https://www.youtube.com/watch?v=0sTBZ2G4vow

What If Our Understanding of Gravity Is Wrong?

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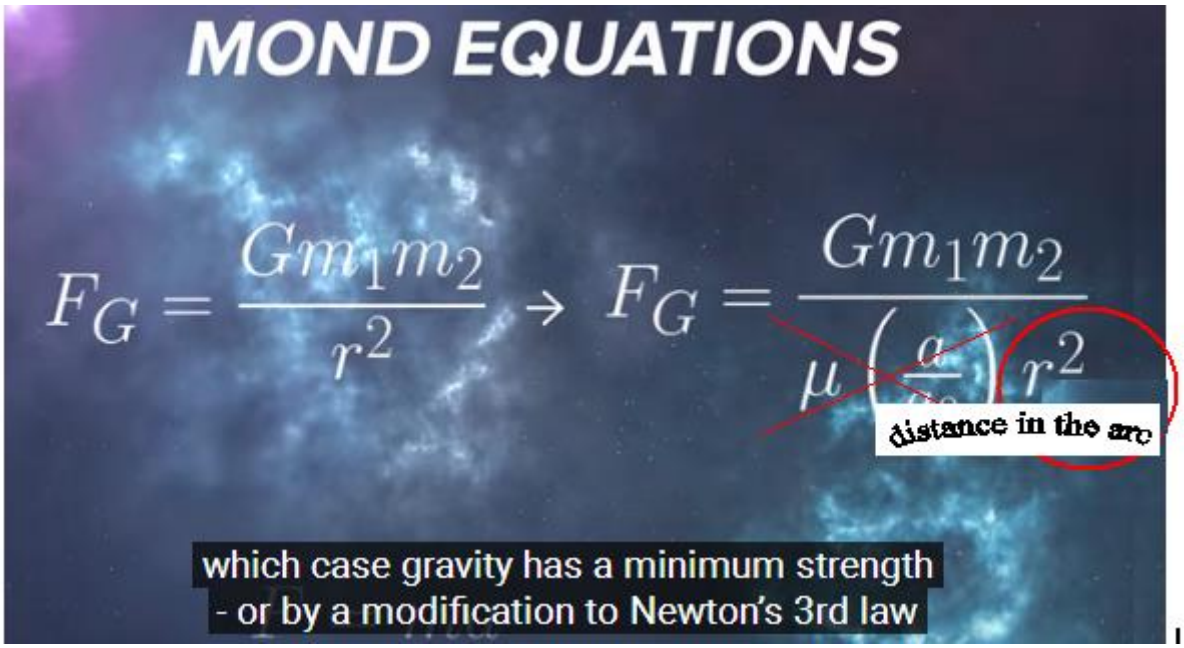
My comment is red nipples, and colored pens. The google translator was used .

00:00
(01)- Thank you to CuriosityStream for supporting PBS! What if there is no such thing as dark matter. What if our understanding of gravity is just wrong? New work is taking another shot at that Einstein guy. Let's see if we've finally scored a hit. We've now been searching for dark matter for over half a century. In the early 60s, Vera Rubin proved * She failed, she just proposed her solution in which she substituted the "measured" values into Newton's law of gravitation and substituted the distances between objects in a straight-non-curvilinear line. But that's the mistake. For long-distance galaxy observers, the curvatures of space-time dimensions within the galaxy are already distorted. When the I-observer is inside the galaxy, the curvatures will be (probably) negligible, but when I-observer determines the force between two objects according to **F = G. (m. M) / x2**, then I must no longer substitute a straight non-curved line **"x "**She is in an arc. **I have been showing this observation on the Internet since 2001**. It was read by at least 40-50 readers-experts-physicists, and none of them ever gave me counter-objections meaningfully substantiated - whether it is correct or not. that the spiral galaxies are rotating so fast that they should fling themselves apart - assuming they are held together by the gravity of their visible mass alone. They would need at least 5 times as much matter * and it was the fault of Rubin et al. that they thought there was a lack of matter in the galaxy, but it was not missing, they mistaken for Newton for "x." to provide the gravity needed to hold these galaxies together. And the gravity of visible matter is also way too weak to hold galaxy clusters together, or to bend the path of light to the degree seen in gravitational lenses - when more distant light sources are warped by an intervening mass. It sure looks like 80% of the mass in the universe is completely invisible to us.* Rough calculations give bad deductions… We've dubbed this hypothetical stuff dark matter, and of course we've talked about dark matter many times on this channel - from the evidence * ?? what is the evidence? ("Evidence"), I have never seen it for its existence to some of the speculative ideas of what it might be made of - from exotic particles to black holes. But what if we've been thinking about this the wrong way all the time? The expected rotation rates of galaxies come from applying our laws of gravity based on the observed mass. So … the mass could be wrong. Or the laws of gravity could be wrong.* I have been repeating since 2001 that Newton's law is not wrong in flat space-time, but is incorrectly used, see Rubinová et al. in crooked space-time, where she inserts a straight line into Newton after an "**x**" and that line is in an arc! This is the correct MOND (this will make $\mathbf{x^2}$ more pronounced in the equation)

After all, if your scientific theory doesn't fit observations we should reject our theory, right? * O.K. But Newton is fine, but you're putting in the wrong data. I proposed an idea here, unfortunately no one has reacted to it for 20 years And for nearly as long as astronomers have been hunting for dark matter, others have been hunting for an alteration to our theory of gravity * (and searched… and searched… and searched) that can explain the effect of dark matter without the actual matter. Today, we're going to look into that long history - what has worked and what has utterly failed - and finally at a new proposal that purports to fix those failures once and for all.* I wonder what the proposal for a "final" remedy is… (?) According to Isaac Newton's Law of Universal Gravitation, the gravitational field drops off with the square of distance* yes, in flat non-curved space-time, but it is different in the galaxy from the mass producing that gravity. In most galaxies, stars are somewhat concentrated towards the centers, which means gravity should weaken towards the outskirts. That means the orbital velocities of stars out there should be lower in order to keep them in orbit. The so-called rotation curve should drop - orbital speed should diminish with distance from center. Dark matter is supposed to add extra mass that's more evenly distributed through galaxies, strengthening the gravitational field in the outskirts to explain the high rotation speeds. Dark matter flattens rotation curves. But what if gravity doesn't obey Newton's law of gravity? * He controls (!), But set the distance - a line in the arc !!!! It is therefore longer and, of course, its square larger. Well, we actually know that it doesn't. Albert Einstein found that Newtonian gravity breaks down when the gravitational field gets too strong - there you need his general theory of relativity, which explains gravity as the curvature in the fabric of space and time rather than just as a classical force.* So what prevents you from thinking that the "space-time" in the galaxy is curved not only in the longitudinal dimensions but also in the temporal dimensions… (?) But Einsteinian gravity looks exactly like Newtonian gravity when gravitational fields get weak. * Thus, it weakens, the "curvature of space-time" decreases. So you mean that Einstein's gravity "produces a curved space-time" (it has a strong gravitational field) and Newtonian gravity the weaker the field, the flatter the space-time ?! Newtonian gravity does not curve space-time, it is considered = it is flat (weak gravitational field) Yes? In other words, would it be possible to correct Newton by using the "curvature distance of two objects" in the formula? what? it is so ? But what if Einstein missed something? * If so, then millions of physicists have overlooked the same thing for him, for a hundred years! What if Newtonian gravity breaks down both for very strong AND very weak fields? ***This is the idea behind Modified Newtonian Dynamics, or MOND***,* (idea modify Newton? or Einstein?) proposed by Israeli physicist **Mordehai Milgrom in 1982**.* I quote MOND from Wikipedia: Modified Newtonian Dynamics (MOND) is a hypothesis that proposes a modification of Newton's law of universal gravity so that the gravitational force changes indirectly linearly with the radius (as opposed to the inverse square of the radius, as in Newton's law of gravity). And this is de facto exactly what I say, that "the curvature of space-time in the galaxy is higher" and therefore the line of distance between bodies must not be inserted into the equation, not equal but in an arc. Won't you study this anymore ?? The idea is straightforward enough - what if there exists a minimum possible acceleration that can be produced by the gravitational force? In MOND, force or acceleration drop off with distance * **in an arc** squared until, at very low values they start to plateau out. This can be done with a modification to either Newton's law of universal gravitation - in which case gravity has a minimum strength - or by a modification to Newton's 3rd law of motion, in which case the acceleration produced by a force has a minimum strength. **If** you tune the modification right you recover the observed rotation curves for spiral galaxies very nicely without the need for extra mass.* Why don't you fine-tune it with my suggestion ??? i.e. a line in an arc And you only need to tune a single parameter - which is effectively the minimum acceleration - to get the correct rotation curves for nearly all galaxies. That's very promising, but in order to be

taken seriously, a new hypothesis like MOND needs to do a few things. **One**: it needs to give the right answer in more than one special case. So MOND would need to do away with the need for physical dark matter in the other places we see evidence for dark matter. **Two**: it needs to be consistent with the other known laws and theories of physics that are experimentally verified. **And three**: it needs to make testable predictions beyond the phenomena that it was tuned for. Let's take these one by one. First, how does MOND do with respect to the other evidence for dark matter? Not … great actually. If you tune MOND * or you tune "my hypothesis" about a line in an arc **to** work for galaxies and then apply it to galaxy clusters, you do get rid of the need for some of the dark matter but not all of it.



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(02)- You still need about 20% of the current *?? Where and from what did the requirements come from ??? What if these requirements disappear if Newtonian gravity is adjusted by my design, ie the distance in the arc? dark matter requirement to explain all the gravity we see in clusters. Now you might think that cutting down the invisible mass requirement by 80% is pretty good - and it is helpful to be honest. But **the fact** that you still need some type of physical dark matter in clusters * for clusters there is again the same requirement for "crooked dimensions" (crooked space-time), in which clusters "float" is seen as a strong point against MOND in its first incarnation at least. There are some other pieces of evidence * ? evidence? Or is the evidence just a conjecture ?? for dark matter that O-G MOND also fails for, but I'll come back to those. For now Point 2. Is MOND consistent with the rest of physics? No. It's totally broken. It doesn't respect conservation of energy or momentum or angular momentum. And it's not consistent with general relativity - in that general relativity does not reproduce MOND in what we call the "weak field limit." Instead it does what it was designed to do - it reproduces good ol' Newtonian gravity. It's not looking good for MOND. But let's address point 3 anyway. Does MOND make any predictions beyond the observations that inspired it? This is actually where we can turn this around. Spiral galaxies all follow this tight relationship between their speed of rotation and their luminosity - the brighter they are the faster they spin. This is the Tully-Fisher Law. It's a little surprising that the Tully-Fisher Law is such a tight relationship because the rotation velocity depends on the dark matter halo * Halo galaxy, why should it be dark matter? who did it? "Halo" - dust can also be a normal substance, which increases the luminosity of the whole. And what will the speed of rotation of

the entire galaxy, or its peripheral arms, depend until it is determined that dark matter does not exist? while the luminosity depends on the stars. Now those two are connected, but some believe that their connection shouldn't be so perfect to give the extremely tight Tully-Fisher law. On the other hand, **if** you tune MOND * which is possible with my design (inserting a line in the arc into Newton) we automatically get the right relationship to get the flat rotation curves of spiral galaxies, you automatically get the correct relationship between rotation speed and luminosity. * Here, too, inserting a line in the arc will correct in the right direction. That was a completely unexpected and un-engineered outcome of MOND. So, while the Tully-Fisher Law was already known, we can sort of count it as a prediction of MOND. And this one success has been enough to inspire others to dig deeper into the idea over the years. * So a good idea is enough for inspiration, yes. And mine, isn't it a good idea for MOND # 5? The next critical step was to get a version of MOND that didn't contradict so much of the rest of physics. For that **Jacob Bekenstein** came to the rescue. You may remember Bekenstein from such hit ideas as the Bekenstein bound, which connects black hole information content to entropy, as well as other black-hole-related awesomeness. In 1984 he diverted his attention for a moment to work with **Mordehai Milgrom** moti.milgrom@weizmann.ac.il in fixing MOND. The first step was to reformulate MOND using Lagrangian mechanics * That was MOND No.4. Why doesn't you, Mr. Bekenstein, reformulate the MOND by "curving the dimensions" of space-time, using the "arc line" in Newton's gravitational equation to MOND # 5?. What on earth does that mean, you ask? Fortunately we just did an episode on the awesome power of the Lagrangian.There we saw that the principle of least action allows equations of motion to be extracted in a way that automatically obeys all of our conservation laws.* General question: What is the difference between a "conservation law" and an "equation" ??? And why is the law of conservation not maintained and violated in many physical situations? I think that equilibrium, that is, equations, that is, "preservation" of physical quantities of quantities, is just a coincidence - an artificial coincidence in "stop time". In the universe, you will not find a place, location, volume of a large area or a small area in which the total equation applies - it is the "artificial state" of physicists that "disintegrates" into an inequality. There is an alternation of symmetries with asymmetries in the universe, and the "equation" is just a "stop-state" of physical action. And done the right way the result can also work with relativity. **Bekenstein and Milgrom** achieved this by adding a second field to gravity * Great, .. great: in order to correct the mistake with MOND No. 1 to 4, physicists rape it with Lagrangian and we have MOND No. 4… or modification "Bulgarian constant". And we have solved…; You say you reformulated the MOND using Lagrange mechanics, meaning you "added a" second field "to the MOND, te you say. But the "second field" means that you have de facto changed the curvature of the space-time dimensions for a given gravity. I'm not a good mathematician, so I can't say the objection exactly.. In Einstein's description, the gravitational field is what we call a **tensor field** - a multi-component object that describes the curvature of spacetime. These guys added a new **scalar field** - a field that's just a single numerical value everywhere in space.* ? So Lagrangian is a "scalar field"? I do not understand sem I am not a mathematician…; that is: they did not change the original "gravitational field" but "" "added" "" scalar - number and thus removed the mistake of previous variants of MOND No. 1-3 ???? Yes? They made MOND No. 4 with that scalar. Yes? It still feels like the "Bulgarian constant". And it was a good start - the resulting "AQuaL - for "a quadratic Lagrangian" gave the same results as MOND, * And so a fairy tale was born: a devil's game that… that if the devils have two horns, all of them, that Beelzebub is not recognizable between them, we will add another corner to Beelzebub…, and the ass is no longer a fairy tale, but a reality except that conservation laws were obeyed, and because this was a relativistic theory it was possible to see if it gave the right result for the bending of light by galaxies, which wasn't even possible with the original MOND. And it did not.

AQuaL also had the unfortunate prediction of faster-than-light waves in this added scalar field, which broke causality. Not to be deterred, Bekenstein came back over 20 years later with an update. * Bekenstein was bored with it for 20 years! ; damage. that Bekenstein didn't read my HDV, there could have been MOND No. 5 If adding one field doesn't work, why not add another? * And others… and others…, we have countless "Bulgarian constants". For such an attitude, if I presented him at discussions with us, I would lick countless ridicule and insults. In 2005 Bekenstein introduced **TeVeS,** (MOND No.6) for Tensor Vector Scalar gravity - based on the fact that it * again objection: a proposal based on an idea, not on "facts", reality is something demonstrable, an idea is a hypothesis. describes gravity with **three** fields - a tensor, a vector, and a scalar.
The introduction of the new field fixed the problem * Physicists like to command the Universe how it should behave, and so physicists "introduce" "Bulgarian constants" (!). They are not observed from reality, they are not mathematical constructs, they are "ad-hock" field ", which is the doctrine of physicists, the hypothesis of how the Universe should behave, not the other way around, that the Universe would show physicists what He himself looks like and how He behaves without physicists…; physicists often do not look for reality, but "introduce" reality… with gravitational lensing and also tamed the awkward causality-breaking nature of AQuaL. It acted like Newtonian mechanics on solar system scales, like MOND on galactic scales, * I think that Newtonian mechanics in the scales of the solar system is a description of "non-curved space-time", the curvature in these scales is very-very small, negligible - therefore it can be substituted into Newton-equation **m. a = G M. m / x^2** the line **"x"** of the distance between two bodies as a straight-non-curved "x". This is no longer the case in the galaxy, the curvature of space-time inside the galaxy is much higher FOR THE REMOTE OBSERVER. The macro-scale universe in stop-state and stop-time has some curvature of space-time…, which changes towards the microscale of the microworld, or to localities such as galaxies, always from the point of view of the chosen Observer differently. This is proved by STR (the essence of which is the rotation of the observer's systems and the observed object) and OTR
http://www.hypothesis-of-universe.com/docs/f/f_056.jpg ; http://www.hypothesis-of-universe.com/docs/h/h_024.pdf ; http://www.hypothesis-of-universe.com/docs/aa/aa_031.jpg and like regular general relativity for gravitational lensing. It was not without problems though - for example the physicist **Michael Seifert** claimed that TeVeS and other MOND proposals produce instabilities in the presence of matter, * that is, it can be seen that each variant of MOND has problems and problems and problems which would, for example, make long-lived stars impossible. But the main problem with TeVeS is cosmological in nature. problems and problems and problems One of the most important pieces of evidence for dark matter as a particle is seen in the light that comes from the very early universe.
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(03)- The cosmic microwave background radiation reveals a lumpiness that tells us how matter pulled = it collapsed, collapsed, withdrew itself together under its own gravity at the earliest times. * Again, the fundamental knowledge of the Universe plays a role here: **the curvature of the dimensions of space-time**… and that curvature is different in the early universe and different in the later "expanded" space-time. Even the universe is expanding globally on a large scale, other than the "locations" within the global expanding Back then, light and matter were locked together due to the extreme densities.* And density is related to the high curvature of space-time dimensions simply because "everything that throws matter-mass is inherently a" crooked space-time, "matter is a wrapped space-time. That is, light and matter were closed due to the extreme attraction of material objects in volume, that is, in "crooked = more crooked space-time". Regular matter was kept from collapsing into any

structures by the pressure of the intense radiation of that era.* Even in the early universe, the "curvature of space-time" is not completely h o m o g e n e o u s…, even the foam of dimensions means the inhomogeneity of the curvatures of dimensions… But dark matter doesn't interact with light, so it would have been able to collapse just fine. And after the universe had expanded and cooled enough for regular matter to be released from the clutch of light, it could have followed the dark matter * Like that dark matter already existed in the early universe? ? oh-no, already in that plasma? …. ???? !!! I'm against into its deep gravitational wells and get to the business of forming galaxies. But **if** dark matter isn't real, and regular matter controls gravity completely, **then no** structure should have been able to form at those early times. * !! ha-ha .. groping and groping… because you have not yet reached the idea-hypothesis that the Universe is two-magnitude and that matter is realized-recruited-produced from 3 + 3 dimensions of space-time in the style of "wrapping into mini-localities - packages" which then conglomerate into multiconglomerates For this reason, most forms of MOND - including TeVeS, come up short. * How many were those modifications of that MOND ?? There were at least four. I called mine MOND No.5 And this is where the new guys come in. In 2020 **Constantinos Skordis** and **Tom Złosnik** proposed * (*Finally, there is a physicist who does not "introduce" what the universe should do, finally there is a "proposal" ..*) a new relativistic version of MOND, and just last month their paper passed peer review. Their big change was that they allowed the scalar field to change its behavior over time. * ☺ ha-ha.., that is, they "allowed hypothetically" to believe that the "scalar field" of past MOND proposals changes its "behavior" as the universe ages (?) and aging means "unpacking" the space-time dimensions after the Big Bang packed into more unpacked states. I'm not a mathematician, but I suspect that this could be the transformation of a scalar field by "changing the size of curvatures" (dimensions) by expanding 3 + 3 dimensions and by collapsing dimensions into localities, into "fields" with different curvatures.- global space-time 3 + 3D is expanding, and at the same time space-time is collapsing in the mini-world (on planck scales) into balls of coiled dimensions for material elements. They managed to tweak their equations so that in the early universe, that field behaved a bit like a type of matter, * Well, finally! : Every curvature of dimensions 3 + 3 and space - space is a state of either mass or field…; plasma is also a kind of curved 3 + 3D, in which clusters-packs of twisted dimensions "float" and these are elementary mass particles…, and these are then conglomerated into other formations = atons, molecules, etc. which **Złosnik** calls "dark dust". * ie "early state foam" 3 + 3D is more homogeneous and with aging = expanding into macro-space separates homogeneities from inhomogeneities. It was able to clump in the right way to kickstart cluster formation.* At every step of the interpretation of quantum physics and cosmology, we must encounter the "clustering" of dimensions 3 + 3, which in this style-way of "packaging" creates something that physicists will be forced to call matter. The curvature of the dimensions of space-time produces matter. –

O.K. Each "package of dimensions" (quarks, gluons, leptons) has a different curvature and they cluster - conglomerate into atoms, and they cluster-conglomerate into molecules, then compounds, then inorganic chemistry, organic chemistry, to biology and even DNA → it was a "parallel" sequence; and we also have a sequence of clusters "in series" by which I mean that atoms cluster in stars, and these into galaxies, galaxy clusters and galaxy chains. But then later its behavior shifted so that it now behaves more like Bekenstein's TeVeS proposal. More work * and the need for more creative, fearless ideas is needed to see if the newly-dubbled RelMOND - relativistic MOND - works for galaxy clusters and keeps stars from exploding - but the authors are optimistic.* (I used to be optimistic too, I'm not anymore, no one will read my HDV for another 40 years. It's a reality and I don't know the reason.) OK, so, problem solved. ??????? We don't need dark matter, anymore? Not so fast. * So every modified theory of gravity had the task of "breaking down" dark matter ?? Yes! I understand.

Why don't you try to modify gravity according to my "x" design in the arc? Why ??? Modified gravity theories still can't explain the Bullet Cluster what is it ? - and I don't have time to get into that and we've covered it before. So I'll just say that when galaxy clusters collide and the dark matter gets ripped away from the light matter - it makes you doubt that dark matter is just light matter acting funny. Of course there are MOND proposals which claim to address this, but the Bullet Cluster might be the most awkward result for modified gravity folks. At this point the two theories are in a bloody theoretical knife fight, where the knife is Occam's razor. Proponents of dark-matter-as-particle say that MOND proposals are now so elaborate and fine-tuned that we can't take them seriously. But MOND proponents say that it's the behavior of dark matter particles that have to be carefully fine-tuned to produce the phenomena that MOND predicts naturally - like the flatness of rotation curves and the Tully-Fisher law. Who's right? Well the majority of experts are pretty firmly in the dark-matter-as-particle camp. Although our experiments haven't detected dark matter yet, there are still plenty of possibilities for what it might be beyond our standard model O.K. → HDV ! of particle physics. And we've been through those before. * **No, they haven't passed, HDV yet. I know it's imperfect, unfinished, but it's basically the right line of thought to make sense** But **Bekenstein** was no slouch, nor are many of the others who have supported MOND theories. We can't dismiss them out of hand. I personally withhold my judgement - because it's OK to be uncertain, and because it'll be equally exciting whichever way this gets resolved. One way or another we opened paths to continue our exploration of reality, * No.!! No. Until you explore HDV, ie the idea of the possibility of building matter from space-time itself, ie from the dimensions of two quantities, in the style of "curvature = packing" into balls = elements which will then be !!! Then have the behavior and properties of matter, until then you have not explored all the meaningful possibilities. whether we're led beyond the standard model by dark matter particles, or beyond general relativity by hidden gravitational modes of space time. A big thank you to CuriosityStream for supporting PBS! CuriosityStream is SmartTV for your SmartTV. The subscription streaming service offers documentaries and non¬fiction titles from various filmmakers, with topics including History, Nature, Science, Food, Technology, Travel, and more. For instance, CuriosityStream has Black Holes: Messages from The Edge of Space, which examines not only black holes, but neutrino astronomy. It takes a deep dive into the science of black holes and takes you into the Antarctic lab where astrophysicists detected neutrinos in the ice of the South Pole. There are also collections of curated programs selected by experts. For more information, go to curiositystream.com/PBSSPACETIME and use the code SPACETIME for a trial. Before we get to comments, we want to tell you about PBS's new medical show called Vitals. It's always been important to stay healthy. But it's gotten harder to tell what medical information is based in science and what is unhelpful pseudoscience. Fortunately, Vitals, PBS's brand new health and wellness show, is here to help. Co-hosts Dr. Alok Patel and nurse Sheena Williams will bust medical myths, explore the latest science and answer all your burning health questions in every episode. Check out Vitals in the link in the description, and tell them that Space Time sent you!

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(04)- Our last episode was all about the principle of least action, and how this one simple idea sort of leads to all of physics. Let's see what you had to say. J Smith asks, if the configuration space Lagrangian seems to bridge quantum mechanics and relativity, what's missing to make this a theory of everything? HDV. Rather than answer this myself, I willl read the reply by Fernando, the co-writer of that episode. In simple terms, the universe at its very core seems to be a set of symmetries + asymmetries (!!) which are manifest in the Lagrangian. This means that if we knew all the symmetries + asymmetries the universe follows we could describe it perfectly, but we don't know all the symmetries and we are not

sure how those symmetries fit with each other.Well put, Fernando. It’s the symmetries of the Lagrangian via Noether’s theorem that yields our conservation laws and ultimately, well, **all of physics**. * No. You miss thoughts on HDV Check our episodes on Noether’s theorem, quantum invariance, and the electroweak force for some details, but we probably need to go even deeper. **Jackie Johnson** asks - in the case of gravitational lensing, isn't the light still traveling in a straight line? Isn’t it spacetime that bends, not light? O.K. That’s a valid way to think of it. Light does travel a straight line if you look at an infinitesimally small patch of space. Imagine light traveling through curved space as like an and walking across a disco ball. The ant’s path around a disco ball looks curved, even if it travels in perfectly straight lines across each mirror. Well, in space the disco ball mirrors are infinitesimally small, but over those regions the path is straight. A few people pointed out an error - I said that the action reduces to an integral over proper time in general relativity. That was right - but I then went on to call this a “principle of least proper time” (?) by analogy to the principle of least action. In fact, in general relativity objects in gravitational fields tend to maximize, not minimize their proper time. (?) That’s still consistent with the whole action thing because the proper name is the principle of stationary action - and the maximum is also a stationary point - of proper time and of the action. (?) But I was still misleading. Thanks for correcting me on that. Many of you point out that you’re already adherents of the principle of least action. As in you take the fastest, easiest, or laziest path to any outcome. Me too! Like, for example, when I come up with a joke to end the comment section.

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It is said that there are other thinkers in 2021 who know how to modify the already modified MOND →

https://www.czechsight.cz/vedci-z-akademie-ved-cr-prisli-s-novou-teorii/