body, the tested physical system - there the tempo of the passage of time changes and... according to STR a...a STR is, in my opinion, a rotation of the systems, i.e. the system tested

from the Observer system. This changes the interval to the given dimension...the time interval is stretched (or vice versa), the length interval is shortened (or vice versa). In our own system, we test another system, a system in motion, in interaction, etc. In the vicinity of a black hole, where there are huge gravitational fields, time becomes more and more curved, **the time dimension is curved, the time dimension is rotated, and thus we, the observer, capture in our observatory "another, i.e. rotated, unit interval" than is the size of the unrotated interval in our vicinity…; the dimension, not the "abstract time-quantity", curves as you approach the center. Compared to a clock in the distant universe **time** near the heart of darkness **very slowly** ticks. Yes, time "ticks" (interval per dimension rotated) slowly, not a clock-mechanism; the mechanism still ticks the same. And it wasn't just black holes that emerged from the new equations. In the century since Einstein's gravitational insights, many more bizarre solutions have been found. In the relativistic literature there are wormholes, warp drives and even entire curved universes. It is sad that in 100 years physicists have not found (in their equations) **such a bizarre thing as the rotation of systems**. And they didn't find her even after 23 years, when she was laid to rest →
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Vše postaveno z tvárné povahy prostoru a času. V roce 1919 pozorování vychýlení hvězdného světla potvrdilo jeho teorii a udělalo z Einsteina vědeckou superhvězdu – a tak vědci zaměřili svou pozornost na přesné měření účinků obecné teorie relativity, aby tento koncept dále upevnili. Jeden z nejpodivnějších experimentů provedli Joseph Hafele a Richard Keating v roce 1971.

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(07)- Their equipment was a series of accurate caesium clocks, and a set of jet plane journeys that completely encircled the Earth. To begin the experiment, all the clocks were placed in the same location and synchronised. Some of the clocks then headed off on a plane, some heading to the East, and others to the West - some moving with the Earth's rotation, others against it. $7600 was spent on flights, with two seats on each plane going to "Mr Clock." And because they were flying, they were in a different gravitational field to the clocks left behind on the ground. After the clocks had circled the world twice, they were all brought together. If the universe was governed by Newton's absolute time, they should all have remained in sync. But if Einstein was correct, relative motions and spacetime curvature would have desynced them. The experiment was run, and the clocks were reunited. They differed by a few hundred nanoseconds. Einstein was declared the winner. But there is one more test of relativity that has proven to be the most spectacular. In developing relativity, Einstein found that stretchy spacetime can wobble and ring. Just as Maxwell found that electricity and magnetism can ripple, so could gravity. But he could not decide if his mathematics were correct or if he was fooling himself And struggled to conclude whether these gravitational waves were part of reality. In 1974, Russell Hulse was a young astronomy student who made a spectacular discovery. With his supervisor, Joseph Taylor, he was peering at the universe with the 300m Arecibo Telescope, and he found a pulsar, a rapidly spinning dead heart of a star that flashed radio waves. This pulsar, PSR B1913+16, was spinning 17 times a second - and was not on its own, but orbited another dead star heart, a neutron star. And with the regular beeps of the pulsar, they were able to accurately chart out the cosmic dance. What they found, however, was quite unexpected. With Newtonian gravity, these dead stars would orbit each other for eternity, But Taylor and Hulse found that the orbits were shrinking, And the stars were slowly but steadily being drawn together. Somehow the energy of their orbits was leaking out into the universe. Taylor and Hulse realised Einstein's gravitational waves were an ideal culprit. They delved into the mathematics of general relativity, And calculated how the orbiting stars form ripples in spacetime - showing how they carry away precisely enough energy to explain the orbital demise. In 1993, Taylor and Hulse received the Nobel prize for their discovery - and 24 years later, the prize was awarded for the direct detection of gravitational waves. The experiment was the Laser Interferometer Gravitational Wave Observatory, or simply LIGO for short, which with unimagined sensitivity, can feel the tiny ripples of spacetime. LIGO has opened a new and exciting window on the universe They are uncovering merging black holes and the collisions between neutron stars. And now astronomers even plan to hunt for the oldest gravitational waves, formed in the birth of the universe. And so, in this new world ushered in by Einstein, it is clear that the entire cosmos is written in the language of gravity, of curved and warped space and time. But there was one more secret to uncover hidden in the equations. First realised by Alexander Friedman in 1922 and later proved by Edwin Hubble, the expansion of the universe is the expansion of space - expanding from an infinite point 13.8 billion years ago known today as the Big Bang. Put simply: there was less space yesterday, and there will be more space tomorrow. Every galaxy is moving further and further away from us, bar our local group, at an average rate of 70 km/s/Mpc - which actually means that at the moment, for every 3.26 million light-years distance from us a galaxy is, it is moving away from us at an extra 70 km/s/mpc. So a galaxy 326 million light years from us is moving at 7000 km/s. And a galaxy 32.6 billion light years away? It recedes from us faster than the speed of light. This may seem bizarre, after everything we have learnt up until this point - but the universe´s speed limit only applies to objects moving through space - and these galaxies do not move through space. Space simply gets between them. This expanding universe makes curving and bending spacetime even more complex to understand. As equations show that space is infinite, what is happening is that the universe is actually becoming less dense. And clearly, this decrease in density is not completely uniform across the universe. You, for example, are not slowly drifting apart. Individual galaxies too hold themselves together due to their mutual gravity, But as this gravity is a manifestation of the curvature of space,

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This experiment does not contradict STR either, when during the "axial $\boxed{\textbf{movement}}$" of the tested body S_1 |$\boxed{\textbf{rotation occurs}}$| system (systems of the tested body - the rocket and the basic observer S_2 with the selected system.). But also about the $\boxed{\text{rotation of systems } S_1 \text{ and } S_2}$ in a variable gravitational field. – OTR. And now comes the consideration of the "pace of time." Here on Earth, we have a pace that we don't actually know "what" it is!!(?) Who set it?, chose it? What is the "cause" of just such a flow rate as we have here on Earth. Why is it like that? Reason with me: When one says "Newtonian absolute time", (see this article) one means a "uniform" **pace** of flow, the s a m e for the entire universe. O.K., but we still don't know why this pace is "just the way it is" here, as it is throughout the universe. When one says "Einstein's relativity", one means "the change in the rate of ***local*** passage" of time, according to the "distribution, distribution of mass in a local location". (*) Those locations are in the bambiliatrda universe, right. STR d i l a t e s time (changes the rate of flow) by rotating-rotating the systems "anywhere" in the universe from ours...and basically OTR also dilates the rate of flow, but not "our" specific rate anymore, but anywhere in the universe and any rate. With Newton's absolute speed, the speed of the passage of time "on the tested body" does not change, (the rocket commander does not observe dilation, a change in the speed of flow, but we on Earth observe "his change in the speed of flow") = we receive information from the rocket about the rotation of "its " of the system itself, and thus the change in the size of the time interval “relative” to our Newtonian (universal) pace. But to look at the pace of time through the prism of OTR, the local pace arbitrarily "chosen" changes into a new pace of flow according to the change of gravity in the locality, i.e. the "distribution of weight" mix. This means that, without the risk of fantasy, it is possible to think about the different pace of the passage of time of "the selected point, the selected body, the selected locality" from the beginning, from the big-bang. The pace of time changes in history anytime, anywhere and in any way. Each location (selected for observation) has its own genesis of the tempo of the passage of time from Big-Bang..., and in the "stop-state" its tempo is just such that we on Earth speculate why it is so and do not know who set it and where it came from. Summary: time passes differently in each galaxy, the pace of that location is different, and every location since BB has experienced different rates of time passing in "its historical stages".
The experiment was started and the clocks were re-unified. They differed by a few hundred nanoseconds. Einstein was declared the winner. But there is one more test of relativity that turned out to be the most amazing. During the development of the theory of relativity, Einstein discovered that **stretching space-time** can oscillate and rotate. Each location in the universe "floats" in that "basic" grid, a 3+3D space-time warp, and at the same time that grid "curves", i.e. on a **global scale** (in maxi-scales) **it expands**, and in **on the mini-scales of the microworld** it still **“packages”** into balls (at this age they are pairs of particles). After the Big-Bang it was a rapid genesis of the production of "packages" of elementary particles, after 13 billion years the "production" of new matter is already tiny, insignificant, only the elements conglomerate into more complex forms of matter. Protein and the like.
http://www.hypothesis-of-universe.com/docs/g/g_041.pdf ; http://www.hypothesis-of-universe.com/docs/g/g_080.pdf Just as Maxwell discovered that electricity and magnetism can ripple, so can gravity. But he couldn't decide if his math was correct or if he was deceiving himself, and he struggled to conclude whether these gravitational waves were part of reality. In 1974, **Russell Hulse** was a young astronomy student who made a spectacular discovery. With his superior Joseph Taylor, he was looking at space with the 300m Arecibo telescope and found a pulsar, the rapidly rotating dead heart of a star that emitted radio waves.

This pulsar, PSR B1913+16, was spinning 17 times per second—and it wasn't itself, but orbiting another dead star's heart, a neutron star. And with the regular beeping of the pulsar, they were able to accurately map the cosmic dance. What they found, however, was completely unexpected. With Newtonian gravity, these dead stars would orbit each other forever, but Taylor and Hulse found that the orbits were shrinking and the stars were slowly but steadily drawn together. The energy of their orbits somehow escaped into space. Taylor and Hulse realized that Einstein's gravitational waves were the ideal culprit. They delved into the mathematics of general relativity and calculated how orbiting stars create ripples in space-time – showing exactly how they carry away enough energy to explain orbital decay. Great. In 1993, Taylor and Hulse received the Nobel Prize for their discovery - and 24 years later, the prize was awarded for the direct detection of gravitational waves. The experiment was the Laser Interferometer Gravitational Wave Observatory, or simply LIGO, which can sense tiny ripples in space-time with unimaginable sensitivity.
Thus, it is gradually traced and proven that space-time itself is genetically curved on large scales, it expands "according to a parabola", but that it can also be curved into local states - fields, and it can also be packaged and foamed in a boiling vacuum (!) and now we also have "space-time ripples". It will always be related to the "creation of matter"… because matter is built from the dimensions of "Length" and "Time". LIGO has opened a new and exciting window into the universe. They reveal merging black holes and collisions between neutron stars. And now astronomers are even planning to hunt for the oldest gravitational waves that arose at the birth of the universe. And so in this new world that Einstein introduced, it is clear that the entire universe is written in the language of gravity, of curved and warped space and time. The entire universe is written in the language of "dimensional warping" of space-time quantities that "offer themselves into states" such as gravity, i.e. into 4 states of fields, and also offer themselves into 25 pieces of packages - elementary particles of matter.
http://www.hypothesis-of-universe.com/index.php?nav=ea ; http://www.hypothesis-of-universe.com/index.php?nav=e
But there was one more secret to uncover in the equations. The expansion of the universe, first realized by Alexander Friedman in 1922 and later **proved** by Edwin Hubble, is the expansion of the universe - the expanding from an **infinity point** 13.8 billion years ago, known today as the **Big Bang**. And here comes my view, my revelation of the error of modern cosmology, i.e. Hubbe's linear law, the equation **v = H0 . d** ... does not correspond to reality. This error led physicists to a singularity, a single "infinite point". Error. My understanding is that the Big Bang is a "change of state", from the pre-big bang flat 3+3D spacetime, infinite, without the passage of time, without matter and fields, to a new post-bang state and that incredibly extremely curved 3+3D spacetime, where begins its **unfolding** of warped length dimensions, and where the unfolding ("unfolding") of time is started, http://www.hypothesis-of-universe.com/docs/c/c_032.gif and a new phenomenon: structure of matter. Matter is realized in contrast to the expansion = **unpacking** of space-time into large-scale dimensions, **packing** into "balls" in the realm of the microworld, i.e. the scale of mini-dimensions. At this moment, it is necessary to realize a neglected phenomenon, i.e. that time (in the macro world) does not run for us, does not run for us, does not run above us, around us, but on the contrary (!) : we run in time, we move in the time dimension and thus we cut intervals in one time dimension (perhaps in the second time dimension and the third dimension) and therefore "time runs". Understand that in the Existence of Space-Time "Time" is a quantity and "Length" is also a quantity and they have 3+3 dimensions and objects move along these

dimensions (even a field is an object) and mark intervals on dimensions. Another view of Being, of space-time, is that it is evolving, http://www.hypothesis-of-universe.com/docs/c/c_032.gif , not expanding from some singularity. From the image = animation, it might appear that the universe is expanding from a single point, but no, it's not. http://www.hypothesis-of-universe.com/docs/c/c_420.gif Those points are almost infinite all around us, wherever you look, there in the vacuum there are such points of "pseudo-singularity" from which space-time emerges from the 'vacuole'. So, by the expansion of space-time everywhere, here on Earth and in every galaxy, the unit interval is "stretched" and we then perceive it as a flow - the flow of time, as the pace of the flow of time. And the dilation, that is the effect (proven mathematically by the STR) of the rotation of the systems of the "observed object" relative to the "system of the Observer". And here again you have "a different speed of the passage of time", but that is not true, because the truth is that the system of the object being tested rotates and we get dilated intervals in our observatory. 3+3D unwrapping from plasma form (QM, linear states of fields) to macro states of the gravitational field for bodies and galaxies and galaxy clusters galaxy clusters. We are all in a non-linear macrocosm, in a gravitational system. The microworld is different, it's a chaos of dimensions, it's a foam of dimensions, it's a boiling vacuum, and that's a linear state. Here, time "jumps" to the left and quickly to the right..., up and down (to the past and quickly to the future). Time just doesn't run in one direction. In addition, it is also important that the "unpacking of space-time from the vacuum", see "gif" happens everywhere, around us and in the galaxy, and therefore a singularity is out of the question, there is no "big-bang". So what exists? I said at the beginning: **"Change of state, leap change of state"** of dimensional curvature. Today, in the vacuum around us, pairs of particles are born", http://www.hypothesis-of-universe.com/docs/c/c_428.jpg once upon a time in that pseudo big-bang, not only pairs were born, but "proper packages" as elementary particles in the variety of dimensions used, for example http://www.hypothesis-of-universe.com/docs/ea/ea_013.pdf and in the variegated beauty of "Lord's" creations http://www.hypothesis-of-universe.com/index.php?nav=ea ; http://www.hypothesis-of-universe.com/index.php?nav=e Simply put: yesterday there was less space and tomorrow there will be more space. Every galaxy is receding further and further away from us, except our local group, at an average speed of 70 km/s/Mpc - which effectively means that at this moment, for every 3.26 million light-years away from us, there is a galaxy, receding from us at an additional speed of 70 km/s/mpc. So a galaxy 326 million light years away is moving at 7000 km/s. And a galaxy 32.6 billion light years away? It is moving away from us faster than the speed of light. This may seem bizarre, after all we've learned up to this point - but the speed limit of space only applies to objects moving through space - and these galaxies don't move through space. The space just gets between them. This expanding universe makes the warping and bending of spacetime even more complicated to understand. O.K. I have been talking and lecturing about the warping of dimensions for the genesis of matter in the universe for 22 years on the Internet http://www.hypothesis-of-universe.com/docs/g/g_041.pdf and no one reads it, no one who reads it reacts.

As the equations show that space is infinite, the universe actually becomes less dense. And it is clear that this decrease in density is not completely uniform throughout the universe. Density here is basically "a motley mix of sites with different curvatures" of dimensions. http://www.hypothesis-of-universe.com/docs/c/c_483.jpg ; http://www.hypothesis-of-universe.com/docs/c/c_240.jpg You, for example, are not slowly receding. Individual galaxies are also held together by their mutual gravity, but since this gravity is a manifestation of the curvature of the universe,

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(08)- What happens at the boundary between expanding and non-expanding space? And that is not the only headache - as expanding space makes the form of yesterday's spacetime different to tomorrow's spacetime - thus breaking what was thought to be one of the key properties of the universe - conservation of energy. The importance of symmetry in physics was laid out in detail by mathematician **Emmy Noether** - in this case a symmetry meaning that when you change your situation, the physics remains the same. Changing location doesn't change physics, meaning momentum is conserved. And the fact that physics is the same today and tomorrow gives energy conservation. But in an expanding universe, where spacetime is changing, this symmetry is shattered. As space grows it doesn´t stretch - it doesn´t dilute. There is just more of it. But as they travel across an expanding universe, photons are stretched, and they lose energy - and galaxies are robbed of their speed as their motion grinds to a halt. Energy is simply not conserved as the cosmos grows, and this is a conundrum that causes problems for physicists to this day. And so, it may now seem that space has finally become physical, real - it can bend, expand, curve and ripple. But there is a final twist, one final rug to be pulled out from beneath us. It can be summed up in the words of the Nobel prize winner **Steven Weinberg**.. To the novice, this statement must seem almost bizarre. How can a leading scientist make such a claim? Well, because he is absolutely correct – in Einstein's relativity, spacetime is truly nothing. The mathematics look like bending and curving. But in reality, relativity tells us space is nothing and has no properties. But what of time in this new picture? How were seconds, hours and minutes affected by the dawn of relativity? New Time To the future civilization, time meant many things. They knew that their time was unique, unshared by any others. They understood that clocks ticked differently, Dependent on where you are and what you are doing. Their engineers had used this malleable nature of spacetime in shaping their civilization. Great portals of distorted time and space allowed travel across the empire. Whilst the slow ticks near the gravitational pull of a black hole had been used to slow time and allow them to watch the end of everything. "People like us who believe in physics know that the distinction between past, present, and future is only a stubbornly persistent illusion." WIth the coming of Einstein's general relativity, physicists were presented with a new headache. They knew that every particle in the universe had a past, present and future. And like a line drawn on a map, they could chart the journey of a particle through the four dimensions of space and time, tracing out its worldline from the past to the future through a series of nows. Each particle in your body, each electron and quark, journeys on its own worldline. Before you were conceived, the worldlines were dispersed. But as you grew, many wordlines condensed into a bundle which is you. And when you are gone, these worldlines will again scatter. For a fleeting moment in the life of the universe, You exist as little more than a collection of wordlines, a brief knot in the fabric of eternity. Whilst unsettling, this appears to make sense, so where is the headache? Firstly, we have to remember what the relativity of time really means. With no absolute time, there is no uniform cosmic clock, And this means that there is no such thing as a unique present, a true instant of now. Without an absolute definition of a cosmic now, how do we define a unique notion of the past? Without a now, just where does the future begin? Headache. Within the equations of relativity, all pasts, presents, and futures are already written. The entire history of all things is already out there - somewhere. This notion, known as the 'block universe', has bothered many physicists and philosophers, as without a now, the cosmos cannot simply unfold from moment to moment. All we can do as we trace out our worldline is follow our predefined path. And concepts dear to us, such as free will, are lost. But this cannot be correct. We clearly remember the past, and the future is a mysterious door that has yet to be opened. They are clearly different. Or are they? Consider two electrons hurtling towards each other. Both carry an identical negative charge, and, through electromagnetism, they repel. As they get closer, the repulsion grows and their motion gradually slows, stops, and reverses. Eventually, the electrons hurtle away from each other, back the way they came. There seems nothing strange about this. But imagine we filmed the interaction between the two electrons. And then showed the film to an audience of physicists - playing a mirrored version, the left switched to right and vice versa.

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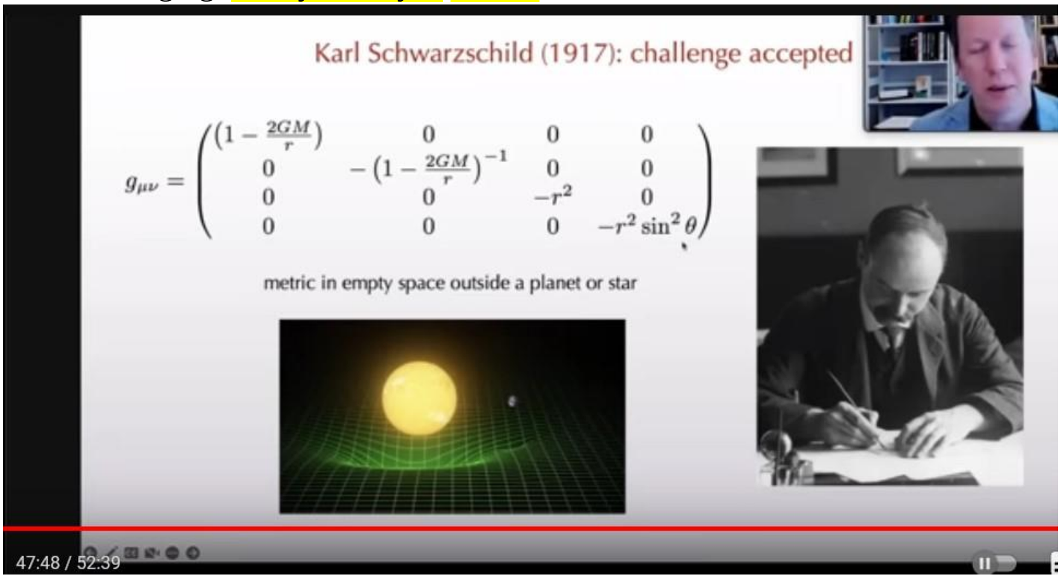
(08)- What happens at the boundary between expanding and non-expanding space? And that's not the only pain - because the expansion of space makes the form of yesterday's spacetime different from tomorrow's spacetime - thereby violating what was thought to be one of the key properties of the universe - conservation of energy. The importance of symmetry in physics was detailed by mathematician Emmy Noether - in this case, symmetry means that if you change your situation, the physics remains the same. Changing the location does not change the physics, which means momentum is conserved. And the fact that physics is the same today and tomorrow gives energy savings. But in an expanding universe, where space-time is changing, this symmetry is broken.



As space expands, it does not stretch - it does not thin. From the vacuum of the Planck scales a "new vacuum" emerges... There is simply more. But as they travel through the expanding universe, do photons stretch? http://www.hypothesis-of-universe.com/docs/c/c_243.jpg ... does the author mean that photons "stretch" just as space-time stretches ? and lose energy - and galaxies they are stripped of their speed as their movement stops. And who-what stops the galaxy? If the space-time to which the galaxies are "pinned" is expanding, then there is no reason to "stop" the galaxies (?) Energy is simply not conserved as the cosmos grows, and this is a conundrum that still troubles physicists today. Misinterpretation, misapprehension of reality… And so it may now appear that is space finally became physical, real—it can bend, stretch, curve, and undulate. Yes, it can warp, but why do you say it can warp just "as of

today"?, finally it can warp, you say. But there is one last twist, one last rug to pull out from under us. It could be summed up in the words of Nobel laureate Steven Weinberg. To a novice, this statement must seem almost bizarre. How can a leading scientist make such a claim? Because he's absolutely right - in Einstein's relativity, space-time is really **nothing**. ?? quoting from the document
http://www.hypothesis-of-universe.com/docs/b/b_037.pdf
According to OTR, the gravitational field is a manifestation of curvature of empty spacetime - so we have a kind of "gravity without gravity". As was shown in §2.5, Einstein's gravitational field equations $\mathbf{R_{ik} - 1/2\, g_{ik}R = 8\pi T_{ik}}$ have an important feature is that they describe the behavior not only of the gravitational field, but also indirectly (through the laws conservation of energy and momentum $\mathbf{Tik;k = 0}$) and its resources. So if we take electromagnetic field in a vacuum, then from Einstein's equations of the gravitational field induced by it $\mathbf{R_{ik} – 1/2\, g_{ik}\, R = 2\, Fil\, Flk – 1/2\, g_{ik}\, Flm\, F}$. (?)
Math looks like bending and curving. But in reality, relativity tells us that space is nothing and has no properties. ?? ?? → http://www.hypothesis-of-universe.com/docs/c/c_370.jpg
But what about the time in this new picture? How were seconds, hours and minutes affected by the dawn of relativity? New time. Time meant many things to future civilization. They knew that their time was unique, shared by no one else. They understood that the clock ticks differently depending on where you are and what you are doing. Their engineers used this malleable nature of spacetime in shaping their civilization. Great portals of warped time and space allowed travel across the realm. While the slow ticks near the black hole's gravitational force were used to slow time and allow them to watch the end of everything. "People like us who believe in physics know that the distinction between past, present and future is just a stubbornly persistent illusion." With the advent of Einstein's General Theory of Relativity http://www.hypothesis-of-universe.com/docs/c/c_370.jpg ; http://www.hypothesis-of-universe.com/docs/c/c_354.jpg ; http://www.hypothesis-of-universe.com/docs/c/c_350.jpg physicists have a new headache. They knew that every particle in the universe has a past, present and future. And like a line drawn on a map, they could map the particle's path through the four dimensions of space and time, tracing its world line from the past to the future through the now series. Every particle in your body, every electron and quark, travels along its own world line. Before you were conceived, worldly lines were diffused. But as you grew, many lines of words collided into the bundle that is you. And when you leave, these world lines dissipate again. For a fleeting moment in the life of the universe, you exist as little more than a collection of lines of words, a short knot in the fabric of eternity. While disturbing, it seems to make sense, so where's the headache? First we have to remind ourselves what the relativity of time actually means. Without absolute time there is no unified cosmic clock,..
By "absolute time" you mean the "certain rate of passage of time" that exists here on Earth, and you believe that the same (pace) exists throughout the universe. By the "uniform cosmic clock" you mean the same rate of passage of time for the entire universe and that means there is no such thing as a singular presence, the true moment of the present moment. ? ? Without an absolute definition of the cosmos now, how do we define the singular notion of the past? Without now, where does the future begin? Headache. Within the equations of relativity, all past, present and future are already written. ? ? OTR equations can "describe" reality, but they can never "write it in reality". The entire history of all things is already out there somewhere. This notion, known as the 'block universe', has troubled many physicists and philosophers because without presence the universe cannot simply unfold from moment to moment. ? ?

All we can do when we trace our world line is follow our pre-defined path. And concepts we hold dear, like free will, are lost. But that can't be right. We remember the past clearly and the future is a mysterious gate that has yet to be opened. They are definitely different. Or are they? Imagine two electrons rushing towards each other. Both carry an identical negative charge and repel each other due to electromagnetism. As they get closer, resistance increases and their movement gradually slows, stops and reverses. Eventually, the electrons bounce off each other and return the way they came. It seems that there is nothing strange about it. But imagine that we filmed the interaction between two electrons. And then he showed the film to the audience of physicists - he played a mirrored version, the left switched to the right and vice versa.

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(09)- Your audience of physicists would still notice nothing amiss with the movie on the screen. Switching left and right does not alter the physics. On the screen, the electrons approach and repel - all appearing to be completely normal. But what if you went one step further - what if you were very clumsy and instead of switching left and right you switched past and future? The film now runs backwards. Time has been reversed. Your audience stares at the screen. What do they see? In this time-reversed movie, two electrons hurtle towards each other. They get closer and closer, with their repulsion growing. Eventually, they halt in their motion and start to move away again. With nothing out of the ordinary, the audience nods in approval at this simple display of physics. But how is this possible? If you had run the slapstick of Laurel and Hardy backwards, the viewers would have noticed - and would immediately know that something was wrong with the arrow of time. And herein lies the question: why is the electromagnetic interaction between electrons insensitive to the direction of time? And not just electromagnetism, but gravity and the strong nuclear force are also unaffected. The weak nuclear force does misbehave slightly - but it is a very tiny effect. It seems that at their core, the universe’s microscopic fundamental interactions do not possess an arrow of time. Time could flow one way or the other, and they simply would not care. But this leaves us with a disconnect. The macroscopic, large scale world we inhabit certainly does know about time. Cooling coffee, burning wood, exploding supernovae - these are not processes that simply can be run backwards. You cannot unscramble an egg. With a little thought, this seems a little bit strange. Our large scale world is nothing more than the collective properties of an uncountable number of atoms. And these atoms are interacting through a fundamental force, electromagnetism, each of the myriad of electromagnetic interactions unaffected by the direction of time. How can such an arrow emerge from the multitude of time ignorant interactions that take place every second? How does time emerge? Some have claimed there is a definitive arrow, an imprint of a cosmological arrow of time. In the simple view of the block universe it stretches infinitely far into the past, and into the future. But this block universe clearly doesn’t appear to resemble our own. For we know that our universe didn’t stretch infinitely into the past – it had a beginning. From observations, we know that the universe was born almost fourteen billion years ago. We don’t know the process that brought it into being, but it was born with both space and time. Just where and how space and time came to be in the universe remains a mystery. But they have remained an integral part of the cosmos over all of its history. But there are other mysteries about the birth of the universe that we don’t understand. And in particular, it appeared to be extremely special, being both hot and dense, and strangely smooth. And this smoothness meant that the newborn universe had a very peculiar property. The universe was born with very low entropy.

It might seem strange that smoothness implies low entropy. As a gas spread throughout a room has higher entropy than gas all squeezed in one corner. But for matter in the universe, this smoothness meant gravity could do its work, and fall together and eventually clump into stars and galaxies. And so as the universe expands, its entropy increases as the matter evolves. Gravitational potential energy is steadily converted into stars, planets, and people. Eventually, this energy is processed into waste heat that spreads throughout the universe. And it is this change from low to higher entropy that imprints onto the cosmos its arrow of time. Recent Nobel Prize winner, Sir Roger Penrose, has thought hard about our universe's initial entropy. He concluded that the probability of this occurring by chance is one part in 10 to the 10 to the 123. Clearly, there must have been something special about our universe's birth. But what this was, we still don't know. And so would this mean that the block universe has no innate arrow of time? Without the big bang would it be impossible to distinguish the past from the future? Imagining how we would experience such a universe is very difficult to do. But indeed, maybe our ability to imagine anything at all is ultimately because of the special birth of the universe. On the tenth of June 1944, a British Halifax bomber was flying over France. With four hundred other bombers, it was supporting the D-Day landings in Normandy. But near the city of Laval, the aircraft was struck by German flak. And crashed in flames into the French countryside. The entire crew perished in the crash. Seven lives were lost, seven lives in a war that eventually claimed millions.

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(09)- Your audience of physicists still wouldn't notice anything wrong with the movie on the screen. Switching left and right does not change the physics. On the screen, electrons approach and repel each other - everything appears completely normal. But what if you went one step further - what if you were very clumsy and instead of switching left and right, you switched past and future? The movie is now running backwards. Time has turned. Your audience is staring at the screen. In the macrocosm, the reality is that time "flows" in one direction, i.e. *-space-time expands, not collapses-*. On the macro scale of the global universe, there is no "unpacking with packing". On a micro scale, yes. At the microscale of the Planck scales, there is a "chaos of changes in curvature", i.e. a very-very fast alternation of "unpacking and collapsing" dimensions (dimensions of both length and time). Therefore, the macrocosm is non-linear - OTR, and the microcosm is linear – QM what does he see? In this time-reversed movie, two electrons are hurtling towards each other. They get closer and closer, their resistance growing. Eventually, they stop moving and start moving away again. The audience nods in agreement at this simple demonstration of physics, nothing out of the ordinary. But how is that possible? If you ran the Laurel and Hardy slapstick backwards, the audience would notice - and know right away that something was wrong with the arrow of time. And here lies the question: why is the electromagnetic interaction between electrons insensitive to the direction of time? Interaction equations from the microworld are also symmetric with respect to the "arrow of time", more precisely (!) "all arrows of time that appear in the given interaction". http://www.hypothesis-of-universe.com/docs/c/c_269.jpg
And not only electromagnetism, but also gravity and the strong nuclear force are unaffected. The weak nuclear force does misbehave a bit - but it's a very small effect. At its core, the microscopic fundamental interactions of the universe seem to have no arrow of time. OK Apparently, the interactions are built from time dimensions and length dimensions so that the "sum" of the time arrows is zero, i.e. the sum of the intervals with the "right and left" arrow is

zero. Interactions are built from dimensions, so it shouldn't be a problem for that interaction to be symmetric and "float" in the asymmetric soup of 3+3D space-time chaos. Why not ! In the macro-universe, the rate of passage of time will not be uniform for the entire universe http://www.hypothesis-of-universe.com/docs/c/c_222.jpg in the macro-universe there will be locations (clusters of galaxies and the gaps between them) with a different rate of passage of time, i.e. with an otherwise large arrow of time, one-way, because it is a universe-wide **unpacking** UNPACKING of dimensions.
Unfortunately, no one reads my thoughts, and if there is an exception, they don't react, they don't start a dialogue, on the contrary, they clap their hands on the head that I'm "on a stick".
Time could pass either way and they wouldn't care. But that leaves us disconnected. The macroscopic, large-scale world we inhabit is certainly aware of time. Refrigerating coffee, burning wood, exploding supernovae—these are not processes that can simply be reversed. Eggs cannot be scrambled. With a little thought, it seems a little strange. Our vast world is nothing but the common properties of an innumerable number of atoms. And these atoms interact through a fundamental force, electromagnetism, with each of the myriad electromagnetic interactions unaffected by the direction of the arrow of time. How can such an arrow emerge from the multitude of temporal unconscious interactions that take place every second? How does time come into being? Some have argued that there is a definitive arrow, the imprint of the cosmological arrow of time. In the simple view of the block universe, it stretches infinitely far into the past and into the future. But this blocky universe clearly does not appear to be similar to our own.

[discontinued]
[I am tired, exhausted, + I have very little time for my opinions. I won't give the reasons yet, but they are there. That's why I "manage" to comment on this text, this Youtube, about one sheet every two days, and that's very slowly. So I decided here on page 25 (out of 34 pages) to stop the comments and publish the "work" on the Internet unfinished. I will gradually add the text with another comment on the net. Thank you for understanding. 12/06/2023 No one will read it anyway]

06/13/2023 …I finally got over myself and finished this work (comments) here

We know that our universe did not stretch into the past indefinitely - it had a beginning. We know from observation that the ||universe was born|| almost fourteen billion years ago. He was not born before 13.8 billion years ago, but a "new state of the universe" from the pre-BB state. We don't know the process that produced it, you (!) don't, but I believe I do. I have a hypothesis that you deliberately did not read or deliberately avoid commenting on →
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http://www.hypothesis-of-universe.com/docs/eng/eng_098.pdf
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but he was born with space and time. Only where and how space and time in the universe came to be, remains a mystery. It remains a mystery to you. http://www.hypothesis-of-universe.com/index.php?nav=aa But they have remained an integral part of the universe throughout its history. But there are other mysteries about the birth of the universe that we don't understand. And in particular it seemed extremely strange, hot and thick and strangely smooth. And this smoothness meant that the newborn universe had a very special property. The universe was born with very low entropy. http://www.hypothesis-of-universe.com/docs/aa/aa_227.pdf It might seem strange that smoothness implies low entropy. Because a gas spreading across a room has a higher entropy than a gas compressed in one corner. But for matter in space, this smoothness meant that gravity could do its work and fall together, eventually clumping into stars and galaxies. And so as the universe expands, its entropy increases as matter evolves. Gravitational potential energy is constantly being transformed into stars, planets and people. Finally, this energy is processed to the waste heat that spreads throughout the universe. And it is this change from low to higher entropy that imprints its arrow of time on the cosmos. A recent Nobel laureate, Sir **Roger Penrose**, has been thinking hard about the initial entropy of our universe. He concluded that the probability of this happening by chance is one part in 10 to 10 to 123. Clearly, there must have been something special about the birth of our universe. But we still don't know what it was. Read HDV. And would that mean that the block universe has no innate arrow of time? Without the big bang, it would be impossible to tell the past from the future? It is very difficult to imagine how we would experience such a universe. But really, maybe our ability to imagine anything at all is ultimately due to by the special birth of the universe. Laws were not born in the Big-Bang. Laws are "formed" during the evolution (change of states) of the universe. On June 10, 1944, the British Halifax bomber flew over France. With four hundred other bombers, she supported the D-Day landings in Normandy. But near the town of Laval the plane was hit by German flak. And it crashed into the French countryside in flames. The entire crew perished in the crash. Seven lives were lost, seven lives in a war that ended up costing millions.
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(10)- The pilot was a thirty-three-year-old Dutch volunteer, Willem Jacob van Stockum. And whilst his name is not familiar today, van Stockum was the man who discovered time travel. Of course, by the 1940s, time travel was a staple of science fiction. The Time Machine by H. G. Wells had been published half a century earlier. But this was all fantasy and whimsy - and a firm impossibility in Newtonian space and time. Yet within the new world of relativity - van Stockum had discovered a scientific basis. Mathematically, relativity is notoriously challenging. Einstein himself had wondered if his field equations would yield any analytic solutions. But merely a year after presenting them to the world, the first such solution was found, as Schwarzhild derived his black holes. And so by the 1920s, the hunt was on for the

mathematical form of the entire universe. Along with the giants of relativity - Einstein, Friedmann, de Sitter and others - laying down rules, finding expanding space which itself could be curved and even space where parallel lines could converge and diverge - some scientists explored the mathematics of hypothetical universes. And Hungarian mathematician Cornelius Lanczos had found a rather peculiar solution. His equations described a universe of dust that was rigidly rotating. And whilst it didn’t appear to describe our actual universe, it was an intriguing result. van Stockum began to wonder about the journey of particles through such a rotating universe. As particles traveled from the past to the future, worldlines stretched around the universe. But as the universe rotated, time and space were stretched and distorted. And the nature of time itself became indistinct. Some worldlines stretched right around the universe and met themselves, forming closed loops. Along these, the future trod over the path of the past, over and over again. Physicists call these closed-loop worldlines time-like paths. But in everyday language, it was nothing less than time travel. That space and time can be so warped as to allow time travel was shocking. And whilst the rotating universe might not be physically realistic, it opened up the question of whether there were other routes to the past Or shortcuts to the future. van Stockum’s goal was to head to Princeton to work directly with Einstein. But as the clouds of war were gathering, he looked back to Europe. Once his homeland was occupied, his desire was to get into the fight. And van Stockum’s own worldline ended in a French field on a dark night in 1944. Whilst van Stockum’s name is now lost to history, time travel and rotating universes are not - as they were rediscovered by the eccentric mathematician Kurt Godel, in 1949. Godel is remembered today as one of the greatest logicians of all time, and his famous incompleteness theorem still baffles today. But his contribution to physics was equally shocking. Escaping the turmoil in Europe as the storm cloud of the second world war gathered, unlike van Stockum Godel did reach Princeton University. There he and Einstein became firm friends, with Einstein supporting his application for American citizenship, specifically by distracting him from pointing out flaws in the United States constitution to the judge seeing his case. It was at Princeton that Godel turned his remarkable mathematical mind to relativity, and the nature of spacetime - and in 1949, Godel’s 70th birthday present to Einstein was a solution to the field equations of relativity. Like Van Stocken, he had found the mathematics of a rotating universe - and closed time-like curves that looped around his cosmos! On receiving his present, Einstein was, in his own words, “disturbed” by the possibility. Godel´s wife had apparently knitted him a sweater too, but it was not part of the final gift. History does not recall why. Einstein died soon after, in 1955 and Godel followed him in 1978. As an old man, Godel asked astronomers if they had found if the universe was truly rotating. The answer was always “no it isn’t” - and that Godel’s universe is not our own. But the possibility that Einstein’s relativity potentially allowed time-travel sent researchers back to their equations. Could time and space really be bent back on themselves so far to allow temporal exploration? Physicists have continued to find mathematical shortcuts through space and time, and there are now many solutions to Einstein’s equations in which space and time are extremely warped. It would seem that in Einstein's relativity, time travel remains a stubborn theoretical possibility. As an example, if you add spin to a black hole, space and time twirl also. And if you dive right through the centre, you might emerge somewhere and somewhen else. Another relativistic structure, a wormhole, builds a spacetime bridge between two locations, And potentially between two different times - but not necessarily a shortcut. So time travel appears
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(10)- The pilot was a thirty-three-year-old Dutch volunteer **Willem Jacob van Stockum**. And although his name is not known today, van Stockum was the man who **discovered** time travel. There is still only the forward and backward direction of the flow of time (omnidirectional) "somewhere" in the "exploration game". Why not explore the dimensions of time in three directions?? Why not. Only not because, according to our chosen units, the units (size units) of length and time are incommensurate?, i.e., order **$10^8/10^0$ …!!?** It is not the universe's fault that it >established< the basic ratio of interval units 1/1 so , that the recalculation for our choice resulted in an order comparison of $10^8/10^0$, i.e. the stupidity of space-time **$c = 1/1 \rightarrow$ $c^3 = 1^3/1^3$**. We humans are simply placed "in space" with a different sensitivity to units of length intervals and a different sensitivity to units time intervals. Time travel is simply stupid because we humans would have to relocate to a microworld where linearity of interactions rules, i.e. Nature mixes forward and backward directions in length dimensions as well as forward and backward directions in time dimensions. !! As Kulhánek says: in the microworld we don't even need time, (because from the perspective of the macroworld, time is two-way = there x here; there x here...), in the microworld the directions of the flow of the "cursor" alternate across dimensions, i.e. also with respect to time dimensions. there and back" and that therefore we don't even need the time of microscopic volumes for the time of macroscopic volumes. However, the professor did not understand at all that the linearity of the microworld (alternation of flow directions) of the movement of objects is only due to the n+m dimensionality of space-time, whereas in the macroworld, 3+3 or 3+1 dimensionality is sufficient, because there is a non-linearity of the curvature of spacetime, into gravitational interactions. Three other interactions belong to the microworld. – Therefore, one can think about investigating the construction of elem. particles of matter from dimensions 3+3. http://www.hypothesis-of-universe.com/index.php?nav=e Of course, in the 1940s time travel was a staple of science fiction. The Time Machine by H.G. Wells was published half a century earlier. But it was all fantasy, sure! and whimsy - and a fixed impossibility in Newtonian space and time. Certainly, in the macrocosm, there is a bidirectionality of three length dimensions and a unidirectionality of one time dimension... because we have a huge disproportion of "our" units $10^8/10^0$ to the Space Units c = 1/1 when spacetime is flat. http://www.hypothesis-of-universe.com/docs/c/c_017.jpg ; But no one will examine these visions of mine for the next 40 years!!! for physicists to be boarded up. Nevertheless, in the new world of relativity - van Stockum discovered a scientific basis. Mathematically, relativity is notoriously difficult. Einstein himself wondered whether his field equations would yield any analytical solutions. But just a year after they were introduced to the world, the first such solution was found, as Schwarzhild derived his black holes. And so, in the twenties of the last century, the "hunt for the mathematical form of the entire universe" began. Along with the giants of relativity—Einstein, Friedmann, de Sitter, and others—who set the rules, they found expanding unfolding space, even three-dimensional "time" that could itself be curved, and even space where could parallel lines converge and diverge - some scientists have **explored** the mathematics of hypothetical universes. But they have not yet investigated (forgot to investigate) the hypothesis of twisting 3+3 dimensions into packages that will then have the nature and behavior of matter - elementary particles of matter. They did not investigate because their intellect did not allow them to go that far… And the Hungarian mathematician **Cornelius Lanczos** found a rather strange solution. His equations described a universe of dust that spun rigidly. And while it didn't seem to describe our actual universe, it was an interesting result. **Van Stockum** began to think um… about the path of particles through such a rotating universe. As particles traveled from the past to the future,

world lines stretched around the universe. But as the universe spun, time and space stretched and warped. And the very nature of time became indistinct. Some world lines stretched right around the universe and met themselves, forming closed loops. The future trampled over them again and again the path of the past. Physicists call these closed-loop world lines time paths. But in common parlance, it was nothing less than time travel. That space and time could be so warped as to allow time travel was shocking. These are the kind of dreams… And while a rotating universe may not be physically realistic, it did open up the question of whether there are other paths to the past or shortcuts to the future. Um… **van Stockum's** goal was to head to Princeton to work directly with Einstein. (The goal of a group of scumbags in Bohemia was to defame Navrátil and put him in a lunatic asylum). But as the war clouds drew in, he looked back to Europe. Once his homeland was occupied, his desire was to get into the fight. And van Stockum's own world line ended in a French field on a dark night in 1944. While van Stockum's name is now lost to history, time travel and rotating universes are not - as rediscovered by the eccentric mathematician Kurt Godel in 1949. Godel is remembered today as one of the greatest logicians of all time, and his famous incompleteness theorem is still misleading today. But his contribution to physics was equally shocking. Fleeing the turmoil in Europe as the storm cloud of World War II gathered, unlike van Stockum Godel reached Princeton University. There, he and Einstein became firm friends, with Einstein supporting his application for American citizenship, specifically by distracting him from pointing out flaws in the United States Constitution to the judge who heard his case. It was at Princeton that Godel turned his remarkable mathematical mind to relativity and the nature of spacetime—and in 1949, Godel's 70th birthday present to Einstein was a solution to the field equations of relativity. Like **Van Stocken**
found the mathematics of a **rotating** universe that's a lot of progress..., I rather believe in **"unpacking" large-scale space-time and "concurrently" with that "packing" micro-world space-time dimensions into packages** immediately after the big-bang into matter – elementary particles and gradually by the development of complexity into complex matter and "basket" conglomerates in the form of complex matter (complexity ends with chemistry and proteins) - and closed curves similar of time that revolved around his universe! This "time-like curve" construction doesn't really smell good to me, although the "curving" of 3+3D dimensions is my thing. When Einstein received his gift, he was, in his own words, "overwhelmed" by the prospect. Goedel's wife apparently also knitted him a sweater, but it was not part of the final gift. History does not remember why. Einstein died soon after, in 1955, and Goedel followed him in 1978. As an old man, Godel asked astronomers if they had discovered whether the universe really rotates. The answer was always "**no, it doesn't rotate"** - and that Goedel's universe is not our own. But the possibility that Einstein's theory of relativity potentially allowed for time travel, in the macro world there is only one arrow of time, to the future..., because here space-time EXPANDS, time dimensions also expand and we perceive this as the flow of time
http://www.hypothesis-of-universe.com/docs/c/c_032.gif sent the researchers back to their equations. Could time and space really bend back on themselves far enough to allow time exploration? No. Physicists have continued to find mathematical shortcuts in space and time, and there are now many solutions to Einstein's equations in which space and time are extremely warped. Extreme distortion of dimensions occurred after BB, a new state of the universe "occurred" when the "previous" infinite flat 3+3D space-time "shrinked, warped" into a "singular location", a location of extreme curvature, boiling vacuum soup, quark-gluon

plasma, in which bundles of elementary particles are instantly born…etc. It would seem that in Einstein's relativity, time travel remains a stubborn theoretical possibility. For example, when you add spin to a black hole, space and time also spin. "spinning" is different than "unwrapping". And if you dive right in the middle, you can emerge somewhere and another time. Another relativistic structure, the wormhole, builds a space-time bridge between two places and potentially between two different times - but not necessarily a shortcut. So time travel appears. ☺

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(11)- to be written into the equations of relativity. The reality of these solutions, whether they can truly exist, remains unanswered. Perhaps we will never be able to focus enough energy into a single place For spacetime to bend right back on itself. We now understand how Einstein's space time works - but we still don't know what it is. Where can we turn next? Well - it was not just Einstein who was charting a new path at the beginning of the 20th century. It was a dramatic period for theoretical physics - and quantum mechanics was at the forefront of the changing order. And so - perhaps, physicists thought - the answer could lie at the smallest scales in the universe.

Quantum Spacetime In the far future, the civilization had become desperate. The stars had long died, and matter itself was starting to melt. Very few remained now, almost frozen in the darkness. The last of life grinding to a halt. But some eyes still stared into the skies, To witness the last bursts of light in the universe. The great books had told them this time would come, Warning them that not even black holes would last forever. Whilst the immense gravity of relativity held them together… On the smallest scale, the action of the quantum world resulted in their ultimate decay. For eons they had struggled to combine the two - the world of gravity had seemed so distant from the quantum. And so too their black hole home was dissolving. They could do nothing to stop it. Indeed, the last few were so very tired, They didn't even try. "A university student attending lectures on general relativity in the morning and others on quantum mechanics in the afternoon might be forgiven for thinking that his professors are fools, or have neglected to communicate with each other for at least a century." There is a grave at Roselawn Cemetery in Tallahassee Florida. Written on it is the name of a man who died in 1984, aged 82. Unlike the others in the graveyard, the man also has a plaque at Westminster Abbey, Not far from the mortal remains of Isaac Newton. The plaque does not say much. It labels the man as a physicist and notes his birth and death. But on the plaque is also an equation, a complex mix of Latin and Greek letters. And this equation was the first unification of Einstein's relativity and quantum mechanics. The famous physicist Niels Bohr referred to Paul Adrien Maurice Dirac as the strangest man to visit his institute. Born in Bristol at the beginning of the twentieth century, he did not at first seem destined for scientific greatness. In 1923, Dirac began his studies at the University of Cambridge. famously focused on his science, He shunned many human interactions, and his conversations were mainly silent. His colleagues named the unit of one word per hour as a "dirac" in his honour. But whilst speech was slow, his mind raced around the problems of physics. It was a heady time to be a physicist, with both Einstein's new world of relativity and the bizarre implications of quantum mechanics opening up - were the fundamental secrets of the universe finally revealing themselves? When Dirac began his exploration of quantum mechanics it was written in the past. The mathematics of Schrodinger and Heisenberg played out on the stage of Newton. With the tick of an absolute clock, and Galileo's vision of space. But Dirac knew that this picture of space and time was simply outdated. Surely the equations of quantum mechanics should reflect Einstein's new visions of space and time. This bothered Dirac, and he scrambled with the mathematics trying to make it work, spending his Sundays walking alone turning over the equations in his mind. And in December 1927, the fog began to clear. A relativistic quantum equation came into view. An equation that obeyed Einstein's demand that there is no special rest in the universe. And Dirac used this equation to explain the simplest of particles, the electron. Suddenly, various peculiar properties of the electron made mathematical sense. Within Dirac's equation, the electron spins and behaves like a small bar magnet, Both properties had been difficult to explain, but they were a natural consequence of relativity. But there was another property that was completely unexpected. If you take the square root of one, there are two solutions - plus one or minus one. In the same way, in explaining the electron the Dirac equation has two solutions. One solution is negatively charged and clearly represents the electron. But just what does the positive solution correspond to? Dirac wondered if it could be the proton, the positively charged particle within the nucleus. But being almost two thousand times more massive, that could not be correct. He eventually concluded his equation was predicting a new particle, the anti-electron.

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(11)- write in the equations of relativity. The reality of these solutions, whether they can actually exist, remains unanswered. We may never be able to focus enough energy in a single place to bend spacetime back on itself. http://www.hypothesis-of-universe.com/docs/c/c_033.gif . I think the "warping of dimensions" into bizarre forms is only there for the ||wet world||, only for the structure of matter, and for interactions, which are linear states of multicurvature dimensions http://www.hypothesis-of-universe.com/index.php?nav=eb . Nonlinear states of curvature will be OTR, gravity, parabola Now we understand how Einstein's spacetime works but we still don't know what it is. Not you, I understand. And I have been describing my vision on the Internet for 22 years. Where can we turn next? Well, to HDV. Well – it wasn't just Einstein who was charting a new path at the beginning of the 20th century. It was a dramatic period for theoretical physics – and quantum mechanics was at the forefront of the changing order. And so – perhaps, the physicists thought – the answer might lie at the smallest scales in the universe. Quantum spacetime. Dimensional Pack Interactions… In the distant future, civilization has become desperate. The stars had long since died and matter itself was beginning to melt. **??** There are very few left, almost frozen in the dark. The last part of life is stopping. But some eyes were still staring skyward to witness the last glimpses of light in space. The great books told them this time would come, warned them that even black holes would not last forever. While the immense gravity of relativity held them together. On the smallest scale, the action of the quantum world led to their final disintegration. For eons they tried to combine the two - the world of gravity seemed so far removed from quantum. And so their black hole home melted away. There was nothing they could do to stop it. Indeed, the last few were so very tired that they didn't even try. **"A university student who attends general relativity lectures in the morning and quantum mechanics lectures in the afternoon could perhaps be forgiven for thinking that his professors are idiots or that they have neglected to communicate with each other for at least a century."** There is a grave in Roselawn Cemetery in Tallahassee, Florida. It is inscribed with the name of a man who died in 1984 at the age of 82. Unlike the others in the cemetery, this man also has a plaque in Westminster Abbey not far from Isaac Newton's remains. The plaque doesn't say much. It marks the man as a physicist and records his birth and death. But there is also an equation on the plaque, a complex mixture of Latin and Greek letters. And this equation was the first unification of Einstein's theory of relativity and quantum mechanics. The famous physicist **Niels Bohr** called Paul Adrien **Maurice Dirac** the strangest man who visited his institute. He was born in Bristol at the beginning of the twentieth century and at first did not seem destined for scientific greatness. In 1923, Dirac began studying at the University of Cambridge. He was brilliantly focused on his science, avoiding much human interaction and his conversations were mostly silent. His colleagues named the unit of ,one word, per hour the "dirac" in his honor. ☺ But while his speech was slow, his mind raced around the problems of physics. It was a heady time o be a physicist, Unfortunately, the opposite is the case today, i.e. in the period 2005 – 2008. And then a period of insults and ridicule in the Czech basin until today, until 2023, when Einstein's new world of relativity and the bizarre consequences of quantum mechanics opened up - were the fundamental secrets of the universe finally revealed? When Dirac began his research on quantum mechanics, it was written in the past. The mathematics of **Schrodinger** and **Heisenberg** took place on Newton's stage. With the ticking of absolute clocks and Galileo's vision of the universe. But **Dirac knew that this picture of space and time was simply out of date**. Surely the equations of quantum mechanics should reflect Einstein's new visions of space and time. This bothered **Dirac** and he fiddled with the math to make it work, spending his Sundays walking around by himself, turning the equations over in his mind. And in December 1927, the fog began to clear. The relativistic quantum equation appeared. An equation that obeyed Einstein's demand that there is no special rest in the universe. And Dirac used this equation to explain the simplest particle, the electron. Suddenly, various special properties of the electron made mathematical sense. In the Dirac equation, the electron spins and behaves like a small bar magnet. Both properties were difficult to explain but were a natural consequence of relativity. But there was another feature that was completely unexpected. If you take the square root of one, there are two solutions - plus one or minus one. Likewise, when explaining the electron, the Dirac equation has two solutions. One solution is negatively charged and clearly represents an electron. But what does a positive solution correspond to? Dirac wondered if it could be the proton, the positively charged particle in the nucleus. But being nearly two thousand times more massive, that couldn't be right. Eventually the concluded that his equation predicted an anti-electron.

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(12)- This particle should have the same mass as the electron but have the opposite, positive, charge. Antimatter. The Dirac equation was the birth of quantum field theory, the most successful physical theory. It is with these mathematics we describe all of the fundamental particles and forces, the basis of the modern standard model. And for each of the particles, there are anti-particles, electrons, positrons, quarks and anti-quarks. All a consequence of Einstein's view of relative space and relative time. But quantum field theory is built on Einstein's special theory of relativity. What of gravity and the general theory of relativity? What if we incorporate curved spacetime into the Dirac equation? Unfortunately, after such incredible early success - the last century has brought us no further in this quest. Within quantum field theory, the quantum wave function that underlies existence still plays out within the arena of space and time. Because of special relativity, this spacetime is more complex than Newton's view, but space and time are still the universal stage. And this stage is broken when considering the curved spacetime of general relativity. Remember, in the general theory of relativity, space and time are dynamic and evolving. They are not simply the stage - they are players in the physics of the universe. Quantum mechanics was complicated enough, but after many years of work its various infinities had ultimately been tamed. With curving, bending, rippling spacetime - the infinities seemed uncontrollable. With the failure to simply merge gravity and quantum mechanics, some physicists have searched elsewhere. This has involved going back to the drawing board, with new ideas for just what space and time are in the quest for the so-called “theory of everything” - the so-far fruitless search to tie the microscopic quantum world to the macroscopic world of general relativity and fully explain the universe. And of course these theories of everything have not necessarily made things simpler. In one of the leading contenders, string or m-theory, there might be 11 or even 26 dimensions. But what do these ideas have to say about the fundamental nature of space and time? Again it’s not so simple. In m-theory, space and time are part of the fundamental structures of the universe. The strange, contorted shape of this structure in multiple dimensions explains everything. Not just space and time, but all matter, all radiation, and all of the forces. What are these fundamental structures made of? M-theory doesn't tell us. Another contender for the theory of everything is loop quantum gravity. On the face of it, this theory is even more bizarre, with space and time being quantum phenomena. At the tiny Planck scale, spacetime is chunky, fundamentally meshed together into a network. And to us, this subatomic mesh has the appearance of smooth space and time. Again, we can ask - what are these quantum grains made of? And again, we are left disappointed as they just are. But perhaps the solution is simpler than this. Perhaps - some have speculated - space and time do not exist at all. Remember at the start of this story we heard the disagreement between Newton and Leibniz. To Newton, space and time were part of reality and existed independent of the matter in the universe. Leibniz, however, said that it was the relationships between matter that defined space and time. Without them, space and time would have no meaning. And the relativistic vision of spacetime seemed to match this picture. Einstein told us that matter defined the structure of spacetime, And spacetime told matter what to do. We know that in the quantum picture, spacetime appears to be lumpy. And that reality is possibly constructed of these bits of spacetime as the universe grows. But what if space and time are not really there? What if space and time are actually emergent phenomena, something we experience only as macroscopic beings? This might sound strange, but we know that we are sandwiched in the universe. This means that we don’t feel the cosmological expansion that dominates the large-scale universe. And similarly, we don’t feel the individual feel individual atoms as they collide with our skin. Instead, we have a collective term, temperature to describe what is happening. Perhaps space and time are the same? In 1997, Juan Maldacena found a key relationship in the mathematics of string theory and gravity. Known as the AdS/CFT correspondence, it could be accidental and of no consequence, but it could also be pointing to something deeper, The path to uniting quantum mechanics and gravity. But if this is the right path, something else emerges. Through this relationship, space and time become granular: pieces of fundamental length and fundamental time - Planck scale pixels that set the smallest resolution of the universe. This would mean that at the smallest scales, space and time would appear as nothing more than grains of sand on a beach.

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(12)- This particle should have the same mass as the electron, but have the opposite, positive charge. Antimatter. Dirac's equation was the birth of quantum field theory, the most successful theory of physics. We use this mathematics to describe all the fundamental

particles and forces that underlie the modern standard model. Using HDV physics, we also describe basic particles, but || in the two-character language of the two quantities "x" and "t" and their 3+3 dimensions. →
http://www.hypothesis-of-universe.com/docs/aa/aa_078.pdf ; http://www.hypothesis-of-universe.com/docs/c/c_047.jpg ; http://www.hypothesis-of-universe.com/docs/aa/aa_037.pdf ;
And for each of the particles there are antiparticles, electrons, positrons, quarks and antiquarks.
http://www.hypothesis-of-universe.com/index.php?nav=ea ; http://www.hypothesis-of-universe.com/docs/ea/ea_016.pdf ; http://www.hypothesis-of-universe.com/docs/ea/ea_016.pdf ; http://www.hypothesis-of-universe.com/index.php?nav=eb

Everything is a consequence of Einstein's view of relative space and relative time. Nonlinear math starts here http://www.hypothesis-of-universe.com/docs/f/f_064.jpg and from there you get to OTR. (((Again, I ask readers for tolerance to my imperfections in mathematics. If I had mastered it, the theory of everything could have been on the table for 30 years))). But quantum field theory is built on Einstein's special theory of relativity. What about gravity and general relativity? What if we incorporate curved spacetime into the Dirac equation? Unfortunately, after such incredible early success - the last century has not taken us further in this quest. Within quantum field theory, the quantum wave function that underlies existence still takes place in the arena of space and time. Because of special relativity, this space-time is more complex than Newton's view, but space and time are still a universal stage. And this phase is interrupted when we consider the curved spacetime of general relativity. Remember that in general relativity, space and time are dynamic and evolving. They are not just a stage – they are players in the physics of the universe. Quantum mechanics was complicated enough, but after many years of work, its various infinities were finally tamed. With space-time curving, bending, rippling - infinity seemed uncontrollable. Failing to simply merge gravity and quantum mechanics, some physicists looked elsewhere. This involved going back to the drawing board with new ideas about what space and time are in the search for a so-called "theory of everything"—the so far unsuccessful quest to connect the microscopic quantum world with the macroscopic world of general relativity and fully explain the universe. And of course these theories of everything don't necessarily simplify things. In one of the leading contenders, string or m-theory, **may exist** 11 or even 26 dimensions. But what do these ideas say about the fundamental nature of space and time? I've already tried to explain this. Above all, they say that matter can be built using multi-dimensional dimensions, both length and time. http://www.hypothesis-of-universe.com/index.php?nav=e here is my many-year-old effort to…
Again, it's not that simple. In m-theory, space and time are part of the fundamental structures of the universe. The strange, twisted shape of this multi-dimensional structure explains everything. Not just space and time, but all matter, all radiation, and all forces. What are these basic structures made of? M-theory doesn't tell us. Another contender for a theory of everything is loop quantum gravity. At first glance, this theory is even more bizarre because space and time are quantum phenomena. On the small Planck scale, space-time is massive, essentially networked. And to us, this subatomic web has the appearance of smooth space and time. Again we can ask - what are these quantum grains made of? And once again, we were left disappointed, as were they. But maybe the solution is simpler than this. Perhaps - some have speculated - space and time do not exist at all. Remember that at the beginning of this

story we heard the disagreements between Newton and Leibniz. For Newton, space and time were part of reality and existed independently of matter in the universe. However, Leibniz said that it was the relationships between matter that defined space and time. Without them, space and time would have no meaning. And the relativistic vision of spacetime seemed to fit this picture. Einstein told us that matter defines the structure of space-time, and space-time tells matter what to do. We know that spacetime appears lumpy in a quantum picture. And this reality is possibly constructed from these pieces of spacetime as the universe grows. But what if space and time don't really exist? What if space and time are actually emergent phenomena, something we only experience as macroscopic beings? It may sound strange, but we know that we are bound in space. This means that we do not feel the cosmological expansion that dominates the vast universe. And similarly, we do not feel that individual atoms feel when they collide with our skin. Instead, we have a common term, temperature, to describe what is happening. Maybe space and time are the same thing? In 1997, Juan **Maldacena** found a key relationship in the mathematics of string theory and gravity. Known as the AdS/CFT correspondence, it could have been accidental and inconsequential, but it could also point to something deeper, a path to the unification of quantum mechanics and gravity. But if this is the right path, something else will appear. Through this relationship, space and time become granular: bits of fundamental length and fundamental time—the Planck-scale pixels that set the smallest resolution of the universe. This would mean that, at the smallest scale, space and time would look like nothing more than grains of sand on a beach.

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(13)- And so, perhaps there is no space between the grains of reality - no time between one grain and another. Perhaps to these grains, these are concepts that make no sense - there are only their relations, how they interact. For us, much larger than the scale of these grains, there is the concept of space. And somehow through the relationships of the grains, we experience the experience of experience. But underlying this, maybe ultimately, space and time simply don't exist, There are just fundamental bits and pieces, and their inter-relationships. This may feel uncomfortable. Just where is the "you" in this relational universe? Perhaps it is best to think of it like this: Most of us have come to terms with the fact that we are physically a collection of atoms. And somewhere in this collection, we, our consciousness, somehow emerges. We seem to be able to live with this illusion of our being. Maybe all we need to do is the same for the stage on which we play out our existence. And so, we have come a long way and are approaching the end of our journey. Space and time, our focus along our path, both seemed so natural, seemed so normal. But we have seen that they are far more strange, more mysterious than they first appear. Though the space and time of Newton were simple and absolute, they became more complex with Einstein's curving spacetime. And the quantum nature of spacetime attempts to dice space and time into little pieces. But are we any closer to really understanding its true nature? A lot of hope is pinned on our next fundamental theories, That a theory of everything will eventually shine a light on the universal stage. And maybe written into the theory will be the true nature of space and time. Perhaps the block universe will be banished as the universe unfolds. Perhaps quantum processes are constructing a "now" one instant at a time. Or perhaps some process we have yet to imagine is defining reality. But, of course, nature is not bound to reveal its secrets. No matter how hard scientists work, they may never reveal the fundamental truth. We must face the fact that some mysteries might remain forever mysteries - indeed just what space and time actually are could forever

be beyond our grasp. And so, finally we return to the twilight of the cosmos. WIthin their home, the last few watched their black hole slowly evaporate. All they wanted was to eke out one more day, one more moment. But eventually, the decay of the universe could no longer be shut out. They had manipulated space, they had mastered
1:14:48
time, bent them to their will. But they could not defeat them. And then, there was darkness.
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(13)- And so perhaps there is no space between grains of reality - no time between one grain and another. Maybe for these grains, they are concepts that do not make sense - there are only their relationships, how they affect each other. For us, much larger than the scale of these grains, there is a concept of space. And somehow through the grain relationships we experience the experience of experience. But beyond that, maybe in the end, space and time simply don't exist, the author is already delirious about it... there are only basic pieces of packages of "entangled" dimensions and their mutual relationships. This can be annoying. Where is "you" in this relational universe? Perhaps it's best to think of it this way: Most of us have come to terms with the fact that we are physically a collection of atoms. And somewhere in this collection we somehow emerge, our consciousness. We seem to be able to live with this illusion of our being. Perhaps all we need to do is the same for the stage on which we play out our existence. And so we have come a long way and we are nearing the end of our journey. Space and time, our focus on our journey, both seemed so natural, seemed so normal. But we saw that they are much more strange, more mysterious than it seems at first glance. Though Newtonian space and time were simple and absolute, they became ||more complex|| with Einstein's curvature of space-time. And what if you find out that matter is built from the dimensions of two space-time quantities. You're going crazy. But it won't be more complicated. Take a look here → http://www.hypothesis-of-universe.com/index.php?nav=ea ; when you understand it, you will find out how wonderful it is. A quantum nature of space-time trying to cut space and time into small pieces. http://www.hypothesis-of-universe.com/index.php?nav=eb
That's right. It is only necessary to look at the reality through my eyes. Understand that "nature cuts nothing." The universe itself in that quark-gluon plasma (boiling dimensional chaos) produces elementary matter particles by "dimensional packing". The tables of leptons, baryons, mesons are beautiful. Each elemental particle is built by "wrapping" another dimension..., no package is the same. And all those beautiful packages from the dimensions "float" in 3+3D spacetime, in a grid of warped dimensions. It is not as you believe that "the nature of space-time cuts up space-time"… But are we any closer to actually understanding its true nature? No you're not. In our other basic theories, there is great hope that a theory of everything will eventually shed light on the cosmic scene. And perhaps the true nature of space and time will be written into the theory. The true nature of 3+3D spacetime is a "warping" of dimensions. The flat universe in front of the BB will "warp" and "packages" of elementary particles will bubble up in this soup. And physicists know that the U quard, the D quark, (of which the baryon is a proton and a neutron) + an electron and its neutrino, (+positron) + a photon and...and that's it. Simple packages (!), simple interactions (!), and we have building blocks for everything. The table is simple. And even the properties of matter, that variety, are enough for anything. http://www.hypothesis-of-universe.com/docs/c/c_310.jpg ← two writing techniques Perhaps the block universe will be

revealed as the universe evolves. Perhaps quantum processes construct the "now" one moment at a time. Or perhaps some process we cannot yet imagine defines reality. Correspondingly, the processes that shape reality include the principle of alternating symmetries with asymmetries. But of course, nature is not obliged to reveal its secrets. Why not? Nature offers its secrets again and again, every day. No secret is "concreted" in front of people so it won't be revealed. No matter how hard scientists work, they may never uncover the underlying truth. This is not the fault of Nature, but of those people. We must face the fact that some secrets may remain secrets forever - indeed what space and time really are, can and it doesn't have to be out of our reach forever. You haven't read my opinion on 3+3D spacetime yet! Apparently on purpose. Whoever read spit out this vision of hatred, and no one added evidence "against" my HDV to those spittle. And so we finally return to the twilight of the cosmos. In their home, the last few watched their black hole slowly evaporate. All they wanted was to live one more day, one more moment. But eventually the disintegration of the universe could no longer be stopped. They manipulated the space, they did it 1:14:48 time bent them to their will. But they could not defeat them. And then it was dark. Off with the skepticism.

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JN, 13/06/2023 + I started the translation on 22/01/2024 and finished it on 26/01/2024.

I know that my work is not perfect, there are many factual, logical and physical errors in it...; who doesn't have them and doesn't? I'm worn out and tired and no one will help. I believe in my wonderful idea.