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Hubble Tension Solved?

Hubbleovo napětí vyřešeno?

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302 tis. odběratelů

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Please join my mailing list here ☞ https://briankeating.com/list to win a meteorite ✹ ---------- ---------- The great Nobel laureate Steven Weinberg once said that physics thrives on crisis. And in 1989, he said physics was short on crises. But luckily for us today, physics is full of them! In this episode, we will discuss two of them: the Hubble tension and primordial magnetic fields. Enjoy!

0:00
(01)- the great Nobel Laureate Steven Weinberg once said that physics thrives on crisis and in 1989 he said physics was short on crises but luckily for us today physics is chock full of them we're going to talk about possibly two Cosmic conundrums come along into the impossible any sufficiently advanced technology is indistinguishable from Magic I've talked with Adam Reese
Is there a primordial magnetic field?
another Nobel laurate about the so-called Hubble tension and that seems to indicate that the agreements between the early Universe measurements of the Hubble constants and the late Universe measurements of the Hubble constant differ difference that is irreconcilable now astronomers have found a possible resolution to the Hubble tension that relies on nothing more exotic than your kitchen's refrigerator magnet astronomers are used to measuring magnetic fields they pervade the cosmos there's even a magnetic field of associated with your body and birds use magnetic fields to navigate the Earth has a magnetic field the solar system has a magnetic field our galaxy has a
1:00
magnetic field the clusters of galaxies that we observe have magnetic fields the question is is there a primordial or fundamental Cosmic primordial magnetic field recently a radio Galaxy survey by the loar collaboration discovered a massive magnetic field pervading dozens or maybe hundreds of galaxies and the question is how could you get such a ginormous magnetic field pervading not just a single Galaxy but hundreds of or dozens of hundreds thousands of galaxies at the same time what are Galaxy
What are galaxy clusters?
clusters and why are they so important to the study of magnetic field well Galaxy clusters are the most massive of all Cosmic objects that are so-called gravitationally bound they're associated in the same way that the Earth is associated with the Sun by the force of gravity and they're in Motion in this case they're Associated by the forces primarily of gravity due to

the dark matter that surrounds these galaxies and in fact their properties LED Z wikii back in the 193 to conjecture the
2:01
existence of so-called Dark Matter validated by Vera Rubin these Galaxy clusters grow by creating small structures onto bigger ones in the process of gobbling up smaller and smaller galaxies to make a more massive and massive Galaxy cluster uh they emit low frequency radio wave emission and that's due to the charge particles mainly the electrons that move in magnetic fields of these galaxies we can detect the motion of those electrons the emission in the radio frequency and you that to as a proxy to measure the magnetic field that caused these electrons to move with the accelerations that they're observed when the loar scientist as discussed in this paper shown here described a measurement of this massive Galaxy cluster they were overwhelmed by the size of the implied magnetic field permeating these Galaxy clusters so they sought out computer simulations to predict how large a magnetic field a cosmic cluster of galaxies should exhibit one possibility
3:00
would be that it had been essentially created earlier on in the cosmic history maybe back primordially closer to the Big Bang than ever thought possible before now this question has bearing not only on the aspects of the formation of galaxies and clusters and their magnetic fields but also on the problem of whether or not the universe's expansion rate is really different at Early Times versus late times for if there were an early magnetic field in the universe that could help to resolve why the measurements of the universe's expansion rate the Hubble constant at Early Times via Cosmic micro background measurements differ so violently with those what by latetime observers such as Adam Reese and Wendy Friedman and others uh that measure the Hubble constant using galaxies as we observe them at low red

The impact and origin of cosmic magnetic fields

shift my colleague and friend Levon pag goian at Simon Frasier University suggested that we might not need to appeal to Exotic physics the new type of of energy or mass or matter but rather just to invoke something that we know and love from our kitchen refrigerator
4:01
namely magnetic fields what magnet what about it cosmologists have known that magnetic fields play an important role in all gravitationally bound systems but they didn't know if there were any Unbound magnetic fields magnetic fields not associated with clusters and magnetic fields have fascinated scientists since the year 1600 when the first scientific study by William Gilbert uh looked at the properties of load Stones these are naturally occurring magneet rocks that people had been using uh as compasses he conjectured back in the 1600s in his famous book called the magnet uh that perhaps the magnetic force originates from a type of force
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(01)- The great Nobel laureate **Steven Weinberg** once said that physics thrives on crises and in 1989 he said that physics is short on crises, but fortunately for us today physics is overcrowded, we will talk about two possible cosmic puzzles. Up to the impossible any sufficiently advanced technology is indistinguishable from the magic I talked about with Adam Reese. Is there a primordial magnetic field? Another Nobel laureate for the so-called Hubble tension and it seems to indicate that the agreement between **Hubble constant measurements** from the early universe and Hubble constant measurements from the late universe differs by a difference that is irreconcilable, now astronomers have found a possible

solution. (*) The reason for the different values measured may be the reality that spacetime has been expanding since the Big Bang, so it was very curved in the early times and today it is very uncurved = expanded. This means that both measurement methods take into account different rotations of the observed objects at the horizon of observation. The Hubble tension, which relies on nothing more exotic than a magnet on the refrigerator in your kitchen, astronomers are used to measuring magnetic fields that permeate the universe, there is even a magnetic field associated with your body, and birds use magnetic fields. Navigation field Earth has a magnetic field Solar system has a magnetic field Our galaxy and
1:00
magnetic field Clusters of galaxies that we observe have magnetic fields, the question is whether there is a primordial or fundamental cosmic primordial magnetic field, yes, I have a feeling…, with every change in the curvature of dimensions, the magnetic field also changes… recently the radio galaxy survey by the LOAR collaboration discovered a massive magnetic field permeating dozens or maybe hundreds of galaxies and the question is how could you achieve such a huge magnetic field permeating not just a single galaxy but hundreds or tens of hundreds of thousands of galaxies at the same time, what are galaxies? Curvature of dimensions… What are galaxy clusters? Differently curved dimensions … Clusters and why they are so important for studying the magnetic field galaxy clusters are the most massive of all cosmic objects that are so-called gravitationally bound, they are connected in the same way as the Earth is connected to the Sun by the force of gravity, which also manifests itself and demonstrates the curvatures of dimensions … and they are in motion in this case they are connected primarily by gravitational forces due to the dark matter that surrounds these galaxies and in fact their properties LED Zwiki back in 1933 2:01 The existence of the so-called dark matter confirmed by Vera Rubin. This is not true → https://www.hypothesis-of-universe.com/docs/eng/eng_130.pdf ; https://www.hypothesis-of-universe.com/docs/c/c_489.jpg the distance between stars in a galaxy must be measured along an arc, according to the curvature of the dimensions and thus the calculations of the speeds at the periphery of the galaxy will come out different and thus the amount of mass will come out different for the judgment that the galaxy is missing mass and that we "have to replace it with dark matter"... these clusters of galaxies grow by creating small structures into larger ones in the process of absorbing smaller and smaller galaxies to create a more massive and massive cluster of galaxies, uh which emit low frequency radio waves and this is caused by charged particles, mainly electrons, which move in the magnetic fields of these galaxies, we can detect the movement of these electrons emissions at radio frequency and you can do this as a Proxy measure the magnetic field that caused these electrons to move with and accelerations that are observed when scientists, as discussed in this article, described the measurement of this massive galaxy clusters, were amazed by the magnitude of the implied magnetic field permeating these galaxy clusters, so they looked to computer simulations to predict how large a magnetic field a cosmic galaxy cluster should exhibit one possibility 3:00 would be that it was essentially created earlier in cosmic history, perhaps originally closer to the big bang than previously thought possible, this question concerns not only aspects of galaxy and cluster formation and their magnetic fields, but also the issue of **whether the expansion rate of the universe is actually different in early times and late times**, Yes, Hubble measured. Did he measure or calculate Distance??… Hubble constructed a linear equation $v = H_0 . d$, and I believe the universe has been expanding since the bang, the expansion is nonlinear https://www.hypothesis-of-universe.com/docs/c/c_032.gif ; https://www.hypothesis-of-universe.com/docs/c/c_239.jpg ; The closer to the Big Bang, the

higher the global curvature of 3+3 spacetime and so Hubble's "d" "wrapped in curvature" will be different than reality at the time
"today". And so "v" will also be different than Hubble imagined. According to my "speculative calculations", the age of the universe is **14.24 billion years** compared to the erroneous calculations of today's physicists **13.79 billion years**. And now it will be difficult to build a logical scene (mechanism) how the reality of the speed of "own expansion" of space-time fits in with the speed of light "then and now", because at that time, soon after BB, the curvature of space-time was drastically high and therefore how light flew in it, how fast and how now when the curvature is minimal (k = 0.0001). And to assess at what "speed" the universe itself expanded in early times and at what speed today... And it is necessary to include STR in the scenario, which undoubtedly does not rely on some kind of relativity, but on the rotation of the systems of the "flying" object and the "standing" Observer. I think that in early times space-time was very curved and the expansion had to be “relatively” fast compared to today's spacetime, which is already almost expanded and therefore expands “slowly”. All this needs to be articulated.
(…and I already have a headache, ,. ., the famous senile dementia is coming, (not) counting my great joint pain, I quote the doctor: *advanced gonanthrose, rheumatoid arthritis with synovitis…etc…*) , because if there was an early magnetic field in the universe that could help solve why the measurement of the expansion of the universe gives the Hubble constant at Early Times through the cosmic microbackground **measurement** differs so sharply from those observed by later observers, ← here is another mistake of physicists, because "today" we measure a) Position "today" + b) Position "then", after BB, while physicists did not understand STR, https://www.hypothesis-of-universe.com/docs/eng/eng_216.pdf , that it involves rotation of the system of the Observer and the observed Object, and therefore the measurements "today" show dilations (of time) and contractions (of length) due to that rotation. And thus the values are "jinked" → we read from the *Horizon of observability* other intervals - "unit size" than we have "unit interval" "at home"...etc. It is simply wrong and needs to be reevaluated like **Adam Reese** and **Wendy Friedman** and others who **measure** Hubble's constant using galaxies when we observe them at low red. Apparently the author is talking about edshift. The influence and emergence of cosmic magnetic fields shift my colleague and friend **Levon Pag Goian** at Simon Frasier University has suggested that we may not need to appeal to exotic physics as a new type of energy, mass or matter, (?!) but rather just conjure up something we know and love from our kitchen refrigerator.
4:01
Namely magnetic fields what magnet what's the deal cosmologists knew that magnetic fields play an important role in all gravitationally bound systems, but they didn't know whether there were any unbound magnetic fields magnetic fields unrelated to clusters and magnetic fields have fascinated scientists since 1600, when the first scientific study by William Gilbert uh dealt with the properties of weight stones, these are naturally occurring magnetic rocks that people used as compasses, he believed in the past. I don't understand the whole paragraph...
1600 in his famous book called Magnet uh that maybe magnetic force comes from a certain kind of force
……

(02)- field that he called reminiscent of a soul oo uh but he correctly did summarize that the Earth possesses a property that makes it effectively a great magnet and that load stones will lock towards the poles of the earth now the question is can you get a non-am damic in other words not a
5:00
rotational generation Force for the magnetic field in the universe so magnetic fields are ubiquitous they essentially are unblockable they can only be blocked by things like superconductors and laboratory generated cancellation fields that we do use uh throughout our experiments so you can't really Shield it so they pervade everything so they can reach out across vast distances in the cosmos now an interesting study done over a decade ago published what's called a lower limit on the amount of cosmic magnetism this is fascinating by looking at the nonobservation of what are called tevv blazar and their Halos we don't see an effect how one would expect to see around very distant blazars which are highly energetic uh nuclei of active galaxies that these Blazers would produce a Halo due to positron electron uh Annihilation that we've talked about in other videos uh but that phenomenon would lead to a burst of gamma radiation
6:00
that we should see surrounding these distant objects the fact that we don't observe these Halos led to a lower limit on the amount of cosmic magnetic field energy present when these Blazers are in their active phase this magnetic field would cause the Divergence of positron electron pairs because they're opposite charge we could use that non-observation to say there is a magnetic field close to these Blazers which themselves are at high red shift therefore there is strong evidence for a minimum amount of cosmic magnetic field energy pervading our universe now how did that get there that is of course an open question looking for the signals as observed by loar that implies that these Galaxy clusters have enormous amounts of magnetic energy and that they are also at Great distance and therefore great time and look back sense from our observational vantage point on Earth so the low far team doesn't know for sure what caused the magnetic field to permeate the filaments that they saw I should point out that we in the microwave background Community are also very interested in the existence of magnetic fields and in principle we could go far far back because the CMB is produced at a time when the universe was only 0.3% of its current age or 380,000 years out of 14 billion years roughly so we can perhaps go back to the very primordial essence of the universe using the cosmic microwave background and this has been a hope for both my friend and colleague leevon pag goian as well as my friend and colleague colleague tme vakas Pati at Arizona State University back in 1991 tenme conjectured that magnetic fields could have Arisen during what's known as the electro week phase transition this is the time roughly less than a millisecond or two after the big bang when the electromagnetic force and the weak nuclear force were unified into one force or before that they were unified and after that time period after Electro week uh unification ended we then manifest different phenomena electricity
8:00
and magnetism whether or not the earliest magnetic field energy could produce a predictable pattern in the primordial soup the primordial plasma protons and electrons if they could actually spin up the very first magnetic fields this is another conjecture that has gone on for a long time so we need to push back even farther back in time beyond the massive and tremendous success of the loar instrument that can only probe you know out to Red shifts of a few where these clusters of galaxies exist we need to go back factors of a thousand more in

red shift and that is potentially only observable using the cosmic microwave background to detect

Detection methods

the existence of a primordial magnetic field using the cosmic microwave background radiation we would employ its polarization and it's interesting all the successes of the CMB to date have all been measured without application or appeal to using cnb's polarization but now this could only be gotten out by measuring What's called the Faraday effect which is allied with the biofrance effect that I spoke about in this video over here the amount of farity rotation of the plane of electromagnetic polarization depends very crucially on the amount of electrons that are present in a plasma but also the amount of magnetic field so you can directly measure the strength of magnetism by measuring how much polarization rotation takes place but looking for farity rotation in the cosmic microwave background radiation is no easy feat it does require Ultra sensitive measurements of the cosmic microwave backgrounds em and B

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(02)- the field he called soul-like oo uh but he summed it up correctly that the earth has a property that makes it essentially a big magnet and that the weight stones lock towards the poles of the earth now the question is can you get non-am damic in other words no and

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rotational generation. The force for the magnetic field in space so magnetic fields are ubiquitous they are essentially unblockable they can only be blocked by things like superconductors and laboratory generated annulus fields that we use in our experiments so you can't actually shield them so they permeate everything so they can reach vast distances in space. An interesting study done over a decade ago published what is called the lower bound on the amount of cosmic magnetism. Fascinating to see the lack of observations of what are called **tev blazars** and their halos, we don't see the effect that one would expect to see around very distant blazars, which are the high-energy cores of active galaxies that would cause these blazars to form halos. Positron electron uh. Annihilation we've talked about in other videos but this phenomenon would lead to a gamma ray burst

6:00

that we should see around these distant objects the fact that we don't observe these halos has led to a lower limit on the amount of cosmic magnetic field energy present when these blazars are in their active phase this magnetic field would cause the divergence of the positron electron pairs because they have opposite charge we could use this non-observation to say that there is a magnetic field near these blazars which themselves have a high redshift so there is strong evidence for a minimum amount of cosmic magnetic field energy permeating our universe now how it got there that is of course an open question in the search for the signals observed by loar which suggests that these galaxy clusters have a huge amount of magnetic energy and that they are also at a great distance hence the great time and hindsight from our observing site on Earth so the low-level team doesn't know for sure what caused the magnetic field penetrated the fibers they saw. In this passage of the explanation, I don't really understand it, and I don't know much *what it's about* and it's a topic that's not interesting to my model, so I guess I'll end my comment. I should point out that we in the microwave background community are also very interested in the existence of a magnetic field. The field, and in principle, we could go back a long way, because the CMB is produced when the universe was only 0.3% of its current age, or about 380,000 years out of 14 billion years, so maybe we can go back to the very beginning of the universe using the cosmic microwave

background. And that was the hope of both my friend and colleague **Leevon Pag Goian** and my friend and colleague **Tme Vakas Pati** at Arizona State University in 1991. Tenme theorized that magnetic fields could have arisen during what is known as the electroweak phase transition, a time period of less than a millisecond or two after the Big Bang when the electromagnetic force and the weak nuclear force merged into one force, or before. They were unified and after that time after the end of Electro week uh unification we have various phenomena of electricity
8:00
and magnetism whether the earliest magnetic field energy could create a predictable pattern in the primordial soup, protons and electrons of the primordial plasma if they could actually spin the very first magnetic fields, that's another conjecture that's been around for a long time, so we need to go even further back in time for the massive and tremendous success of the loar instrument which can only examine, you know, the redshifts of a few places where these galaxy clusters exist, we need to factor that back in. A thousand more in redshift and that's potentially observable only using the cosmic microwave background to detect. Detection methods for the existence of a primordial magnetic field using the cosmic microwave background radiation would use its polarization and it is interesting that all the previous successes of the CMB were all measured without the application or attraction to use the polarization of the CNB, but now it was possible to get it only by measuring. What is called the Faraday effect, which is related to the biofrance effect that I talked about in this video, the magnitude of the rotation of the plane of the electromagnetic polarization depends very fundamentally on the size of the electrons that are present in the plasma, but also the amount of magnetic field, so you can directly measure the strength of the magnetism by measuring how much polarization rotation is going on, but looking for the rotation of the faraday in the cosmic microwave background radiation is not an easy task, it requires Ultra sensitive measurements of the cosmic microwave background em and B

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(03)- mode polarization States as well as the correlation between them and it is somewhat degenerate with this type of barrent effect that we spoke about in earlier videos and we'll continue to speak about nevertheless it is quite interesting that we can look for these signatures in many many different wavelength regimes we can look at low frequency radio emission we can look for Gap marray emission or the lack of gamma ray emission surrounding these tev Blazers and that measurement can also be combined those measurements and low
10:00
frequency radio emission extremely high gamar Ray emission we can use that in combination with millimeter wave microwave measurements such as that as going to be produced by the Simon Observatory can combine to give us a narrower and narrower parameter space over which Cosmic magnetism could arise so this is quite fascinating whether or not these magnetic fields which are known to exist throughout the Cosmos on the smallest scales of you and me all the way up to Cosmic Galaxy cluster ERS and perhaps even beyond that those measurements could lead to an understanding of what happened at extremely early times as if it weren't enough to go back billions of years with Galaxy clusters 8 billion years back to the cosmic microwave background we could go back to perhaps microsc or maybe even billions of a second after the big bang if indeed some phase transition is responsible for the origin of matter so

How does this relate to the Hubble tension?
how does all of this relate to the so-called Hubble tension that exists
11:00
between cosmic microb background measurements of the universe's expansion rate 380,000 years after the big bang and the late time relatively late time say billions of years after the big bang magnetic fields produce a very particular type of energy it's called a stress energy the type of stress energy that's produced by an early magnetic field can also contribute to the fre equations that we've talked about in previous videos and that can cause the universal expansion rate which we call the Hubble constant it can cause that to vary over time and so you can ask the Hubble constant today and you can compare it to what the Hubble constant would be evaluated when the CNB was uh was produced 380,000 years after the big bang and you compare those two and they are discrepant how does this come into play could be that there was excess energy in the form of primordial magnetic fields that were again implanted by an as yet unknown mechanism but these primordial magnetic fields would cause the universe to expand somewhat faster at Early times and so we
Outro
12:00
could look and compare these two Co these Cosmic expansion rates and we could ask the question as to whether or not the discrepancy is caused not by some exotic force or field contestants Dark Energy evolving but it could be a very prosaic solution one that involves
12:16
you going no farther than your kitchen refrigerator to appreciate namely a primordial Cosmic magnetic field
…….

(03)- polarization states of the mode and also the correlations between them and it's somewhat degenerate with this type of barren effect that we've talked about in earlier videos and we'll continue to talk about it, however it's quite interesting that we can look for these signatures in many different wavelength regimes, we can look at low frequency radio emissions, we can look for Gap marray emission ?-? or lack of gamma ray emission surrounding these tev Blazers and this measurement can also be combined with these measurements and low
10:00
frequency radio emission extremely high gamma ray emission that we can use in combination with microwave measurements at millimeter waves like the measurement that the Simon Observatory will produce to give us a narrower and narrower space of parameters over which cosmic magnetism could arise. it's quite fascinating whether these magnetic fields, which are known to exist throughout the universe on the smallest scales of you and me, down to the cosmic galaxy cluster ERS and perhaps beyond, these measurements could lead to an understanding of what happened in extremely early times, as if going back billions of years with galaxy clusters 8 billion years back to the cosmic microwave background wasn't enough, ??? we could go back perhaps to microsc or maybe even billions of seconds after the big bang if there is indeed some phase transition responsible for the creation of matter, so **How does this relate to the Hubble voltage?** how does all this relate to the so-called Hubble voltage that exists
11:00

between measurements of the expansion of the universe 380,000 years after the big bang in the cosmic micro background and the late time relatively late they say that billions of years after the big bang magnetic fields produce a very special type of energy called stress energy, ?? a type of stress energy, which is produced by the early magnetic field, can also contribute to the fre equations that we talked about in previous videos, and which can cause a **universal expansion rate**, which we call the Hubble constant, this idea is not wise, logical and observed either. Global expansion will not be constant for reasonable cosmologists can cause time to change, what, what??, a constant rate will change time??, and so today you can ask about the Hubble constant and you can compare it to how the Hubble constant would have been evaluated when the CNB was made 380,000 years after the big bang and you compare these two and they are inconsistent, ? if they are others are inconsistent??? how did that happen. The game could be that there was excess energy in the form of primordial magnetic fields, which were again implanted by a mechanism as yet unknown, but these primordial magnetic fields would have caused the universe to expand unfold somewhat faster in the early times, and so Outro what?
12:00
We could look and compare these two Cosmic expansion rates and we could ask ourselves whether the discrepancy is not caused by some exotic force or field competing with Dark Energy, but it could be a very prosaic solution that involves
12:16
you don't have to go further than your kitchen fridge to appreciate the primordial cosmic magnetic field in particular. The author definitely got the exit wrong here when he gave a (champagne-fueled) explanation of the "solution of the Hubble tension".
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Martin Drda STV Group
https://forbes.cz/lists/nc24/ 100 nejbohatších