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You Were Lied To About The Big Bang

Lhali vám o Velkém třesku

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0:00

(01)- You don't actually understand the Big Bang Theory because what they teach in schools is wrong. I know this because I just got my degree in physics and what they taught us isn't actually what most physicists believe. When I started writing this video, I basically just wanted to explain what the Big Bang was and prove anyone who didn't believe it wrong, but it turns out I was wrong. Most physicists today no longer believe that the Big Bang was the beginning of the universe. Ultimately, I just want to answer the question that I think everyone has about the Big Bang Theory. What was it that actually banged? Was it a singularity? Nothing? What? So let's get to the bottom of this together and please enter this video with an open mind. Clear all your beliefs about the Big Bang and I'm sure you'll have your mind blown. The Static Universe Long before modern science had been created, humans looked to the stars and wondered about our place in the universe. There were seemingly infinite descriptions of how the universe came to be. Hundreds of gods with their own creationist stories. The Greek atomists believed that the universe was

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infinite in space and time. The Hindus, Stoics, and Buddhists all believed that the universe went through cycles of creation and destruction. And then in 1687, 44-year-old Isaac Newton published his now famous Principia. In it, he showed that the same laws that described motion here on Earth are true across the universe as a whole. Newton's gravity was born. But there was a problem. If his universal law of gravity were true, and every object with mass would attract one another, then surely this force would cause the universe to simply collapse in on itself. Newton borrowed his solution from the Greeks. He basically said that the universe were infinite with no centre, and so the matter wouldn'tcollapse together as the unseen planets and stars would balance the entire system perfectly. Our first model for the universe was born. The static universe.

Newton's Problem Newton's description of the universe was not only infinite in space, but also in time.

2:00

Newton was a Christian, and therefore believed that his god may have created the universe, but didn't do so at any point in time. This idea of the static universe became widely accepted. That was until some people realised it had a problem. When people looked up to the sky at night, they saw bright spots of light coming from stars and large expanses of darkness. But if the universe were really infinite and eternal as described by Newton, you should be able to look in any direction and see something. A star, a galaxy. This would make the night sky as bright as the sun. And yet, that is not what we see. The universe must therefore not be infinite, static and eternal. Something had to change.

Einstein's Revolution And that change came over 200 years later, and as with many things in physics, it came from Albert Einstein. In 1915, Einstein published his brilliant theory of relativity, and in it he made a bold discovery. As an observer speeds up, time slows down and length contracts. The closer you get to the speed of

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light, the slower time ticks, until at the speed of light, if you could reach it, time stops altogether. Space and time are therefore innately connected. They are one and the same thing. And they form the very fabric of the universe itself, spacetime. Gravity isn't a force between objects, it's the bending of spacetime itself by objects within it. The sun bends the fabric, and the earth moves around this curved surface in an orbit. This was all good in theory, but they needed a way to test it, and four years later, they did just that. On May 29th, 1919, a total solar eclipse occurred, and it was visible from Brazil. Arthur Eddington organised two expeditions on behalf of the Royal Astronomical Society to image the eclipse. They were doing this to test Einstein's theory. If he were correct, then it wouldn't be just objects that move through this bent spacetime, but the light itself should be bent and curved to move along this warped path. And since during an eclipse you see the stars behind the sun, they could check and see if he was right. If his theory was wrong, and the gravity of the sun doesn't bend the starlight, then they should appear to be here. But they weren't. The stars were here. They had shifted during the eclipse, being warped by the sun's gravity by roughly the same amount as Einstein had predicted. Einstein was immediately shot into stardom. The Times of London reported, New Theory of the Universe, Newtonian Ideas Overthrown, and his name became synonymous with genius. Einstein's new laws didn't just apply to the gravity between objects either. They could be used to examine the fabric of the cosmos itself. While he had dethroned Newton with his new theory of gravity, he soon found himself faced with the same problém

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infinite in space and time. Hindus, Stoics, and Buddhists believed that the universe went through cycles of creation and destruction. And then in 1687, 44-year-old Isaac Newton published his now-famous Principia. In it, he showed that the same laws that describe motion here on Earth apply throughout the universe as a whole. Newtonian gravity was born. But there was a problem. If his universal law of gravity were true, and every object with mass attracted another, then this force would surely cause the universe to simply collapse in on itself. Newton borrowed his solution from the Greeks. Essentially, he said that the universe was infinite and had no center, and therefore matter would not collapse together because the invisible planets and stars would perfectly balance the whole system. Our first model of the universe was born. The static universe.

Newton's problem Newton's description of the universe was not only infinite in space, but also in time. The universe (or rather, what was before the Big Bang is better called Stoic spacetime) is/could have been infinite because it contained no matter. (!)

2:00

Newton was a Christian, and therefore believed that his god could have created the universe, but at no point did he do so. This idea of a static universe became widely accepted. That was until some people realized he had a problem. When people looked up at the sky at night, they saw bright spots of light coming from the stars and large expanses of darkness. However, if the universe were truly infinite and eternal, as Newton described it, you should be able to look in any direction and see something. A star, a galaxy. That would make the night sky as bright as the sun. And yet that is not what we see. So the universe does not have to be infinite, static and eternal. Something had to change. The “Bang” must come with a new idea what it is (!) It is a “jump change” in the curvature of dimensions… from k=0 to k= ∞. The universe before the Bang was infinite, flat, smooth and without matter, time did not run and space did not expand, it had nowhere to expand, since it was already infinite. Then the “Creator” took a Locality from such a universe and in it changed k=0 to k=∞…, which will be an extremely curved number of dimensions. Only now can the creation of matter, the construction of matter, elementary particles as packages-balls of dimensions occur. There are only 26 of them and for baryonic matter only three are enough: electron proton and neutron, or leptons, six and quarks also six. Now the genesis of the universe can occur, the flow of time and the expansion of space will start. Etc. as I describe it..

Einstein's revolution.

And this change came more than 200 years later and, as with many things in physics, it came from Albert Einstein. In 1915 Einstein published his brilliant theory of relativity and made a bold discovery in it. As the observer accelerates, time slows down and length decreases. But Einstein did not even finish this >brilliant< thing. "There is no dilation or contraction on the observed object, it is observed only by the chosen Observer, brought to rest. This STR is essentially a rotation of the systems (the system of a standing Observer and a moving object, even the object can be a "cursor on the computer screen". Another shortcoming of Einstein was and still is that he copied the gravitational constant from Newton and assigned dimensions to it. And that is literally a fraud. "G" is not a physical reality, it is just a "correction factor" so that the equation is an equation. How to solve the dimensional inequality in OTR is another story elsewhere on my website.

The question and problem of the gravitational constant – CZ

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The question of the **gravitational constant,**
This is a very difficult question
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The closer you get to the speed of light, the slower time runs, not on the object, but in the observer's observatory... until at the speed of light, if you were to reach it, time would stop altogether. Because the time dimension rotates 90^0. Space and time are therefore naturally connected. They are one and the same thing. And they form the very fabric of the universe, spacetime. Gravity is not a force between objects, it is the bending of spacetime itself the objects in it. And if the length dimension and the time dimension start to bend = curve = pack into the Sun bends the fabric and the Earth moves around this curved surface in orbit. This was all good in theory, but they needed a way to test it, and four years later they did. On May 29, 1919, there was a total solar eclipse that was visible from Brazil. Arthur Eddington organized two expeditions on behalf of the Royal Astronomical Society to image the eclipse. They were doing this to test Einstein's theory. If he was right, then not only would objects move through this curved space-time, but light itself would bend and curve to follow this curved path. And since you see stars behind the sun during an eclipse, they could test whether he was right. If his theory were wrong, and the sun's gravity didn't bend starlight, then they should appear to be there. But they weren't. The stars were there. During the eclipse, they shifted and were distorted by the sun's gravity by about the same amount as Einstein had predicted. Einstein immediately became a star. The Times of London reported on the new theory of the universe, Newton's ideas were refuted, and his name became synonymous with genius. Einstein's new laws didn't just apply to gravity between objects. They could be used to explore the structure of the universe itself. Although he dethroned Newton with his new theory of gravity, he soon found himself facing the same problem.
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(02)- that Newton faced 200 years earlier. In general relativity, the universe was unstable. It must either expand or collapse thanks to the force of gravity. To try and solve this problem, Einstein modified his equations, adding in a value that he called his cosmological constant.
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It represents the energy of empty space itself. Basically, if you just took a box of empty space, how much energy would be in that box? He could then adjust this value to match the observations of the static universe. He would go on to call this his biggest mistake, but as we'll see later in the video, he might have been right all along. As you've seen so far in this video, science is really the key to understanding our

Planet Wild universe on a deeper level, and that doesn't just apply to space. It applies here on Earth too. That's why I'm beyond excited to partner with Planet Wild for this video. Think of Planet Wild like crowdfunding, but for nature conservation. Members fund the organization every month, and they use those funds to bring back endangered species, protect the oceans, and restore forests. They actually document all of these projects in video reports on their YouTube channel, so you can directly see how your contribution is being used to protect the planet. And that's my favorite part. As a member, you can directly see the impact you're having with your own eyes. I saw the importance of nature conservation when

6:03

I was recently in Chile visiting the Vera Rubin Observatory. Wildlife conservation and protecting the pristine skies in Chile is paramount to the facility, and therefore astronomy as a whole. It's why I joined the Planet Wild community. Their projects are so inspiring. They recently backed indigenous communities to help protect one of the most biodiverse places on Earth, the Amazon. So if you want to be a part of this community making a difference in nature conservation, consider joining Planet Wild. You can contribute whatever you want, big or small. You can start for as little as the price of a sandwich. And just because I think they're worth supporting, the first 100 people to sign up using my code COBY10 will get their first month paid for by me. Just scan the QR code or click the link at the top of the description. The best part? You'll see results within 30 days here on YouTube. There's no catch at all. Cancel anytime, whenever you want, no questions asked.

Island Universes Okay, so around the same time that Einstein was figuring all of this relativity stuff out, astronomers had been turning their attention to the

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night sky, trying to solve one of the longest standing problems in physics. For centuries, astronomers had observed these fuzzy clouds in the sky. They called them nebulae, the most famous one being Andromeda. They didn't really know what they were. The philosopher Immanuel Kant described them as island universes, but we had no way of measuring how far away they were. That was until a brilliant woman, Henrietta Swan Leavitt, had made a breakthrough. Leavitt was a part of a small group of poorly paid female astronomers known as the Harvard Computers. She was tasked with measuring photographic plates to catalogue the position and brightness of stars. In doing this, she studied a special kind of star known as a Cepheid variable. These are bright stars that pulse regularly over periods that range from a few days to multiple months. She noticed a pattern. The longer the pulse, the brighter the star actually was. So astronomers could measure the period, figure out the brightness of the star, and compare that brightness with how bright they looked from Earth. Since far away objects appear fainter, they could use that comparison to measure the distance to the Cepheid variable. Armed with this method, Edwin Hubble turned his telescope to the Andromeda nebula and saw one of these special variable stars. He measured the period and calculated the distance to Andromeda. His result? 900,000 light years, well beyond the outer reaches of our galaxy. Those island universes exist. All of these fuzzy nebulae that we had been looking at actually were galaxies of their own, just like our Milky Way. In that instant, the universe as we know it increased in size by a million times. Hubble had changed astronomy forever. Another astronomer, Vesto Slipher, had also been looking The Universe is expanding at these galaxies when he noticed something too. Most of them had their light redshifted, indicating that they were moving away from us at insane speeds, hundreds of kilometers per second.

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We now know that this redshift was caused by the Doppler effect. Building on this, Hubble

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Earth. Since distant objects appear fainter, they could use this comparison to measure the distance to a Cepheid. Armed with this method, Edwin Hubble pointed his telescope at the Andromeda Nebula and spotted one of these special variable stars. He measured the period and calculated the distance to Andromeda. His result? 900,000 light years away, which is far beyond the boundaries of our galaxy. These island universes exist. All of these blurry nebulae that we observed were actually galaxies in their own right, just like our Milky Way. At that point, the universe as we know it expanded a million times.
Hubble changed astronomy forever. He discovered the linear equation $\boxed{v = H_0 . d}$ … and thus linear expansion up to the singularity. But I say that the equation is ultimately wrong anyway, because it only applies up to a certain distance, then it starts to curve into an involute. Therefore, the singularity and the age of the universe are also wrong https://www.hypothesis-of-universe.com/docs/c/c_053.jpg ; https://www.hypothesis-of-universe.com/docs/c/c_239.jpg ; https://www.youtube.com/watch?v=LbLLWmmL3YE ;
Another astronomer, Vesto Slipher, was also studying these galaxies when he also noticed something. Most of them had a redshift of light, which indicated that they were moving away from us at a crazy speed, hundreds of kilometers per second.
9:02
We now know that this redshift was caused by the Doppler effect. Based on this, Hubble followed up on
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(03)- used his new methods from Slipher and Leavitt to measure the distance to a number of galaxies and figure out how quickly they were moving away from us. He put all of this data onto a plot, and the trend was clear. The farther away the galaxies were, the quicker on average they were flying away from us. Exactly what we would expect to see if the universe was expanding. The static universe of Newton and even Einstein was dead. Hubble's observations had confirmed what other physicists had believed for a while now. Alexander Friedman and George LaMartre had been using Einstein's equations to predict a dynamic universe, and they were right. They immediately thought to turn back the clock. If the universe is expanding as time passes, The Primeval Atom when we move back in time, it should contract, getting closer and closer together until it reaches an extremely dense state. LaMartre called it the primeval atom. He claimed that we were living in the smoke and ashes of a bright but very rapid fireworks.
10:05
LaMartre became known as the father of this new theory, somewhat ironically because he was also a Catholic priest. The Beginning of Time Remember earlier how I said space and time were innately linked? One singular space-time. This meant the beginning of space would also be the beginning of time. Stephen Hawking and Roger Penrose would later go on to show that this wasn't just an assumption either. Time really did stop at this initial dense state. They did this by taking Penrose's solutions for a black hole singularity, where there's infinite density and curvature at a single point, and applied it to the entire universe. They were able to show, under a set of assumptions, that the expanding universe we see today had to have started with a singularity in the distant past. A day without yesterday. This is probably what you were taught in school, that the Big Bang started from the singularity. But as we'll see, this is almost certainly not true. There was a problem with this primeval atom model of the universe. If you took the rate of the universe's

The Age Problem

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expansion and just turned back the clock, you could figure out how old it was. And when they did this, the answer was an embarrassing 1.8 billion years old. Geologists at the time already knew that the Earth was at least 4.5 billion years old, so what's going on? Something had to be off.

The Steady State Universe But to be honest, even without this problem, Einstein just didn't like the idea of an expanding universe. He had deep-rooted beliefs in his idea of a static universe, and so he began exploring a new theory that combined the primeval atom with his static universe. If the density of energy has to remain constant, he suggested that new particles of matter should be continually formed. He imagined a universe expanding without any origin, where the new particles could be created, arising from his cosmological constant, the energy of empty space. The expansion of space spreads out the new matter, and so the total energy density of the universe is constant.

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Everything is solved. But he couldn't get this idea to quite work though. There were all of these small problems, and so he didn't tell anyone, and it was only discovered in his archives in 2014. Lucky for him though, three scientists in England had all thought of the same idea all the way back in 1945. Fred Hoyle, Thomas Gold, and Hermann Bondi thought up the same concept Einstein had abandoned. They called it the steady state model. These were the two big ideas at the The Big Bang Theory time, the primeval atom and the steady state. Hoyle actually had a radio show and spoke about science in England, and one time he was on air describing the two of them when he referred to the primeval atom, saying all the matter in the universe was created in one big bang at a particular time in the remote past. The Big Bang name was born, and it stuck. We had the foundations of the Big Bang in place, and it probably sounds pretty similar to what you think the Big Bang actually is. A long time ago, everything was closer together and hotter, and then bang! The universe is born. But there was still testing to do. One thing that people were thinking about is

What happens to the matter?

13:03

what happens to all of the matter, the planets, humans, stars, galaxies, all of that, as they get traced back in time to the Big Bang. The physicists George Gamow and Ralph Alpha showed that as the universe contracts, it would get hot and dense, and eventually the matter would break down into a soup of protons, neutrons, electrons, and photons. So right after the Big Bang, everything was just this soup of particles. There was no empty space. It was so hot that the whole universe was basically just one big nuclear reactor. The protons and neutrons would

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getting closer and closer together, until it reaches an extremely dense state. LaMairtre called it the Primordial Atom. He claimed that we live in the smoke and ashes of a bright but very fast firework.
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LaMairtre became known as the father of this new theory, somewhat ironically, because he was also a Catholic priest. The beginning of time. Remember how I said earlier that space and time are inherently connected? One singular spacetime. This meant that the beginning of space would also be the beginning of time. More precisely: the beginning - the beginning of the pace, the passage of time..., **Stephen Hawking and Roger Penrose** later showed that this was not just an assumption either. Time did indeed stop in this initial dense state. They did this by taking Penrose's solution for the black hole singularity, where there is infinite density and curvature at one point, and applying it to the entire universe. Under certain assumptions, they proved that the expanding universe we see today must have started with a singularity in the distant past. A day without yesterday. You were probably taught in school that the Big Bang started from a singularity. But as we'll see, that's almost certainly not true. There was a problem with this primordial atom model of the universe. If you took the rate of expansion of the universe
The Age Problem
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and simply turned back time, you could figure out how old it was. And when they did, the answer was an embarrassing 1.8 billion years. Geologists at the time already knew that the Earth was at least 4.5 billion years old, so what was going on? Something had to be wrong. The Universe at a Steady State. But frankly, even without this problem, Einstein just didn't like the idea of an expanding universe. He had a deep-rooted belief in his idea of a static universe, so he began exploring a new theory that combined the primordial atom with his static universe. If the energy density had to remain constant, he proposed that new particles of matter should be constantly being created. That's not a bad idea. After the Big Bang, matter in that frothy boiling plasma of curved dimensions was born quite rapidly and gradually slower and slower along the “descending exponential curve”. Otherwise it could be with the complexity of the material elementary particles – from simple to more complex. He imagined the universe expanding without any origin, where new particles could arise, resulting from its cosmological constant, the energy of empty space. The expansion of space spreads new matter, and so the total energy density of the universe is constant.
12:00
Everything is solved. But he could not properly implement this idea. There were a lot of little problems, so he didn't tell anyone about them, and the discovery wasn't discovered until 2014 in his archives. Luckily for him, three scientists in England had come up with the same idea back in 1945. **Fred Hoyle, Thomas Gold, and Hermann Bondi** had come up with the same concept that Einstein had abandoned. They called it the steady-state model. At the time of the Big Bang Theory, there were two big ideas - the primordial atom and the steady-state. Hoyle even had a radio show in England where he talked about science, and once on the radio he described both of them when he mentioned the primordial atom and said that all the matter in the universe was created in one big bang at some time in the distant past. The name Big Bang was born and it stuck. We had the foundations of the Big

bang and it probably sounds pretty much like what you think the Big Bang actually is. Once upon a time, everything was closer together and hotter, and then bang! The universe was born. But there was still testing to be done. One thing people wondered about,

What happens to matter?

13:03

What happens to all the matter, planets, people, stars, galaxies, everything, as you trace it back in time to the Big Bang? Physicists **George Gamow and Ralph Alpha** have shown that as the universe contracts, it heats up and thickens, and eventually matter breaks down into a soup of protons, neutrons, electrons, and photons. So right after the Big Bang, everything was just this soup of particles. "First" there was a foam of warped 3+3 dimensions. Already in it, elementary particles of matter were born by "packaging", and then compactification, etc. There was no empty space. It was so hot that the entire universe was essentially just one big nuclear reactor. Protons and neutrons would

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(04)- used his new methods from **Slipher and Leavitt** to measure the distance to a number of galaxies and figure out how quickly they were moving away from us. He put all of this data onto a plot, and the trend was clear. The farther away the galaxies were, the quicker on average they were flying away from us. Exactly what we would expect to see if the universe was expanding. The static universe of Newton and even Einstein was dead. Hubble's observations had confirmed what other physicists had believed for a while now. Alexander Friedman and George LaMartre had been using Einstein's equations to predict a dynamic universe, and they were right. They immediately thought to turn back the clock. If the universe is expanding as time passes, The Primeval Atom when we move back in time, it should contract, getting closer and closer together until it reaches an extremely dense state. LaMartre called it the primeval atom. He claimed that we were living in the smoke and ashes of a bright but very rapid fireworks.

10:05 a.m

LaMartre became known as the father of this new theory, somewhat ironically because he was also a Catholic priest. The Beginning of Time Remember earlier how I said space and time were innately linked? One singular space-time. This meant the beginning of space would also be the beginning of time. Stephen Hawking and Roger Penrose would later go on to show that this wasn't just an assumption either. Time really did stop at this initial dense state. They did this by taking Penrose's solutions for a black hole singularity, where there's infinite density and curvature at a single point, and applied it to the entire universe. They were able to show, under a set of assumptions, that the expanding universe we see today had to have started with a singularity in the distant past. A day without yesterday. This is probably what you were taught in school, that the Big Bang started from the singularity. But as we'll see, this is almost certainly not true. There was a problem with this primeval atom model of the universe. If you took the rate of the universe

The Age Problem

11:05 a.m

expansion and just turned back the clock, you could figure out how old it was. And when they did this, the answer was an embarrassing 1.8 billion years old. Geologists at the time already knew that the Earth was at least 4.5 billion years old, so what's going on? Something had to be off.

The Steady State Universe But to be honest, even without this problem, Einstein just didn't like the idea of an expanding universe. He had deep-rooted beliefs in his idea of a static universe, and so he began exploring a new theory that combined the primeval atom with his static universe. If the density of energy has to remain constant, he suggested that new particles of matter should be continuously formed. He imagined a universe expanding without any origin, where the new particles could be created, arising from his cosmological constant, the energy of empty space. The expansion of space spreads out the new matter, and so the total energy density of the universe is constant.
12:00 p.m
Everything is solved. But he couldn't get this idea to quite work though. There were all of these small problems, and so he didn't tell anyone, and it was only discovered in his archives in 2014. Lucky for him though, three scientists in England had all thought of the same idea all the way back in 1945. Fred Hoyle, Thomas Gold, and Hermann Bondi thought up the same concept Einstein had abandoned. They called it the steady state model. These were the two big ideas at the time of The Big Bang Theory, the primeval atom and the steady state. Hoyle actually had a radio show and spoke about science in England, and one time he was on air describing the two of them when he referred to the primeval atom, saying all the matter in the universe was created in one big bang at a particular time in the remote past. The Big Bang name was born, and it stuck. We had the foundations of the Big Bang in place, and it probably sounds pretty similar to what you think the Big Bang actually is. A long time ago, everything was closer together and hotter, and then bang! The universe is born. But there was still testing to do. One thing that people were thinking about is
What happens to the matter?
1:03 p.m
what happens to all of the matter, the planets, humans, stars, galaxies, all of that, as they get traced back in time to the Big Bang. The physicists George Gamow and Ralph Alpha showed that as the universe contracts, it would get hot and dense, and eventually the matter would break down into a soup of protons, neutrons, electrons, and photons. So right after the Big Bang, everything was just this soup of particles. There was no empty space. It was so hot that the whole universe was basically just one big nuclear reactor. The protons and neutrons would
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(05)- used his new method from Slipher and Leavitt to measure the distance to a number of galaxies and to find out how fast they were moving away from us. He plotted all this data on a graph and the trend was clear. The further away the galaxies were, the faster they flew from us on average... they flew and flew until they reached the speed of light. And then they disappeared and ...and what was that?? ; It was precisely by rotating the systems of galaxies and stars that the flight path of the object was rotated by 90^0 - the horizon of observation. But: this is observed by a "standing object" = Earth, an Earthling. On a rocket that reached this horizon with a speed of "c", the commanders do not observe anything like this. It is equivalent to Mr. "quasar" looking towards us and claiming that we are moving here at the speed of light, and >disappearing from him< on "his horizon". The vision of the rotation is that "out there at the horizon" space-time is the foam, the plasma, in which elementary particles are born and from them (new) stars, galaxies...quasars. Exactly what we would expect if the universe was |expanding|. unfolding... The static universe of Newton and even Einstein was dead. Oh, it wasn't... Hubble's observations confirmed what other physicists had believed for some time. **Alexander Friedman and George LaMairtre** used Einstein's equations to predict a dynamic universe and they were right. They immediately thought of turning back time. Turning back the pace of time that, which ...??? If the universe is expanding with the passage of time, **Primordial atom** When we go back in time, it should be contracting, getting closer and closer to itself until it reaches an extremely **dense state**. This is what an Earthling observes… but the Quasar should observe the same thing when he looks at us. He sees foam, plasma, and no Earth or Sun. LaMairtre called it the primordial atom. He claimed that we live in the smoke and ashes of a bright but very fast firework.

10:05

In the morning, LaMairtre became known as the father of this new theory, somewhat ironically, because he was also a Catholic priest. **The Beginning of Time** Remember how I said earlier that space and time are inherently connected? One singular space-time. That meant that the beginning of space would also be the beginning of time. And yet, that is not the case. In the “past universe,” before the big bang, time did not flow and space did not expand. And that changed after the big bang. Only here did the **flow, the passage of time, and the expansion** begin. So it is not the beginning of time (it was already there) but the beginning of the "flow of time". **Stephen Hawking and Roger Penrose** later showed that this was not just an assumption either. Time really stopped in this initial dense state. Oh my, finally the considerations come together. They did this by taking Penrose's solution for the black hole singularity, where there is infinite density and curvature at one point, and applying it to the entire universe. Under certain assumptions, they proved that the expanding universe we see today must have started with a singularity in the distant past. But that may not be true either. Where you "detect" that singularity, there may be billions of singularities around it. Like here on Earth when we look at Planck scales 10^{-43}, matter springs up there. That locality called singularity can be as big as half the pre-big-bang universe. So what is it about? Because the universe before the big bang was absolutely flat, and after the BB it was absolutely curved into foam, into plasma from dimensions, at t=0 still without matter. A day without yesterday. You were probably taught that in school, that the Big Bang started from a singularity. But as we will see, almost certainly it is not true. There was a problem with this model of the universe of the primordial atom. If you take the expansion rate of the universe the problem of age

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morning

and simply turned back time, you could find out how old it was. And when they did, the answer was an embarrassing 1.8 billion years. Geologists at the time already knew that the Earth was at least 4.5 billion years old, so what was going on? Something had to be wrong. The Steady-State Universe But frankly, even without this problem, Einstein just didn't like the idea of an expanding universe. He had a deep-rooted belief in his idea of a static universe, so he began to explore a new theory that combined the primordial atom with its static universe. If the energy density must remain constant, he proposed that **new particles of matter** should be constantly being created. And I believe that too. Just in a different coordination. Right after BB, i.e. in one second, for example, 89% of matter was created, then in three seconds 6% of matter was created, then in 1800 seconds 1.2% of matter was created, and then in half a billion seconds a measly 0.00000000000002% of matter was created… etc. I made up the numbers. So these are descending and ascending curves, not stupid inflation. Even today, new matter will be created on Earth, (from the perspective of the entire universe) e.g. in 7 hours

$9.109 \cdot 10^{-33}$ kg of matter in 1 km3 volume. He imagined the universe expanding without any origin, where new particles could be created, resulting from its cosmological constant, the energy of empty space. The expansion of space spreads out new matter, and so the total energy density of the universe is constant. O.K.
12:00
Everything is solved. But he couldn't really push the idea. There were all these little problems, so he didn't tell anyone about them, and the discovery wasn't discovered until 2014 in his archives. Luckily for him, three scientists in England had the same idea back in 1945. Fred Hoyle, Thomas Gold, and Hermann Bondi came up with the same concept that Einstein had abandoned. They called it the steady-state model. That doesn't have to be the case, though* Those were the two big ideas at the time of the Big Bang Theory, the primordial atom and the steady-state. Hoyle even had a radio show in England talking about science, and he was on the air once where he described both of them, when he mentioned the primordial atom and said that all the matter in the universe was created in one big bang at some time in the distant past. I think matter was created gradually (as I gave the fictional example here). The name Big Bang was born and it stuck. We had the foundations of the Big Bang laid and it probably sounds pretty similar to what you think the Big Bang actually is. Once upon a time, everything was closer together and hotter, and then bang! The universe was born. Phew, the universe wasn't born in the Big Bang. Before the BB, there was no matter and genesis… But there was still testing to be done. One thing people wondered about was:

What happens to matter?

13:03
What happens to all the matter, planets, people, stars, galaxies, everything, once you trace it back in time to the Big Bang? What happens is that you trace the genesis of the structure of matter from a state of simple matter to more and more complex matter… Physicists George Gamow and Ralph Alpha showed that as the universe contracts, it heats up and condenses, and eventually matter breaks down into a soup of protons, neutrons, electrons, and photons. O.K.. So right after the Big Bang, everything was just this particle soup. It was a boiling 3+3D space-time in which elementary particles were being born by "packaging" dimensions… There was no empty space. It was so hot that the entire universe was basically just one big nuclear reactor. Protons and neutrons would
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(06)- snap together, forming the nuclei of hydrogen, helium, and lithium atoms. After about five minutes, everything had cooled down enough for this nuclear reactor to shut down. All of the atomic nuclei had been formed and locked into their exact proportions. Gamow and Alpha predicted that 75% of the nuclei would be hydrogen, 25% would be helium, and a tiny proportion of things
14:02
like lithium would be found. Amazingly, they were right. Observations agreed with this ratio.

Predicting the CMB And they didn't stop there. This team kept thinking about the early universe and their soup. Five minutes after the Big Bang, and the soup was filled with basically three things. Atomic nuclei, electrons, and photons of light created in the Big Bang. This light was continually being absorbed by the nuclei and re-emitted, flying around in the plasma because it was so hot. The soup would stay like this for 380 ,000 years until it had finally cooled to a nice 2,700 degrees Celsius. In that moment, everything changed. Immediately, the electrons snapped the closest nuclei and those photons of were finally free to fly out through empty space. If you were there watching, it would have been a bright red glow, and ever since then, this light should have been travelling out through the universe, being stretched by spacetime as the universe expands, getting red-shifted so much that it should now be in the microwave

15:03

end of the light spectrum, and extremely cold, around 2 Kelvin. They called it the Cosmic Microwave Background Radiation, if they wanted to once and for all prove that the Big Bang was real, they would need to find this light, and if they could do it, they would literally be taking a picture of the Big Bang. The hunt was on. Seeing God By the 1940s, an astronomer named Andrew McKellar was studying clouds of alcohol in space when he measured the temperature of that empty space around the clouds. He found it to be 2.3 degrees Kelvin. So what was it? Well, he didn't know, and no one connected the dots. He was measuring the afterglow of the Big Bang, and didn't even realise it. In the meantime, the Steady State Model was basically dead. The main problem for the Big Bang was this age problem. It predicted the universe was far too young. New data had shown that the original distance to the Andromeda Galaxy was miscalculated. It was actually over 2.5 million light

16:01

-years away. So using this new data, the age of the universe was predicted to be 10 to 20 billion years old. The age problem was solved. Astronomers at Princeton had set their sights on the CMB, and they were getting close. They could feel it. But someone beat them to it. Just down the streets at Bell Labs, they had detected this strange hiss in their data. Arno Penzias and Robert Wilson couldn't figure out what it was. They tried everything to remove it, but to no avail. That's when they spoke with some people from MIT, and they realised what they were looking at. It was in fact the Cosmic Microwave Background Radiation, measured at 2.7 degrees Kelvin. They received the Nobel Prize for this discovery, and the Big Bang had its crown jewel. If we could see it today, as it were when it was first emitted, and také a picture, it would look like a red glow in the sky from every direction. The light from the Big Bang itself. And it wasn't long until they did just that. Took a picture. By 1982, NASA had approved the creation of a spacecraft that would image the entire CMB.

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It could sweep the sky, mapping what it looked like in every direction. The COBE satellite. And by 1990, they had all the data they needed, and made their big reveal. The CMB in all of its glory. They had mapped the entire sky's contribution, and had the most complete image of the CMB ever taken. Stephen Hawking declared the result the scientific Discovery of the century, if not of all time. And it wasn't just beautiful, it confirmed something that scientists had suspected for decades. In physics, there's something called a black body. It's an idealised object that absorbs all light. 100% of it. All of that energy should then be re -emitted by the object in a perfectly predictable way. Its light spectrum should look like this. Depending on the temperature of the object, this shape could change, but there is always a perfect theoretical spectrum shape for the black body.They predicted that the CMB should have this signature of a perfect black body, and it did.

18:02

It was the most perfect black body ever observed in history. Standing ovations, Nobel prizes, and an accurate description of how the universe was born. So that's the end of the story, right? Problems with The Big Bang The universe starts with a bang, and that's it. Well, not quite. There were three huge problems that were still left unanswered. The first is known as the

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(06)- they snap together to form the nuclei of hydrogen, helium, and lithium atoms. After about five minutes, everything had cooled down enough for this nuclear reactor to shut down. All the atomic nuclei had been created and fixed in a precise ratio. Gamow and Alpha predicted that 75% of the nuclei would be hydrogen, 25% helium, and a small fraction of things like lithium would be found. Surprisingly, they were right. The observations matched this ratio.

CMB prediction.

And they didn't stop there. This team kept thinking about the early universe and its soup. Five minutes after the Big Bang, the soup was basically full of three things. Atomic nuclei, electrons, and photons of light created in the Big Bang. This light was constantly being absorbed by the nuclei and re-emitted, flying around in the plasma because it was so hot. The soup stayed like this for 380,000 years until it finally cooled to a comfortable 2,700 degrees Celsius. At that moment, everything changed. The electrons immediately broke the nearest nuclei, and these photons were finally free to fly out into empty space. Into empty space… If you were looking there, it would be a bright red glow, and since then this light should have traveled through space, been stretched through space-time as the universe expanded, and redshifted so much that it should now be at the microwave end of the light spectrum and extremely cool, around 2 Kelvin. They called it the cosmic microwave background radiation. If they wanted to prove once and for all that the Big Bang was real, they would have to find this light, and if they could do it, they would literally have taken a picture of the Big Bang. The hunt was on. Seeing God In the 1940s, astronomer Andrew McKellar was studying alcohol clouds in space when he measured the temperature of the empty space around the clouds. He found it to be 2.3 degrees Kelvin. So what was that? Well, he didn't know it, and no one connected it. He was measuring the afterglow of the Big Bang and didn't even realize it. Meanwhile, the steady-state model was basically dead. The main problem with the Big Bang was this age problem. It predicted that the universe was too young. New data showed that the original distance of the Andromeda galaxy had been miscalculated. It was actually over 2.5 million light

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years away. So using this new data, the age of the universe was predicted to be 10 to 20 billion years. The age problem was solved. **(?)** Astronomers at Princeton focused on the CMB and were getting closer. They could feel it. But someone beat them to it. Not far away at Bell Labs, they noticed this strange hiss in their data. Arno Penzias and Robert Wilson couldn't figure out what it was. They tried everything to remove it, but to no avail. Then they talked to people at MIT and realized what they were looking at. It was actually the cosmic microwave background, measured at 2.7 degrees Kelvin. They won a Nobel Prize for this discovery, and the Big Bang had its jewel. If we could see it today, at the time it was first emitted, so to speak, and take a picture of it, it would look like a red glow in the sky from all

directions. The light of the Big Bang itself. And before long, that's exactly what they did. They took a picture. In 1982, NASA approved the creation of a spacecraft that would image the entire CMB.
17:03
It could fly across the sky and map what it looked like from all directions. The COBE satellite. And in 1990 they had all the data they needed and made their big reveal. The CMB in all its glory. They mapped the entire contribution of the sky and had the most complete image of the CMB ever taken. **Stephen Hawking** declared the result the scientific discovery of the century, if not of all time. When I once said about 20 years ago that IF my HDV were confirmed (here is a guide to building matter from cp dimensions, it would be the greatest discovery of all time… and I put that statement on the internet), the bag burst with insults, seven pursuers went crazy, screaming for me to jump out of the window or sign up for a psychiatric hospital… And it was not only beautiful, but it confirmed something that scientists had suspected for decades. In physics, there is something called a black body. It is an idealized object that absorbs all light. 100%. All this energy should then be re-emitted by the object in a perfectly predictable way. Its light spectrum should look like this. Depending on the temperature of the object, this shape can change, but there is always a perfect theoretical shape for a black body spectrum. They predicted that the CMB should have this signature of a perfect black body, and it did.
18:02
It was the most perfect black body ever observed in history. Standing ovations, Nobel Prizes, and an accurate description of how the universe was born. So that's the end of the story, right? Problems with the Big Bang The universe begins with a bang and ends with it. Well, not quite. There were three huge problems that still remained unanswered. The first is known as

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(07)- **Horizon Problem**. We have since mapped the CMB to extremely high precision, and measured the thermal difference across the entire sky. And it's nearly perfect. The entire signal is pretty much exactly 2 .7 degrees Kelvin, no matter where you look. The problem is, there was nowhere near enough time for the temperature to pass from one side of the universe to the other, and let everything come to a perfectly even temperature. Even travelling at the speed of light, there was no way that two points in the CMB from opposite sides of the universe could have thermalized in the 380,000 years before
19:00
the CMB light was emitted. It would have literally taken trillions of years. And you might assume that the problem would be solved if the universe were just perfectly uniform right from the start. But if that were the case, we wouldn't see this abstract distribution of galaxies today. The second problem is known as the Flatness Problem. Space in the universe can have different degrees of curvature. The amount of curvature is given by a number called omega. If omega is 1, then space is flat. Parallel lines will stay parallel forever. If omega is less than 1, space is negatively curved. These parallel lines will diverge. And if omega is greater than 1, space is positively curved. Those very same parallel lines will converge. When we measure the curvature of space in real life, it's nearly perfectly 1. This prediction of a flat, expanding space is inherently really unstable. If there's any slight deviation from 1 in either direction, it would rapidly diverge away from that value, like a pencil balanced on its tip falling over. And since we measure it as 1 today,

20:04

it must have been unimaginably close to 1 in the distant past. If omega wasn't 1, the consequences would be catastrophic. The universe could tear itself apart or collapse and destroy itself. So why is the universe so flat? The third is known as the monopole problem, and it was pointed out by particle physicists. At such high energies like those that would have been present in the early universe, a huge number of these strange particles called magnetic monopoles should have been formed. These are hypothetical isolated magnets with just one polarity, either north or south with no corresponding opposite. The problem is, we have never found even one, and they would have been so heavy that they would have prevented the universe from expanding. And beyond these problems, there was still the singularity. Most physicists felt something had to be off, that these were just artifacts of the mathematics. Einstein even called the idea that the universe started at the Big Bang singularity repugnant. By this point in our story, everything had started to come to a head. Hawking and Penrose's proof of the singularity hinged on four assumptions.

21:06

Gravity is always attractive. The universe has three space dimensions and one time dimension. Time travel into the past is impossible. And Einstein's theory of general relativity describes the evolution of the universe at all scales. And now every single one of them is in doubt, especially the fourth. We know that GR has some big problems when it comes to those interactions where it disagrees with quantum mechanics. Both Hawking and Penrose have disavowed many of these assumptions. Their singularity proof that time started at the Big Bang had fallen apart. It's clear that we needed something more, something better than the Big Bang singularity. Our solution would come from a brilliant physicist The Inflation Revolution named Alan Guth. Guth was thinking about phase transitions in ordinary physics. Ice cubes turning into liquids as they melt. If you then heat it more, you get steam. These are phase transitions. But there are some strange kinds of phase

22:01

transitions too. If liquid water is pure enough, it can be cooled down below the normal freezing point, delaying the phase transition in a process known as supercooling. In the Big Bang, it was thought that the universe cooled down from an infinite temperature as it expanded. But this cooling would give us the monopole problem. So what if we could delay it like we can with water? They calculated that if the cooling is delayed a bit, the monopole problem disappears. They just don't get created. The question then becomes, what does this supercooling do to the expansion rate of the universe? Well, you might think of empty space as, well, what it sounds like. Just completely empty. But quantum mechanics has shown us that it really is a sea of chaotic activity. Hidden from us, there's a layer of quantum fields, each one corresponding to a specific particle. An electron field, a quark field, you get it. When there's a ripple in that field, we get the particles that make up you and I. Our electrons

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(07)- The horizon problem. Since then, we have mapped the CMB with extremely high precision and measured the temperature difference across the entire sky. And it is almost perfect. The entire signal is practically exactly 2.7 degrees Kelvin, no matter where you look. The problem is that there was not nearly enough time for the temperature to pass from one side of the universe to the other and for everything to perfectly equalize. Even traveling at the speed of light, there was no way that two points of the CMB on opposite sides of the universe could have thermalized in the 380,000 years before the CMB light was emitted. It would have taken literally trillions of years. And one would assume that the problem would have been solved if the universe had been perfectly uniform from the beginning. Well, that was when it was in the form of a “boiling foam” … $k=\infty$ at $t = 0$. But if that were the case, we wouldn’t see this abstract arrangement of galaxies today. The second problem is known as the **flatness problem**. Space in the universe can have different degrees of curvature. Sure. The curvature scale also includes $k=0$; $k= \infty$. The degree of curvature is given by a number called omega. If omega is 1, then space is flat. And before the big bang… $k=0$ Parallel lines will remain parallel forever. **Well…well not forever. One day the big bang will come**. So not forever. If omega is less than 1, space is negatively curved. These parallel lines will diverge. And since it was flat before BB (omega 1) it must have been positively curved in BB and after. And if omega is greater than 1, space is positively curved. These same parallel lines will converge. And I believe that. When we measure the curvature of space in real life, it is almost a perfect 1. Yes, spacetime is expanding towards flatness. This prediction of a flat, expanding space is inherently very unstable. ?? If there is any slight deviation from 1 in any direction, it would quickly deviate from that value, like a pencil balanced on its tip tipping over. And since we measure it as 1 today,

20:04

must have been >in the distant past< unimaginably close to 1. That is, before BB. If omega were not 1, the consequences would be catastrophic. The universe could tear itself apart or >collapse< and be destroyed. When spacetime with $k=0$ collapses, then $k=0$ –—> $k= \infty$. So why is the universe so flat? It is very flat, but not “sigma =1”. The third proble| is known as the monopole problem? and particle physicists pointed it out. At such high energies as would be present in the early universe, a huge number of these >strange particles called magnetic monopoles< should be created. Why should they be created? Maybe they were created and then quickly disappeared or transformed into something else. Don't you think so?? They are hypothetical isolated magnets with only one polarity, either north or south, without a corresponding opposite point. The problem is that we have never found one and they would be so heavy that they would prevent the expansion of the universe. Monopolys are not and probably never have been. Why would they have to be??... ?? And besides these problems there was still the singularity. If there are millions of these singularities, then such a state is a giga-singularity, and it is a “big final location”… which will eventually end up as “infinite two-dimensional spacetime without matter” and…and then again $k=0$ –—> $k= \infty$, without monopoles. Most physicists felt that something must be wrong, that these were just artifacts of mathematics. Einstein even called the idea that the universe began with a Big Bang disgusting. O.K. The universe did not begin with a big bang, the universe existed before the BB as a two-dimensional infinite space-time without matter, without the passage of time, without expansion (unfolding dimensions), without fields, without laws. At this point in our story, everything began to take shape. Hawking and Penrose's proof of the singularity relied on four assumptions. Error. The Big Bang existed, but the singularity did not. The past state of the Universe was "**infinite two-dimensional space-time without matter**" and therefore such a state was not essentially the Universe, it was "only" space-time. The Universe "comes into being" only when matter appears in it. And that happened only after the BB.

21:06

Gravity is always attractive. And that's why there are no monopolies. The universe has three spatial dimensions and one time dimension. Error. Until you fix the error you will have problems. The universe has 3+3 dimensions**. Time travel to the past is impossible. Sure, in the macro world; but in the micro world it is possible and also that "time backwards" is manifested there, in interactions. And Einstein's theory of general relativity describes the development of the universe in all scales. Therefore, someone should show that in the microworld on Planck scales, time has a “curving and uncurving” of curvature, or flow – the flow of time, backwards and forwards. I can’t do it, I’m a bad mathematician. And now each of them is questionable, especially the fourth one. ?? We know that general relativity has some big problems when it comes to those interactions where it disagrees with quantum mechanics. Ha-ha… Both Hawking and Penrose distanced themselves from many of these assumptions. Their proof of the singularity that time began with the Big Bang fell apart. It’s clear that we needed something more, something better than the Big Bang singularity. Sure. The solo singularity is a mistake. The Big Bang happened “at a location in spacetime”, not “at a point” = a solo singularity. And when you consider that the “Locality” in spacetime before BB can be almost infinite, then it’s God’s idea… and it means eliminating the “solo-singularity” from all the eons of R.Penrose. Our solution would come from a brilliant physicist named **Alan Guth**. Guth was thinking about phase transitions in ordinary physics. Ice cubes turn into liquids when they melt. If you then heat them up more, you get steam. These are phase transitions. But there are some special kinds of phase transitions. If liquid water is pure enough, it can be cooled below its normal freezing point, delaying the phase transition in a process known as supercooling. At the Big Bang, the universe was thought to have cooled from an infinite temperature as it expanded. But this cooling would give us the monopole problem. So what if we could delay it, like we can with water? They calculated that if the cooling is delayed a little, the monopole problem disappears. They simply will not arise. And they will also not arise in the “finite space-time locality” in the pure pre-big-bang space-time with k=0. The question then is what this undercooling (k= ∞) does to the expansion rate of the universe? **Well, maybe** you imagine empty space, as it actually sounds. Just completely empty. !!! Without matter, as in the state of cp before BB. But quantum mechanics has shown us that it is actually a sea of chaotic activity. However, only in BB and later… A layer of quantum fields is hidden from us, each of which corresponds to a specific particle. Electron field, quark field, you understand. Plasma is a chaos of curvatures of dimensions, in which “stop-states” of curvatures are born as “packages” that never change. The electron was born as a package of curved dimensions a hundredth of a second after the Big Bang and will remain so forever. And so will other elementary particles, and…and if the “proton package” changes, what is it?, then it is no longer a proton, but “quark packages”…etc. When a wavelet appears in this field, we get the particles that make you and me. Our electrons

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(08)- come from this underlying field. In this empty space, particles and antiparticles like

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electrons and positrons pop in and out of existence all the time, briefly moving apart before reuniting and disappearing back into the vacuum of the quantum fields. It's these quantum interactions that gives the vakuum of empty space a tiny little bit of energy. And remember, energy and mass are the same thing. So if you have enough empty space and can extract the energy from the vacuum, you can get enough mass to create you, me, or even the entire universe. Guth started to calculate how quickly the universe would expand if it were driven by the energy of this empty vacuum of space, and the rate was insane. The universe in a tiny fraction of a second would expand by at least a hundred trillion trillion times. He immediately realized that this insane period of growth would immediately fix the flatness problem. By using this period of rapid growth, the equations got flipped upside down. The value of omega, representing the curvature of the universe, was rapidly driven towards one. No matter what shape the universe was initially in, the vacuum energy-driven expansion perfectly flattened

24:04

out the universe. The flatness problem was solved. When he did this calculation, he knew he was onto something big. He wrote spectacular realisation. This kind of supercooling can explain why the universe is so incredibly flat, and therefore resolve the fine-tuning paradox pointed out by Dick. The problem seemed to disappear like magic, all thanks to this period of rapid expansion. Guth named it inflation. The final problem inflation had to solve was the horizon problem, and it was actually quite simple. Since inflation grew the size of the universe by such a huge amount in way less than a fraction of a second, any two points that we see that were too far apart to be able to communicate and come to the same temperature in the old model would have started out much closer together. This gives them time for the photons to go back and forth and arrive at the same temperature. That's why the CMB looks so uniform today. The horizon problem was solved too. This theory of inflation was doing magic tricks.

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It solved the three most pressing problems for the Big Bang just like that, replacing the pesky singularity in the process. And that wasn't even its biggest triumph. When we look out at the CMB, we can see these areas that have a slightly higher density. There's a little bit more of that primordial soup here than in those cold spots. And since gravity always pulls more matter towards these over-dense regions, these little variations explode over billions of years thanks to gravity, giving us the cosmic web of galaxies and structure that we see today. If the CMB were perfectly uniform, the universe would have no galaxies at all. Inflation is driven by the quantum inflation field, and these fields have built-in inherent quantum fluctuations thanks to the uncertainty principle. These quantum fluctuations get frozen into the plasma as the expansion slows down, giving us the variation that we see today. If it weren't for these quantum fluctuations during inflation, there would be no galaxies or structure in the universe today. Combining all of these ideas, we can finally piece together a complete view of what actually

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banged during the Big Bang. We start with empty space. What actually banged? No matter or light, nothing at all. But our empty space is filled with an underlying field, the inflationary field. This field forces that empty space to rapidly increase in size. If it started out to be around the size of a grain of rice, it would have grown to be bigger than our observable universe in less than a trillionth of a trillionth of a single second. Keep in mind, at this point, there is still nothing. Just empty space. And then inflation ends. And bang. Just like that, all of the energy in this inflationary field of empty space gets immediately converted into the matter and light in the universe. This is the hot, dense Big Bang that you were taught about in school. The light we see as the CMB today, and the matter that forms every star, human, galaxy, all of it is formed from the

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vacuum energy in that moment. No need for any singularity at all. But here is the crazy part about inflation. It doesn't end everywhere all at once. It happens in patches. So while inflation might decay into matter and radiation, creating our universe and the Big Bang right here, it can continue inflating outside of our universe, spawning potentially infinite numbers of these

Big Bang universes. And we just happen to be inside one of them. The multiverse is born. End of story? And that is the most widely accepted view of how the universe came to be.
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(08)- come from this fundamental field. In this empty space, particles and antiparticles, such as
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electrons and positrons, are constantly being created and disappearing, and this behavior of the Universe has remained to this day – in the foam of the vacuum, these phenomena still take place… they move apart briefly before reuniting and disappearing back into the vacuum of quantum fields. It is these quantum interactions that give the vacuum of empty space a tiny amount of energy. O.K. And remember, energy and matter are the same thing. So **if you have** enough empty space and you can extract energy from the vacuum, **you can** get enough matter and that's the point… even in HDV, that this mechanism of "curving and unwrapping" dimensions is ***matter-creating***…empty space is still spacetime with $k \neq 0$ and it is capable of this packing of dimensions… to create yourself, me or even the entire universe. Guth began to calculate how fast the universe would expand if it were driven by the energy of this empty vacuum of space, and the speed was insane. The universe would expand at least a hundred trillion trillion times in a fraction of a second. He immediately realized that this insane period of growth would immediately solve the flatness problem. The big bang **is a jump** change from $k=0$ to $k=\infty$ Using this period of rapid growth, the equations were turned upside down. And how would the equations change "according to my idea", i.e. a jump change ?? The value of omega, representing the curvature of the universe, in the macro-universe just conic sections… quickly approached one. No matter what shape the universe had initially, the expansion driven by the energy of the vacuum flattened the universe perfectly. The flatness problem was solved. No. The flatness of $k_1 \neq 0$ only approached the flatness of $k_2 \neq 0$ When he made this calculation, he knew he was onto something big. He wrote up a grand discovery. This kind of supercooling can explain why the universe is so incredibly flat, yet it is not $k = 0$ and thus solve the fine-tuning paradox that Dick pointed out. The problem seems to have disappeared as if by magic, and all thanks to this period of rapid expansion. So there will be no more "periods without rapid expansion"?? or the period of the jump from $k = 0$ to $k \neq 0$ Guth called it inflation. I called it ***"the jump in the curvature of dimensions"***. The last problem that inflation had to solve was the horizon problem, I have also already solved (and perhaps solved) the horizon problem: in the macrocosm, where there is already matter, the curvature towards BB changes slowly, in the microcosm quickly by "packing" dimensions into balls = elementary particles of matter. Matter slows down the expansion... and it was actually quite simple. Since inflation increased the size of the universe by such a huge amount in much less than a fraction of a second, any two points we see that were too far apart to communicate and reach the same temperature in the old model would start out much closer together. This gives them time >for the photons to travel back and forth and reach the same temperature<. That is why the CMB looks so uniform today. The horizon problem has also been solved. This inflation theory did magic tricks.
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It solved the three most pressing problems of the Big Bang, while replacing the pesky singularity. And that wasn't even his greatest triumph. When we look at the CMB, we see these regions of slightly higher density. There's a little more of that primordial soup here than

in these cold places. And because gravity always pulls more matter into these overly dense regions, these small variations explode over billions of years due to gravity, giving us the cosmic web of galaxies and structures that we see today. If the CMB were perfectly uniform, the universe would have no galaxies. Inflation is driven by a quantum inflationary field, and these fields have inherent quantum fluctuations built into them, thanks to the uncertainty principle. These quantum fluctuations freeze into plasma as they expand, giving us the variation that we see today. If it weren't for these quantum fluctuations during inflation, there wouldn't be any galaxies or structure in the universe today. By putting all of these ideas together, we can finally put together a coherent picture of what's really going on.
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struck during the Big Bang. We'll start with empty space. What actually struck? No matter or light, nothing at all. But our empty space is filled with an underlying field, the inflationary field. This field is causing this empty space to expand rapidly. If it were the size of a grain of rice to begin with, it would expand to the size of our observable universe in less than a trillionth of a trillionth of a second. Keep in mind that at this point there's still nothing. Just empty space. And then inflation ends. And bang. Just like that, all the energy in this inflationary field of empty space is instantly converted into matter and light in the universe. This is the hot, dense Big Bang that you learned about in school. The light that we see today as the CMB, and the matter that makes up every star, every person, every galaxy, all of it is created from
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the vacuum energy at that moment. No singularity is needed. But here's the crazy part about inflation. It doesn't end everywhere at once. It happens in little trickles. So while inflation can collapse into matter and radiation, creating our universe and the Big Bang right here, inflation can continue to unfold beyond our universe, potentially spawning an infinite number of these Big Bang universes. And we happen to be inside one of them. The multiverse was born. End of story? And that's the most widely held view of how the universe came into being.
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(09)- Probably not what you were taught, right? When I was taught it two years ago, it was said that inflation happened after the Big Bang. The singularity was still spoken about, and there was really no mention of the multiverse. So case closed. End of story, right? Well, not quite. As you've seen in this video, the field of cosmology is constantly evolving, changing, and new theories are always popping up, claiming to have
28:04
a better, more accurate description of the origin of the universe. While this theory of the inflationary Big Bang is currently the best we have, it doesn't come without its own problems. Some popular critics argue that inflation is just too flexible and not falsifiable enough. In science, theory doesn't mean just an idea like it can mean in everyday language. A scientific theory has to make predictions that can be tested using observations from our telescopes and detectors. But it also predicts the multiverse, something physicists aren't very comfortable with. And before you go commenting saying, ah, physicists can't even agree what the Big Bang is, how are we expected to believe it? Slow down. There are things that we know for a fact to definitely be true. The hot, dense Big Bang, just meaning that everything in the universe used to be really close together and much hotter than it is today, definitely happened. We can literally see it. That is not up for debate. But looking beyond that and trying to answer questions of what caused that hot, dense state

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and what came before it is what's still undecided. The research for this video was largely based on a book called The Battle of the Big Bang. The authors attended a conference about black holes and fundamental physics where all of the attendee are at the cutting edge of this field and surveyed them about what they believe to be true about the beginning of the universe. When they asked them if they believed that the Big Bang was the beginning of time, the majority of them actually agreed it says nothing about when time in our universe began. Alan Guth, the father of this inflation idea, said the Big Bang theory was never actually a theory of the bang. It says nothing about what banged, why it banged, what happened before it banged. And that's probably a good way to think about this description of the Big Bang. I put out a poll on YouTube and Instagram asking people who didn't believe in the Big Bang to tell me why, so hopefully Your problems with The Big Bang we can try and answer some questions. After looking through thousands of responses, it seems like there were really three main problems that

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people had

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(09)- That's not what you were taught, is it? When I was taught this two years ago, they said that inflation occurred after the Big Bang. There was still talk of the singularity, and there was no mention of the multiverse. So, case closed. End of story, right? Well, not quite. As you saw in this video, the field of cosmology is constantly evolving, changing, and new theories are constantly emerging that claim to have

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a better and more accurate description of the origin of the universe. While this inflationary Big Bang theory is the best we have at the moment, it's not without its problems. Some popular critics argue that inflation is simply too flexible and not falsifiable enough. In science, a theory doesn't just mean an idea, as it might mean in everyday language. "A scientific theory must make predictions that can be verified by observations from our telescopes and detectors." But it also predicts a multiverse, which is something that physicists are not very happy about. And before you start commenting that physicists can't even agree on what the Big Bang is, how are we expected to believe it? Slow down. There are things we know for sure to be true. —–> A hot, dense Big Bang, meaning that everything in the universe used to be really close together and much hotter than it is today, definitely happened. This talk is not far from my HDV, that is, the vision of a "jump change" of dimensions from k = 0 to k = ∞. What is truer? We can literally see it. That is not up for debate. But looking beyond and trying to answer the questions **what caused this hot, dense state**

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and what came before it is still undecided. What caused it? The principle of alternating symmetries with asymmetries "intervened" and carried out cyclic Universes, when from the singularity with k = 0 the genesis progresses to k = infinity and "there" there is an absolute flatness k = 0 and that "sometimes" changes to k =∞ and … and this goes on and on – that is the reason "what" caused that hot state, that dense plasma, that singularity, that genesis of the structure of matter…, etc.** The research for this video was largely based on the book called The Battle for the Big Bang. The authors attended a conference on black holes and fundamental physics, where all the participants are at the forefront of this field, and conducted a survey among them about what they consider to be true about the beginning of the universe.

When asked if they believed the Big Bang was the beginning of time, most of them actually agreed that it says nothing about when time in our universe began. This is definitely a flawed view. Ad 01) The VT was not the beginning of time, but was the beginning of the flow - the passage of time. Ad 02) Time in our universe does not begin, but the flow - the passage of time begins. So physicists, even the "best" ones, get Nobel Prizes and they >**ban**< me and forbid me from saying HDV... and insult and humiliate me.** Alan Guth, the father of this inflationary theory, said that the Big Bang theory was never really a Bang theory. It says nothing about what went bang, why it went bang, what happened before it went bang. And that's probably a good way to think about this description of the Big Bang. **It's sad... that in 44 years I haven't found anyone to read my HDV and offer to elaborate on it. Sad... I posted a poll on YouTube and Instagram **asking people who didn't believe in the big bang to tell me why**, I've been writing my opinion online for 22 years... and I wrote it until May 2024 when the rabid haters **blocked** me from YouTube and from joining the debates... https://www.hypothesis-of-universe.com/docs/j/j_236.pdf ; https://www.hypothesis-of-universe.com/docs/j/j_235.pdf ;

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