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Julian Barbour on "The Janus Point: A New Theory of Time" | Closer To Truth Chats

Julian Barbour o "The Janus Point: Nová teorie času" | Chaty blíž k pravdě



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568 tis. odběratelů

111 723 zhlédnutí 3. 12. 2020

Physicist Julian Barbour discusses his newest book, "The Janus Point: A New Theory of Time." In it, Barbour makes the radical argument that the growth of order drives the passage of time -- and shapes the destiny of the universe.

my comment is inserted in red font in the text

0:00

(01)- I was on a radio program with the astronomer royal in this country and and i said frankly the expanding universe stinks it's not expanding it's changing its shape julian it's great to see you i checked it's been almost a decade which gives me some sense that The Janus Point maybe uh time is some kind of an illusion and having been sheltered for months where wednesday seems the same as sunday time no longer seems to be flowing in my life so i'm almost becoming a believer in your radical theory of time um i in all seriousness though i i have uh read the your new book the janus point the new theory of time and uh i was immediately struck by the um the vastness of your vision last time we spoke we were focused on time which was radical enough in terms of your approach but now from that you've built a a really a remarkable superstructure that engages virtually everything so what i'd like to do to begin is give you my sense of the major ideas that you have um and then you go through it correct me get we want to get the overview and then we want to go into each of the pieces to give the uh justification or at least the reasons for the speculation so let me start and i have roughly five points uh first that time does not flow and it does not have a single direction past the future second the history of the classical universe is a succession of shapes it's an important word in your work shapes from which the notion of duration of what we may think is time emerges three the history of the universe is not one of increasing disorder which of course is the traditional and and conventional wisdom and science increasing uh entropy but rather you say of the growth of structure so we're going to need to talk about structure four you have a what you call a new vision of the big bang which is you define as the janus point because time then flows in both directions the janus being two faces it flows in two directions from the janus point and it's driven by you say the expansion of the universe and the growth of order whether it's galaxies planets or life and then the fifth and final point is that you challenge the conventional wisdom that the universe and all reality is headed for heat death which is not dying by heat it's it's the death of heat so that there's a a very bleak future where nothing can happen because everything is is totally homogeneous and uh and as a result of challenging that you say therefore life can expand without bound which is a remarkable statement and it contradicts virtually everyone else that i know so how did i do with the overview and give me your sense well i would i would say it's that's a fairly good overview i

would just put in a caveat at the end about life going on forever the the important word is is can or perhaps one even should say could um because uh that's really in speaking in normal terms that's the very distant future and really all sorts of things could happen before we get there speaking in conventional terms sure but uh you know we have a big rip or all sorts of things that people talk about uh under understood but the fundamental point is that the universe is not heading inexorably without any possibility of of change towards this um elimination of heat or what's called heat death where everything is totally homogeneous and once that happens nothing interesting can happen anymore that's quite correct my belief is that there's no need for variety to stop increasing variety can go on increasing forever that is that is entirely possible so that that's a super important point and it flies in the face of pretty much all of of our mutual colleagues and their views which i which i know you take as a compliment not a criticism well it's not it's not quite against everyone people that the key thing in this is the question of ratios quite a lot of modern cosmologists do say that there won't be heat death but what they say is that the the density of energy will decrease but all of all that we ever are aware of really is is contrast is densities different brightnesses i mean as i look at your face uh one side of it is brighter than the other and i noticed the difference there so if there is always variety in that sense that in some places intensities are greater than other even if the overall intensity is going down there is still some reality there there is variety this is the key thing if there were no variety we would we would not be able to think about anything we could not have any sense of science so it's variety that's the crucial thing and that depends upon ratios not upon absolute values okay that makes sense but if if if the trend is towards this homogeny then take you know at the asymptote take it out as long as as long as you can eventually it will depress the capacity on a continuing basis to create variety and eventually become zero by no means necessarily i mean the you can go on creating uh differences all the way just think

(01)- I was on a radio program with the Astronomer Royal in this country and I said frankly, the expanding universe stinks, it's not expanding, it's changing its shape. Yes, they change their dimensional curvatures both at the global level (expansion = unwrapping) and at the mini-level of planck scales in interactions... Julian, good to see you, I checked it's been almost ten years now, which gives me some feel it Janus point maybe uh, **time is some illusion** ugh that's a major mistake and when I've been hidden for months when wednesday seems the same as sunday time, **seems** that my life isn't flowing anymore, so **I'm almost starting to believe your radical theory of time** um, **um, and what theory is that??** Although in all seriousness I read your new book, **Janus points to a new theory of time** **I'm curious what it's like...** and I was immediately captivated by **the breadth of your vision**, the last time we spoke we focused on a time that was radical enough from your approach, but now you're from they've built a really **remarkable superstructure** that includes **virtually everything**, so what I'd like to do is give you my sense of the main points you have and then walk you through it properly. I see, we want to get an overview and then we want to go into each of the pieces **to give uh reasoning or at least reasons for speculation** so I'll start and **have about five points, uh that time doesn't pass ??** and has no single direction beyond the future a second of the history of the classical universe is a **sequence of shapes** it is an important word in your work **shape**, probably the author means "geometrical shapes". My HDV has visions into "packages" of dimensions,...a little preview, http://www.hypothesis-of-universe.com/docs/c/c_426.jpg ; http://www.hypothesis-of-universe.com/docs/c/c_416.jpg ; http://www.hypothesis-of-universe.com/docs/c/c_416.jpg ; http://www.hypothesis-of-universe.com/docs/c/c_416.jpg

universe.com/index.php?nav=ea from which emerges the notion of the duration of what we may think of as time three the history of the universe is not one of increasing disorder, which is of course the traditional and entropy-increasing conventional wisdom and science, but rather you're talking about structure growth so we'll have to talk about structure four, you have what you call a new vision of the big bang, which you define as the Janus point, (*) because time then flows both ways, Janus has two faces, flows in two directions from the Janus point and is controlled by you, you say, expansion of the universe and growth of order whether it's galaxies, planets or life, and then the fifth and final point is that you question the conventional wisdom that the universe and all reality is headed for a heat death that doesn't die of heat, it's heat death, so the future it is very gloomy. Where nothing can happen because everything is perfectly homogeneous and uh and as a result of what you say, life can expand without limit<, (?) which is a remarkable claim and contradicts virtually everything else, that I know so how did I do it with an overview and give me your mind I'd say it's a pretty good overview, I'd just add a warning at the end that life goes on forever, the important word is may or might even should have said could because uh it's really in normal terms it's very far in the future and really all kinds of things can happen before we get there in conventional terms sure but you know we have a big rift or all kinds of we don't understand the things people are talking about, but the Basic Point is that the universe is not heading inexorably without any possibility of change towards this elimination of heat or what is called heat death, disagree. My dogma is that "dimensional warping is matter forming". This means that where space-time is smoothed out, its dimensional curvatures disappear, there "disappears" matter and thus energy, heat. And at that moment the Universe is ready for a new big-bang = a sudden change of state from zero curvature of dimensions to an "infinite" foam of 3+3D curvature. (within a few seconds the "infinite" curvature changes according to an exponential downward curve to the "acceptable" curvature of the "boiling" vacuum... where everything is completely homogeneous and once that happens, nothing interesting can happen. it alludes to almost all our mutual colleagues and their views, which I know you hold as a compliment, not a criticism, so it's not, it's not quite against all people that the key thing in this is a question of ratios, quite a lot of modern cosmologists say , that there will be no heat death, but they say that energy density will decrease, I think no, that energy density will be constant, emergent foam of dimensions, i.e. warped dimensions from vacuum "delivers" to "expanding" space-time matter-energy but all we're ever aware of is actually contrast, density, different brightnesses, I mean when I look at your face, one side is brighter than the other and I notice a difference, so if there's always diversity in the sense that in some places the intensities are greater than others, even if the overall intensity decreases, there is still some reality, there is diversity, that is the key thing, if there was no diversity, we would not be able to think about anything, I would replace the word "variety" with the word "complexity" of configurations of matter from simpler to more complex according to my "Pyramidal Evolution"

http://www.hypothesis-of-universe.com/docs/aa/aa_037.pdf

we could not have any sense of science so it's variety that's the crucial thing and that depends upon ratios not upon absolute values okay that makes sense but if if the trend is towards this homogeneity then take you know at the asymptote take it out as long as as long as you can eventually it will depress the capacity on a continuing basis to create variety and eventually become zero by no means necessarily i mean the you can go on creating uh differences all the way just think

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(02)- about ordinary real numbers with their decimal expansion the decimal expansion can go on forever so there's always going to be a difference between one decimal place and the next one so to speak so you you could have two you could imagine two real numbers looking at their decimal expansion as you go along there's always a difference between them so so there's absolutely no reason for variety to be killed off just because uh one's got an idea of an intensity i think a lot of the problem comes from not thinking about the entire universe all around us we see measuring rods and clocks and we think they are absolute but there can't be a measuring rod outside the universe we have to look for measuring rods within the universe and if the things we take to be measuring rods there are some that are so long as long as that and there are other ones that are that long there'll be a difference between them even if you might imagine that they're all getting smaller but that difference remains it's that ratio that is always the one that counts two is always less than three your analogy to the real numbers and how Analogy to Real Numbers they work uh is it supports your point but i wonder is there a fundamental difference between the abstract quality of numbers and the reality factors of matter for example you know we talk about uh the uh plank lengths and so as things get smaller and smaller if they hit a hurdle call it a plank length or whatever uh that that changes the physical dynamics and so the the the analogy to the abstract abstract numbers to physical matter is not direct it's not direct but we don't really know what happens at the planck length at the moment the planck length is ultimately determined really by the frequencies of the cesium atom because that's the key thing in metrology and we don't really know what happens i mean certainly cesium atoms don't exist down at the planck length that's for sure so it's it's it's uncertain i mean the the fact is all scientific data ultimately come in the form of numbers and if there are differences between numbers if there are ratios uh then there's there's meaning there is always meaning in ratios okay so let's do this let's go through each of the points that that uh i've put together sort of the big categories that that you have and and and give me a sense of why these things are true i think everything i said uh is is uh contradicts the conventional wisdom um there are people i'm sure who agree with you but so each of these points let's start with with your concept of time that it doesn't flow it does not have a single direction past the future this is something you've worked on for for decades and and are in fact a a world standard on this but let me hear it afresh so the the first point about time not uh not necessarily flowing in only just one direction first of all all the known laws of nature at least all the ones that could possibly count in determining what is called the arrow of time they are uh they don't make a distinction between the direction of time the laws work the same way in both directions and this has been the great mystery really since the discovery of the laws of thermodynamics around 1850. so but what people always thought about i think the key thing in all of this that is why people have not realized the proper way to think about this is that the laws of thermodynamics were discovered through the behavior of steam engines and what a steam engine must maintain keep the steam in the cylinder box in the cylinder and so i say that all of the conceptualization of all of these issues has been for steam in a box or a system in a box and a system in a box behaves completely differently from one that is not you can i mean people say you start off with with uh shall we say a drop of liquid in the corner of a box that is a very low entropy state the if it's in the box the liquid will will it might even be a little bit of ice initially the ice will become water the water will evaporate and the water molecules will spread out over the whole box that's the classic story of the increase of entropy however if there is no box there and that ice is out in space and it melts it will behave in a completely different way it will go it will expand that in fact actually what it typically does is

expand like an expanding universe but if at the same time these atoms can interact gravitationally they would cluster together and form structures and this behavior in ein newton's theory of gravity was already clearly recognized in 1772 and when that happens if you just look at newton's theory as long as the energy is not negative so zero energy or positive energy you find that the system grows in size in both directions of time there's always a minimum size where the system is most uniform the distribution of the particles is most uniform and in both directions the structure grows so this aspect of newton's theory nobody's

(02)- about ordinary real numbers with their decimal expansion the decimal expansion can go on forever so there's always going to be a difference between one decimal place and the next one so to speak so you you could have two you could imagine two real numbers looking at their decimal expansion as you go along there's always a difference between them so so there's absolutely no reason for variety to be killed off just because uh one's got an idea of an intensity i think a lot of the problem comes from not thinking about the entire universe all around us we see measuring rods and clocks and we think they are absolute but there can't be a measuring rod outside the universe we have to look for measuring rods within the universe and if the things we take to be measuring rods there are some that are so long as long as that and there are other ones that are that long there'll be a difference between them even if you might imagine that they're all getting smaller but that difference remains it's that ratio that is always the one that counts two is always less than three your analogy to the real numbers and how Analogy to Real Numbers they work uh is it supports your point but i wonder is there a fundamental difference between the abstract quality of numbers and the reality factors of matter for example (?)

You know for example we're talking about plank lengths and the way things get smaller and smaller if they hit an obstacle, call it plank length or whatever that changes the physical dynamics, so the analogy to abstract abstract numbers physical matter is not direct, it's not direct, **but we don't really know what's going on at the Planck length, scale.... yes, you don't know. (!) In the vacuum foam = plasma of curved 3+3 dimensions, matter is born, elements are born by "packaging" dimensions, which then gradually conglomerate into ever **more and more complex formations**** (quarks+ leptons → atoms, → molecules, → compounds, → chemistry, → biology → living matter DNA) ; sample: http://www.hypothesis-of-universe.com/docs/eb/eb_002.pdf ; http://www.hypothesis-of-universe.com/docs/aa/aa_037.pdf at this point the planck length is ultimately determined really by the frequencies of the cesium atom because that's the key thing in metrology and we don't really know what's going on happens, I think cesium atoms down at the planck length don't exist, that's for sure, so it's uncertain, I mean the fact is that all scientific data ultimately comes in the form of numbers and if there are differences between the numbers, if there are ratios, then there's meaning, there's always meaning in relationships, okay, so let's go, let's go through each of the points that I put together kind of big categories that you have and and give me a sense of why these things are true, I think that everything that i said it is, it goes against the conventional wisdom um there are people that i'm sure agree with you but each of these points let's start with your concept of time that it's not t flow it doesn't have a single direction into the future , you've been working on this for decades and it's actually a world standard, but let me hear it again, **so the first point about time doesn't necessarily flow in only one direction, Objection and Note : **One** direction in the macro world !!! (in accordance with**

OTR) but in the microworld time also flows in the opposite direction... because the "arrow of time - cursor" travels along the crumpled space-time "there and back", both ways, (see QM, interaction matter on the Planck scale) as acknowledged by Prof. P.Kulhánek (here http://www.hypothesis-of-universe.com/docs/aa/aa_203.pdf pg. 12) especially all known laws of nature, at least all those that could count in determining what what is called the arrow of time, they don't distinguish between the direction of time, the laws work the same way in both directions and that's been a big mystery really since the discovery of the laws of thermodynamics around 1850. So but what people have always thought about I think is the key thing in all that people didn't realize The right way to think about it is that the laws of thermodynamics were discovered through the behavior of steam engines and what a steam engine has to maintain in order to keep the steam in the cylinder box in the cylinder and so I say that all the conceptualizations of all these the problems were for a pair in a box or a system in a box and a system in a box behaves very differently than one that is not, you can tell by that people say you start with uh let's say a drop of liquid in the corner of the box that is in a very low state entropy if it's in a box the liquid will be it can be a little ice initially the ice becomes water the water evaporates and the water molecules are dispersed throughout the box this is the classic story of entropy increasing but if there is no box and ice it's in space and it's melting, it's going to behave completely differently, it's going to expand, that actually what it usually does is expand like an expanding universe, but if these atoms could interact gravitationally at the same time, they'd clump together and form structures and this behavior in ein newton's theory of gravitation was clearly recognized as early as 1772 and when this happens, if you look at newton's theory so long because energy is not negative, so zero or positive energy, you will find that the size of the system grows in both directions of time, there is always a minimum size where the system is most uniform, the particle distribution is most uniform, and the structure grows in both directions, so nobody has this aspect of Newton's theory

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(03)- recognized it although it was discovered in one of the most important papers by the mathematician lagrange in 1772 and it was that insight actually as recently as 2012 which made me realize this could be the explanation of the arrow of time the the the approach that you're you're Anti entropy using on this um is the fundamental difference between a confined space and a space that has no has no bounds um it's not clear to me why to the um to that individual space where that kernel of ice is is is is uh evaporating why that's different than the closed box at some point it will but initially it would be the same it depends how big your box your conceptual box is well yes actually in the initial stage of the ice melting and the water then evaporating it is actually rather like that happening in in empty space uh and it would look initially like an expanding universe but it's the it's the box that is so important that is where the the idea that entropy is bound to increase eventually comes right so you you have uh introduced a new concept called antix entexy if i pronounce it properly yeah taxi okay get my get my emphasis in the right place um and you define this kind of the opposite of entropy because it's something that um it it kind of helps create structure or it decreases it it's sort of everything you thought about entropy and turning it upside down that's that's quite correct and and i think it's uh the people have said for a long time that gravity is anti-thermodynamic because if you start off with a uniform distribution of matter subject to newton's gravity the system will will clump well this is this is the phenomenon i'm talking about and so to save the

second law of thermodynamics everybody is so determined they must save the second law of the dynamics it cannot be violated they say gravity is anti-thermodynamic and it increases when it grabs the entropy under gravity increases but i'm saying actually stop and think actually what it's doing it's becoming more special i mean uh i mean if you look around the universe it looks very special it doesn't look disordered at all i mean the fact that we can talk to each other we can go out with telescopes and look at these fabulous galaxies and things does that look like disorder tell it to the marines is all i can say look i loved your analogy because the typical um a way to describe in lay terms the expanding universe is a balloon that's that's expanding and so dots on the balloon get further and further apart as the expansion occurs but but you characterize it as as coins which are solid and immovable that are kind of pasted on the balloon so within the coin there is there is structure and that that that there's no disorder there even though those coins may be getting further and further apart that's quite true the the thing that it all comes back to ratios the ratio if you take the diameter of the coin and divide it by the distance to the next coin that decreases as the universe uh ex in the normal terms as the universe expands that's when people say the universe is exp i was on a radio program with the astronomer royal in this country and i said frankly the expanding universe stinks it's not expanding it's changing its shape what it's doing that is the only objective truth it is changing its shape this is all that the astronomers observe so that's your second big point that the The succession of shapes the history of the universe is a succession of a succession of shapes and these shapes the relationship between them is what gives us duration and then our sense of time correct and it's and there's also no shadow of doubt that these shapes are getting more structured and more interesting i mean there's no shadow of doubt that when you go back near to the big bang the universe looks very uniform and it's been getting less and less uniform and more and more structured at least up to now what might happen in the very distant future we cannot say with any degree of confidence but we know that up to now let me give you the traditional argument that um that you need to uh undermine uh is that explains that and that says that while the overall universe is indeed increasing in entropy so that the second law is maintained um locally that because of the flow of energy like from the sun to the earth there can be structure plants people or whatever but that's drawing the sun's energy so it's a it's a it's a local concentration that increases order and structure which seemingly contradicts the second law but no it doesn't really because the energy that it's drawing from outside more than makes up for that that's the conventional way of looking at it but there is another way uh i a thing that i think is very important is what william thompson who then became lord kelvin said in 1852 he had a very significant paper which he titled on a universal

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(03)- recognized it, even though it was discovered in one of the most important papers by the mathematician Lagrange in 1772, and it was this insight that made me **not until 2012 realize that this could be the explanation of the arrow of time** approach that you are **Anti Entropy** on this um there is a fundamental difference between a confined space and a space that has no boundaries um it is not clear to me why into that single space where it is the ice core is it is it is evaporation why is it different from closed at some point box but initially it would be the same depends on how big your box is your conceptual box is fine yes actually in the initial phase of melting ice and water then evaporation is actually more like what happens in empty space and **at first it would look like an expanding universe**, but it's that box that's so important that it's where the idea that **entropy will necessarily increase** eventually comes right, so you introduced i a new concept called antix entexy, if i pronounce it correctly, yes taxi, yes,

emphasize the place correctly and define this kind of **opposite of entropy**. **My thoughts on entropy** →

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http://www.hypothesis-of-universe.com/docs/aa/aa_202.pdf ;

http://www.hypothesis-of-universe.com/docs/eng/eng_112.pdf ;

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because it's something that helps create structure or reduces it, it's kind of everything you thought about entropy and flipping upside down, that's quite right and I think **people have been saying for a long time that gravity is anti-thermodynamic**, because if you start with a uniform distribution of mass subject to newtonian gravity the system will clump together well, this is the phenomenon I'm talking about, and because of this, to save the second law of thermodynamics, everyone is so determined that they must save the second law of dynamics, it cannot be broken, they say gravity is anti-thermodynamic **I talk about it here 11/12/2021**

http://www.hypothesis-of-universe.com/docs/aa/aa_183.pdf **pg. 3** and it increases as it absorbs entropy under gravity, but I'm saying really stop and think about what it's doing, it becomes more special I mean uh, I mean if you look around the universe it looks very special.

(*) http://www.hypothesis-of-universe.com/docs/eng/eng_112.pdf ; http://www.hypothesis-of-universe.com/docs/aa/aa_183.pdf ;

((A sequence of increasingly complex and complex structures from atoms, to molecules, to compounds, to macromolecules, to DNA - this is the process of "anti" entropy...)) Not to look disorganized at all, I mean the fact that we can talk to each other, we can go out with the telescopes and look at these wonderful galaxies and things **that look like mess** tell the marines is all i can say look i loved you analogies because the typical way to describe an expanding universe in layman's terms is a balloon that expands and so the dots on the expanding balloon get further and further from away from each other, but you characterize it as coins that are solid and immobile, they're kind of stuck on a balloon, so inside the coin-galaxy is a structure-**complexity from higher dimensional curvatures, here entropy decreases** and that there's **no mess**, O.K. we're on the same page even though those coins can get further and further apart, it's quite true that it all comes back to ratio. If you take the diameter of a coin and divide it by the distance to the next coin that shrinks how the universe uh ex in normal conditions as the universe expands that's when people say the universe is exp I was on a radio program with an astronomer royal in this country and **i said honestly, an expanding universe stinks, it doesn't expand, it changes shape, it doesn't expand, it expands** http://www.hypothesis-of-universe.com/docs/c/c_032.gif what it does, that's the only objective truth, it changes its shape, it **changes the global curvature of dimensions** that's all astronomers observe, so that's your second big point, that the sequence of shapes of the history of the universe is a sequence of shapes, and the relationship between these shapes they are what give us duration and then our sense of time is correct, **the global curvature of space-time is decreasing, therefore the arrow of time has one direction to the future** and there is no doubt that these shapes are becoming more and more structured and even more interesting, i mean there is no shadow of a doubt that **when you go back close to the big bang the universe looks very uniform**,

when you go back close to the big bang the universe looks very uniform,

OK ,the seething vacuum, the froth of dimensions, that is the unity of uncomplexity, although there is a high curvature of dimensions and it is less and less uniform and more and more structured, at least until now what may happen in the very distant future we cannot say with any degree of certainty, but we know that so far let me give you the traditional argument that um you have to undermine that explains it and that says that while the overall universe is actually increasing in entropy, = curvature is decreasing so that the second law is obeyed locally that because of the flow of energy like from the sun to the earth there can be structures of plants people or whatever, but that draws on the sun's energy so it is a local concentration that increases order and structure which seems to contradict the second law, but no, it's not really, because the energy it draws from outside more than makes up for it, that's the conventional way of looking at it, but there's another way, uh and thing that I think is very important **William Thompson**, who afterwards became **Lord Kelvin**, said in 1852 that he had a very important paper which he called the universal

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(04)- tendency in nature to the dissipation of mechanical energy and this this is the sort of story now he said he had chosen the word dissipation because it did not mean that energy was being destroyed only the creator could do that what what he could have said was that energy is spreading now if energy is spreading that doesn't mean to say that structure is being destroyed the image i give right at the end of my book is if i have a bit of a blob of ink on a piece of white paper and i put my thumb down on that ink i just get a smudge but if instead i take a pain a pen i can take exactly the same amount of ink and draw a beautiful diagram if i'm a good artist and my conject my contention is that is what nature is doing it is spreading out energy and creating structure and you can see a beautiful example of this it's been raining a lot in this uh around here in the last few days i walk down to a stream where the water flows over a shallow water flows over a a ford and water drops fall from the tree into the water so there's energy concentrated in that drop of water as it falls into the water but when it does that beautiful circular wings rings spread out so that is your spreading of the energy which was all concentrated in the thing and it's created that beautiful picture and you have lots of drops coming down and all those circular waves pass through each other they don't destroy each other they pass through each other so actually you can sit there and watch it for hours and it's a very beautiful effect that is energy spreading that i think is the right way one should talk about the second law of thermodynamics when you haven't got a system imprisoned in a box that drop of water is not imprisoned it is eventually because of the banks of the stream but if this was a still ocean those waves could go on forever well they could go on forever um but there's some attenuation of over over time there's attenuation but not of necessarily of the ratios because bigger ones will meet smaller ones and when the bigger ones meet smaller ones there's always a difference you what you need is difference to talk about science so your characterization which is what i had your point three

The growth of structure uh that the history of the universe is not one of increasing disorder but rather of the growth of structure whereas the conventional wisdom says that yes there is the growth of structure that's obvious you can't deny that uh but it is it is because of the differential in the universe and different segments of it but still there's an overall disorder so that that is a crucial point because everything that you uh projects speculation of course everything you project is dependent upon that fundamental point is that right can you just i i could you repeat the point you said i may not i may not repeat it the same way the second

time no no that doesn't matter the the fundamental aspects of your big speculations your big idea is based on the fact that the increasing growth of structure is a fundamental part of the what i think you call the law of the universe absolutely yes big idea this big idea um that this that's the important thing whereas conventional wisdom says yes we see the growth of structure of course we do but that is because we are in in in um in local areas drawing on the uh the energy of of of the totality and therefore in other areas the entropy is is still increasing so the overall uh sum is is still towards disorder over over time but locally there is this growth of structure because of this differential so what i'm saying is and you you've explained that but that is the fundamental uh idea that undergirds your your totality yes i mean can i just say something a little bit about black holes because black i mean this was the famous discovery of stephen hawking that when black holes form a huge amount of of matter is concentrated in a very small region but that is actually changing the structure of the universe it's putting a lot of matter in a very small space um we know we've seen this marvelously when two black holes merge it's just like a drop of water falling into the into the water the gravitational waves spread out it's just unbelievable the information that is constantly streaming over the earth with with the details of what is going on right back to very close to the big bang right they're milliseconds they're very things the more we go down in the energy that we receive uh or we still go on picking up details i mean these radio telescopes now are picking up energy densities that are unbelievably low but they're still picking up all this fabulous structure and and a picture of what the universe is like i mean let's go to let's go to the big bang because you

(04)- the tendency in nature to dissipate mechanical energy and this is the kind of story he said he chose the word dissipation because it didn't mean the energy was being destroyed, only the creator could do what he could, i said the energy is spreading now, if the energy spreads, it does not mean that the structure is destroyed. The picture I show at the end of my book is when I have a piece of ink on a piece of white paper and I put my thumb down on the ink, it just smudges, but if I give myself pain with a pen instead, I can take exactly the same amount of ink and draw nice diagram, if I'm a good artist and my idea of the dispute is that **that's what nature does, spreads energy and creates structure** the genesis of the universe is in the sense that "localities" fold (increasing curvature of conglomerates) but the "globals" are unwrapping, the curvature of spacetime is decreasing, on large scales and you can see a beautiful example of that, it's been raining a lot here for the last few days I'm going down to the stream where the water is flowing over the shoal the water is flowing over the ford and the drops of water are falling from a tree into of water, so there's concentrated energy in that drop of water as it falls into the water, but when that happens, the beautiful circular rings of the wings spread out, so you spread out the energy that was all concentrated in that thing and created that beautiful image, and you've got a lot of of drops that fall down and all those circular waves pass each other, they don't destroy each other, they pass each other, **yes, complex structures (chemical formulas of proteins) of curved dimensions "float" in a slightly curved yarn, 3+3D, 3+ network 3 dimensions** so you can actually sit there and look at it for hours and it's a very beautiful effect which is energy diffusion which I think is the correct way to talk about the second law of thermodynamics when you don't have a system trapped in a box where not even a drop of water is trapped it's ultimately because of the banks of the stream but if it was a calm ocean those waves could go on forever well they could go on forever but there's some attenuation there's an attenuation over time , but not necessarily of ratios because they are bigger meet smaller and when bigger meet smaller there is always a

difference what you need is a difference talk about science so your characteristic which is what I had your point three: Growth **complex and more complex** structures, http://www.hypothesis-of-universe.com/docs/c/c_076.jpg that the history of the universe is not one of growing disorder, but rather of growing structure, while conventional wisdom says, that yes there is structure growth that's obvious you can't deny it but it's so it's because of the difference in the universe and its different segments but there's still an overall mess so that's the key point because all you're projecting is speculation , of course everything you project depends on this basic point, it is correct, you can I could repeat the point you said, I must not, I must not repeat it the same way a second time no no it does not matter, the basic aspects of your great speculations are your big idea based on the fact that increasing structure growth is a fundamental part of what I think you call a cosmic law absolutely yes big idea this big idea um that this is an important thing whereas conventional wisdom says yes we see structure growth of course that yes, but that's why we in in v um in local areas draw on the energy of the whole, and that's why entropy keeps increasing in other areas, so the total over time is still a mess, **unpacking curvatures in global, and collapsing curvatures n locals** . I've been **preaching this view for many years now...** but locally this growth of structure is because of this difference so what I'm saying is and you've explained it but that's the basic idea that underpins your totality yes I think I can just say a little bit about black holes because i mean black it was stephen hawking's famous discovery that when black holes are formed **a huge amount of matter is concentrated** in a very small area **because in a small area the high curvature 3+3D is concentrated but alone the location is simple, it has no complexity** but it actually changes the structure of the universe, it puts a lot of matter-mass into a very small **horribly curved** space um, we know we've seen it amazing when two black holes merge , it's like a drop of water falling into water, gravitational waves are spreading out, it's just incredible information that's constantly flowing across the earth detailing what's going on right back to the very close big bang, it's milliseconds, it's the same things , the more we go down in the energy that we're receiving, or we're still continuing to collect details, I think these radio telescopes are now recording energy densities that are incredibly low, but they're still capturing this whole wonderful structure and picture of what the universe is like, I mean, let's go to to the big bang because you

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(05)- have a a definitely a new vision of it this is your janus point and which you say time flows in both directions or two directions from that driven by the expansion of the universe or the growth of structures so so take me through that so first i should say there are two possibilities that what happened at the big bang or the janus point uh one is that the in the talking in the conventional way the size of the universe does not go to zero this is the situation that lagrange discovered in 1772 then there you just have a situation where effectively there are two universes with opposite directions of time there is one point where in the conventional way the size of the universe is its least at the smallest value and the distribution of matter is most uniform and in both directions away from it the matter clumps the structure grows that's the picture if the universe does not go to zero size possibly much more exciting is when it does go to zero size and it may be even there that my janus point idea may be challenged this would depend on exactly how quantum gravity comes out in the end it may be that there is actually just one point once very special shape of the universe and and out of it all possible shapes emerge bit by bit as it were from a single point a single shape which i call alpha now that's an idea which actually developed as i was writing the book and might even undermine

the title of the book but either way the problem of the arrow i think either way whichever possibility turns out to be the better one there is an explanation of the arrow of time that mystery of why everything flows in the same direction if the size is non-zero then there is these arrows pointing in his upper opposite directions and the symmetry is respected all the solutions have the same symmetry if the size goes to zero and this more uh radical idea is correct then the universe will have a unique beginning the law of the universe says it must start in the most uniform state that is absolutely possible and from then on uh variety will go on increasing forever each successive shape will have a greater variety so i can appreciate um the concept and i see obviously our side of the big bang where The opposite direction time flows in the direction we're familiar with i flows as i'll put in quotes um but what happens on the other side the other side you say structure uh also is developed as time goes in the opposite direction how does that happen first of all anybody like you and me who can talk to each other they're going to be on one side or other of the janus point and for them for each side time will seem to flow forward in exactly the same way i mean one just analogy i mean imagine that you and i went to the top of mount fuji in japan and we walked in opposite directions down that beautiful mountain as we go down we find the landscape and the vegetation changing progressively as it goes down and essentially it will change in exactly the same way for each of us so as we go down in our separate ways we can't talk to each other we can't shout over top of man fuji and we just find that the the world changes in exactly the same way for us so if by the chance we could then speak on the phone we would say we've had exactly the same oh qualitatively the same experience you know i love the the analogies that Analogies you use here and and in your book i mean they're very rich and they're very meaningful and and of course they do support your vision um but i i always have to wonder that there seems to be a vast gulf between these human related macroscopic uh analogies and and what we're talking about in terms of of the universe there's so many bizarre things from quantum mechanics to uh size and everything else but but the analogies are great and uh you know so i i like them a lot yeah well like what i will say is i think they are it's it amazes me i think they are actually almost the first time anybody has spoken like this i it it to me it is an amazing fact that people have just not questioned that box in which thermodynamics was discovered so much came out of thermodynamics including after 50 years the discovery of quantum mechanics they they all it was critical that box the the theory all assumed that the atoms and the molecules bounced elastically off the wall of the box and that led to they they confirmed the existence of atoms and molecules their sizes and eventually they discovered quantum mechanics that is absolutely amazing and people were so amazed by that and it seemed absolutely inevitable that the second law must be absolutely true and nobody has questioned that i search every time i look at what people have written in books in scientific papers i have not seen one single person questioning this assumption that the system is in a

(05)- have a whole new vision for this, this is your janus point and what you say is that time flows both ways or two ways from that which is driven by the expansion of the universe or the growth of structures, so walk me through it, firstly i should say there are two possibilities , that what happened at the big bang or at the janus point, uh, one is that, normally speaking, the size of the universe does not drop to zero, which is the situation that Lagrange discovered in 1772. Then you have a situation where **effectively there are two universes with opposite directions of time**, **???**, there is one point where, conventionally, the size of the universe is the

smallest at the smallest value and the distribution of **mass is the most uniform** = foam = plasma and in both directions **times** away from it, matter clumps together, **yes !**, right after the big-bang begins **also** folding, i.e. packing dimensions into balls http://www.hypothesis-of-universe.com/docs/c/c_142.jpg (and then into conglomerates → atoms, molecules, compounds... http://www.hypothesis-of-universe.com/docs/c/c_040.jpg) and **also** **simultaneous with packing** 3+3D the network of space-time **unfolds**, both phenomena go together in one development. The flow of time is realized by dimensions **unwrapping** from that plasma = foam, boiling vacuum http://www.hypothesis-of-universe.com/docs/c/c_167.gif ; into the global form we see today → networks of galaxies and stars in them, solar systems http://www.hypothesis-of-universe.com/docs/c/c_362.jpg and in them - on them genesis up to living matter. And mini-localities on Planck scales **are packed up**, from which elementary particles of matter are born, the structure grows, that's the picture, if the universe doesn't go to size zero, maybe it's much more exciting when it does go to size zero, and even there my janus point idea might be challenged. It depends on how exactly quantum gravity turns out, it may be that there is really only one point, once a very special shape of the universe, and from it all possible shapes emerge bit by bit, as if from one point the only shape that I now call alpha, that's an idea that actually developed while writing the book and might even undermine the title of the book, but in any case, I think the problem ora, whichever option turns out to be better, there's an explanation for the arrow of time, the mystery , why everything flows in the same direction, if the magnitude is non-zero, then these arrows are pointing in its upper opposite directions, and the symmetry is respected, all solutions have the same symmetry, if the magnitude goes to zero, and this more radical idea is correct, then the universe will have a unique the beginning, the law of the universe says that **must start in the most uniform state possible**, before the big-bang it is like this: space-time is two-dimensional, massless, flat = non-curved dimensions, infinite, no expansion, no flux-flow time and... and without laws, principles, rules, those are the minimum necessary...; after the big bang, there is a change from extreme to extreme: from zero curvature to "infinite curvature" in that stop-state (the limit on the right is zero and the limit on the left is infinite curvature). And there will be a genesis of the universe...see hundreds of my articles, description of HDV visions... which is absolutely possible, and from then on the diversity will increase forever yes, but it will also be true: the more the complexity increases, the more it will less, the less there will be locations where there is higher and higher complexity... see rhetorical aid: **"quality times quantity is constant"** → ∞ . 0 = 1 . 1 ; (symbolic) ..when in the end the most complex thing in the entire universe will be only on Earth, it will be us, humans ...which leads to the inflated statement that we human beings, thinking and making artificial drugs, computers, rockets and children and ...and pedophiles.. .. we are at the top of the evolutionary pyramid throughout the universe each successive shape will have greater diversity, yeah... each new mass conglomerate will have greater diversity of dimensional curvature

so i can appreciate um the concept and of course i see our side of the big bang where the opposite direction of time flows to the direction we know i flows how i put in quotes um but what happens on the other side?, the other side you say >**structure uh also evolves , how time goes in the opposite direction**, it is nothing strange in the micro world, on the contrary, without the reverse running of time it would not be possible to build "packages" of matter and interaction... how it happens especially to anyone like you and me who can together talking, there will be a janus point on one side or the other, and for them, for each side, time will seem to be moving forward in exactly the same way, I have just one analogy in mind, I think

imagine that you and I went to the top of Mt.Fuji in Japan and we went in opposite directions As we descend from that beautiful mountain, we find the landscape and the vegetation progressively changing as we descend, and basically it's going to change in exactly the same way for each of us, so as we descend in different ways, we can't talk to them. We cannot shout fuji people over each other and we will find that the world is changing exactly the same for us, these ideas "about time" i.e. about the second dimension of time is a terribly, terribly bad vision and understanding of that dimension of time... in the macro world, time goes in one direction because spacetime is still expanding since the big bang. Some locations will unzip more slowly than others, but no "unpacking" will occur. This can happen only and only in the micro world with the goal of building mass structures... http://www.hypothesis-of-universe.com/docs/c/c_486.jpg so if we could talk on the phone by chance, we would say, that we had the exact same oh, qualitatively the same experience you know, I love the analogies you use here and in your book, I think they're very rich and they're very meaningful and of course they support your vision, but I always have to wonder that there seems to be a huge gap between these macroscopic analogies related to humans and what we're talking about in terms of the universe, there's so many bizarre things from quantum mechanics to uh size and everything else, but the analogies are great and uh, you know, I have he's very happy, yes, like what can I say, I think they are, it amazes me, I think they're actually almost the first time someone has talked like that, it's amazing to me the fact that people just didn't question that the box that was in thermodynamics discovered so much came out of thermodynamics including after 50 years the discovery of quantum mechanics they all it was critical that the box the theory they all assumed that atoms and molecules bounced off the wall of the box elastically and this led to them confirming the existence of atoms and molecules their size and eventually they discovered quantum mechanics which is absolutely amazing and people were so amazed and it seemed absolutely inevitable that the second law must be absolutely true and no one questioned that I look for every time I look at what people have written in books in scientific papers, I didn't see a single person who questioned this assumption, I did, already after 2006... that the system is

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(06)- box well this also relates to this uh **Roger Penrose** enormous contradiction that that you talk about which says that the universe had to begin with with very high order very low entropy um and then has been going through this progressive degradation uh through the inexorable effect of the second law of thermodynamics and yet all around us there's there's the the growth of structure and what some people have done **roger penrose** in particular and he's a friend of all of ours and we wish him uh great congratulations for his long uh uh awaited nobel so that's great um but he talks about and he he even comes up a number the the level of of of order in in that he has to have in the early universe is like 10^{121} which is 121 zeros the number doesn't have a name um it's so large uh but so he has to come up with that in order to play out the traditional structure and you don't need to do that is that right well i my position that i've put in the book very hesitantly uh well i hope respectfully because it's two very great scientists is that both richard feynman and roger penrose may have got to the right answer but with the wrong argument yeah you take it you take on the biggest and the best yeah yes well no i i i mean i think it's it's the it's absolutely cl there's this famous theorem that puangaray proved in in in the early 1890s called the recurrence theorem that basically if you have a system which is got to be in a box then it will always come back to the state that it was in once before arbitrarily closely and if you look carefully at the arguments

that both feynman and penrose do underlying that is the assumption that the universe is in a box it's it's it's quite clear in in fineman and it's also if you look carefully in penrose when he comes up with that estimate that fabulous number basically he's assuming uh it's a critical point in his his first book the empress new mind that the universe recollapses it doesn't expand forever and that's what enables him to come up with an estimate he assumes that all the matter in the observable universe collapses into a black hole he estimates the entropy of that black hole using hawking's formula and that's what leads him to this absolutely colossal number but pretty well all the evidence at the moment most cosmologists now are convincing strong evidence the universe will go on expanding forever so i think that strongly undermines penrose's argument nevertheless uh that the universe would start off with a very uniform special state that was always very likely going right back to this paper of lagrange in 1772 that that it would be uh there would be a uniform a most uniform state in the past so i think that the the conclusion is correct but the argument is wrong jeff i would not answer back but roger might get he's only 25 miles away he might get a bit annoyed with me julian this has been absolutely fascinating it's remarkable how you have developed these ideas since last we talked i'd really be interested as your book is published the janus point a new theory of time we want to support it and as you get feedback from it and you get reaction from the physics of physics and cosmology communities come back and talk to us tell us what they say and we'll we'll see your responses so congratulations on the book look forward to next time thank you for watching if you like this video please like and comment below you can support closer 33:25

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(06)- v ok, this also applies to this huge **Roger Penrose** contradiction you are talking about, which says that **the universe must have started with very high order very low entropy** well sure, I repeat: **A succession of increasingly complex and complex structures (after big bang) from atoms, through molecules and through compounds to macromolecules to DNA - this is a process "against" entropy... the more complex something is, the lower entropy it has. And this means that in the genesis of matter, of new structures, entropy jumps by stop-jump to a low level so that it can /smoothly/ grow from it. At every historical time, everywhere and constantly, entropy changes by jumping "down" = to low entropy, and then it continuously grows and...and so on, and then the inexorable effect of the second law of thermodynamics went through this progressive degradation and **yet all around us is the growth of structure yes, this has been my vision for about 15 years, maybe more, I'd have to go look it up in the archives...** and what some people have done especially Roger Penrose and he's a friend of all of us and we wish him uh big congratulations on his long uh uh awaited nobel so that's great um but he talks about it and he even comes to the number, order level in that it has to have in the early universe, it's like the **10¹²¹ st** power, which is the number 121 zeros, it doesn't have a name, um, it's that big, but so it has to make it up to play the traditional structure, and you don't have to, it's correct my position i put the book very hesitant uh well i hope respectfully because they are two very great scientists is that both **Richard Feynman** and **Roger Penrose** may have got the right answer but with the wrong by argument yes you take it you take the biggest and the best yes yes good no I think I think that's it it's perfectly clear there's this famous theorem that **Puengaray** proved in the early 1890s called the recurrence theorem, that basically if you have a system that has to be boxed, then it will always return to a state it was**

arbitrarily close to once, and if you look closely at the arguments that both Feynman and Penrose **make, the assumption, that the universe is in a box**, I say it in other words too, that "our Universe" after the Big Bang is a location in the pre-big-bang state of infinite flat 3+3D space-time...; in a certain view of the Universe, one can speak of the fact that "our Universe (*curved, with matter, with the flow of time, with expansion = unfolding of space with four physical fields and with a sequence of ever-emerging laws, rules and principles*) is a finite location and **“floats”** in that flat infinite space-time that is-was before and after the big bang..., yes, we are in a box, we are a finite location...

it's pretty clear in Feynman and it's also if you look carefully in Penrose when he comes up with that guess that the fabulous number basically assumes, uh, that's a critical point in his first book Empress New Mind that the universe it collapses again, it doesn't expand forever and that's what allows him to come up with the estimate he assumes that all the matter in the observable universe collapses into a black hole, he estimates the entropy of that black hole using the Bekenstein formula and that leads him to this absolutely colossal number, but pretty well all the evidence now most cosmologists have convincing strong evidence **that the universe will expand forever**, I already believe not "forever" but until the "last crooked dimension" is wiped out... then there will be in this space-time, a new big bang, = the curvature of flat dimensions in some location will change to infinitely curved with a jump, and another location of Universe #2, then #3 will occur... so I think that strongly undermines Penrose's argument, however uh, that the universe would start with a very uniform special state, yes, before the Bang, that uniform state of the universe = two-dimensional. Then a bang, and the state of time-space as plasma = a boiling cauldron of crooked dimensions, in which matter is born by "packaging" dimensions. Each element has its own unmistakable package, characterizing properties, and one of the properties is mass...etc., as I write elsewhere, long, and everywhere in my HDV which always very likely went back to this Lagrange article in 1772, that in the past there would have been a uniform and the most unified state so I think the conclusion is right but the argument is wrong Jeff I wouldn't answer but Roger might get that it's only 25 miles away he might be a little mad at me Julian, that was absolutely fascinating, it's remarkable how you've developed these ideas since we spoke, I'm really interested because your book is coming out **Janus Point** a new theory of time, I have, I think, a better the "theory" of time. It's not a theory, because it's an ordinary simple knowledge that people simply haven't figured out until now, because of their blindness: **three dimensions for the quantity Time** ... which we want to support and how you get feedback from you that and you get a reaction from the physics physics and cosmology communities come back and talk to us tell us what they say and we'll see your answers so congratulations on the book, I'm looking forward to it until next time, thanks for watching, if you will, please like this video **like for what? No one will read it and want to understand it anyway, and no scientist will ever respond** and you can support the comment below closer

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**Julian Barbour: The Janus Point & the Arrow of Time**



## Julian Barbour: Janusův bod a šíp času



[Dr Brian Keating](#)

161 tis. odběratelů

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[#Cosmology](#) [#BigBang](#) [#ArrowofTime](#) Julian Barbour is the author of the highly regarded The Discovery of Dynamics and the bestseller The End of Time and now, The Janus Point. He received his PhD in physics from the University of Cologne in 1968. He is a past visiting professor of physics at the University of Oxford and lives on the edge of the scenic Cotswolds, UK. A major new work of physics, The Janus Point will transform our understanding of the nature of existence.

**Julian Barbour: Janusův bod a šíp času doktor Brian Keating 161 tis. odběratelů 18 725 zhlédnutí Premiéra: 9. 9. 2021 Brian Keating's Into The Impossible Podcast #Kosmologie #BigBang #ArrowofTime** Julian Barbour je autorem vysoce ceněného The Discovery of Dynamics a bestselleru The End of Time and now, The Janus Point. Doktorát z fyziky získal na univerzitě v Kolíně nad Rýnem v roce 1968. Je bývalým hostujícím profesorem fyziky na univerzitě v Oxfordu a žije na okraji malebného Cotswolds ve Velké Británii. **Hlavní nové dílo fyziky, Janusův bod, změní naše chápání podstaty existence.**

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Ukázky transformace z jedné zápisové techniky do jiné zápisové techniky

Examples of transformation from one writing technique to another writing technique

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