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1: No Big Bang? Quantum equation predicts universe has no beginning

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Paul Matt Sutter â€" why do we call the Big Bang a singularity, when we also call black holes singularities? The Universe is filled with coincidences. Or like the plot of Force Awakens and every other Star Wars movie, the coincidences are everywhere. Follow along with me here. Singularity, singularityâ€¦ where have we heard that word before? Apart from Ray Kurzweil and his crew of technological singularitarians. That word comes up when we discuss the formation of the Universe; the Big Bang. Back at the beginning, And then, in a fraction of a second, everything expanded outward. Astronomers call this region of infinite density the Big Bang singularity. Was the Big Bang singularity just a really big black hole singularity? A black hole with all the mass of the Universe inside it? Did the whole Universe start off from a really massive black hole? In as far as we know, these kinds of things, these breakdowns in the mathematics, happen in two places. But in the early universe, we have a different solution â€" we have a different thing going on. But in the early universe, things are changing. Either the stuff in the universe causes the stuff to collapse and contract, or the stuff in the universe causes the universe to expand. And it depends on what the universe is made of, and it turns out, handily enough, that the universe is made of the kind of stuff that makes it expand. Could Black holes have formed in the Early Universe because it has such high densities? Oh yeah, very clever, Fraser. Maybe in those early microseconds. But in order to make that black hole form, you had to have a little bit of extra stuff like in a pocket, like an extra gas cloud or a star, a little bit higher density than normal. Then gravity can work, and start pulling in more stuff, and more stuff, and more, building and building until you get the gravitational collapse that leads to a black hole. But in the early universe, everything was uniform. There were no differences in gravity. It all cancels each other out. Top-down illustration of a black hole 4. Right now the universe is expanding â€" will it someday collapse? And that, well, that kinda sucks. If you took the mass and energy of the entire Universe and turned it into a black hole, it would have almost the exact same density as the Universe itself, and an event horizon larger than the observable Universe. So does that mean that we are, in fact, living inside a black hole? Could we tell the difference?

2: Big Bang, dark matter and black holes killed by math

Big Bang, Black Holes, No Math is a one-of-a-kind publication that shares with the reader just how exciting the universe has been throughout its history in a way non-majors can understand, enjoy and appreciate.

Milestones of a life in physics By Submitted by Marianne on March 28, This article first appeared as a feature on the website of the Cambridge Mathematics Faculty. Ask a physicist about the same concepts and he or she will tell you they are accepted components of our theory of the Universe. When Stephen Hawking started his career in the early s neither of these two statements was true. The fact that they are now is to no small extent due to Hawking himself. At the beginning of s the idea that the Universe might have sprung from an extremely hot and dense beginning â€" a Big Bang â€" was hardly more than scientific speculation, much like the entire field of cosmology was barely considered a legitimate part of science. The then accepted theory of the history of the Universe, the steady state theory, held that the Universe had existed forever. Indeed, had Hawking been allowed to study under the PhD supervisor of his choice, the astronomer Fred Hoyle, he would have been drawn into defending this theory. As it happened, he helped to demolish it. From the Big Bangâ€¦ The discovery of the cosmic microwave background CMB radiation in provided the first nail in the coffin of the steady state theory. A map of the cosmic microwave background CMB formed from data taken by the Planck spacecraft. The varying colours represent tiny variations of the temperature of the CMB. These variations that give important clues about the nature of the Universe. ESA and the Planck Collaboration. Having begun his studies under Dennis Sciama instead of Hoyle, and influenced by the eminent Roger Penrose, Hawking began to investigate whether the general theory of relativity necessarily implied that the Universe started in an initial singularity. Another alternative to the steady state theory was that of a cyclical Universe, which eternally contracts to a hot and dense Big Bang-like state and then expands again. Working with George Ellis and Roger Penrose, Hawking eventually arrived at his famous singularity theorem: By the beginning of the s Big Bang theory was fully accepted. Apart from its theoretical foundations, the Big Bang even owes its name to Hawking. Black holes can arise, for example, when a massive star collapses under its own gravity. Among other things, he discovered the notion of an event horizon of a black hole, the boundary of no return that surrounds the central singularity. He also proved his famous area theorem, which states that, no matter what happens to a black hole, the area of its event horizon can never become smaller. This hinted to a curious connection to a different part of physics, picked up by the young physicist Jacob Bekenstein: After a good run of work on black holes by Hawking and others, Hawking thought the field was all wrapped up. You should think of them as fossils of the Big Bang. If you could find them they would provide an important clue to the origin of the Universe. While working with Gibbons, Hawking realised that even neutral, non-rotating primordial black holes would lose mass and would have evaporated long before our time. This amounted to a revolutionary statement. Hawking went on to formulate a thermodynamic theory of black holes, the central equation of which is the famous Bekenstein-Hawking entropy formula. With many more gravitational wave detections expected [If an object falls into a black hole, is the information that comes with it lost, or can it be recovered from the radiation when the black hole evaporates? If it were lost then a fundamental law of physics, the second law of thermodynamics, would be violated. This information paradox hugely intrigued Hawking. During the last years of his life Hawking, Malcolm Perry and Andrew Strominger worked hard on a mechanism that explains how information may be recovered. Just as the singularity theorems applied to the "local" phenomenon of black holes and the "global" phenomenon of the Big Bang, his black hole radiation result may also illuminate the history of the Universe in its entirety. Remarkably, Hawking and Gibbons realised that the Universe as a whole could, in some sense, be regarded as a black hole turned inside-out. One of the major mysteries about the Universe at the time was how the large-scale structures we see today â€" planets, stars, galaxies â€" came into being. The Hawking-Gibbons idea of an inside-out black hole helped make precise a theory that resolves this mystery. The theory explains how quantum fluctuations that occurred at a time when the Universe was undergoing a period of rapid expansion could have seeded the large structures we see today. That period of expansion was called inflation and was first suggested by the physicist

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Alan Guth. Fanciful as it may sound, the idea is more than just pure theory. The theory of inflationary fluctuations now has excellent observational evidence, particularly from the cosmic microwave sky as observed in increasing precision by the COBE, WMAP and Planck satellites. Physicists hope that current and future experiments looking for the signatures left by gravitational wave in the CMB will offer further insights about the nature of inflation and early epochs of the Universe, and even about the fundamental structure of the Universe. By their very definition black holes are linked to the force of gravity and therefore described by general relativity, the theory that applies to the Universe at large scales. However, the radiation that emanates from black holes is made of particles, which fall under the jurisdiction of quantum physics. Unfortunately any naive attempt to combine general relativity and quantum physics in a single mathematical framework is doomed to fail: A unified theory of quantum gravity is the holy grail of modern physics. Using approaches that had proved successful both in describing the radiation emanating from black holes and in inflationary theory, Hawking has worked on his own approaches to quantum gravity. It is here that the greatest challenges for future generations lie. There are also suggestions that Hawking has made with James Hartle and some of his students about [All of these questions are a challenge to constructing a theory of quantum gravity. The work that Stephen did [which Gibbons participated in] is very much a low order approximation: During his lifetime cosmology has grown into a fully-fledged precision science, which has seen spectacular advances and is looking forward to more to come. With more observational evidence due to arrive from further analyses of the CMB and from gravitational waves, Hawking leaves us in exciting times and his successors with important ideas to work on. About this article Marianne Freiberger is Editor of Plus. This article first appeared as a feature on the website of the Cambridge Mathematics Faculty.

3: Was the Big Bang just a black hole?

Big Bang, Black Holes, No Math Physics We Need Topic 2: Gravity 1 Big Bang, Black Holes, No Math ASTR/PHYS Dr. David Toback Lectures 10, 11 &

Modified by Ilja Schmelzer Original by John Baez Hawking Radiation In Hawking published a shocking result: Instead, they should glow slightly with "Hawking radiation", consisting of photons, neutrinos, and to a lesser extent all sorts of massive particles. This has never been observed, since the only black holes we have evidence for are those with lots of hot gas falling into them, whose radiation would completely swamp this tiny effect. Still, the effect is theoretically very interesting, and folks working on understanding how quantum theory and gravity fit together have spent a lot of energy trying to understand it and its consequences. The most drastic consequence is that a black hole, left alone and unfed, should radiate away its mass, slowly at first but then faster and faster as it shrinks, finally dying in a blaze of glory like a hydrogen bomb. How does this work? Virtual particle pairs are constantly being created near the horizon of the black hole, as they are everywhere. Normally, they are created as a particle-antiparticle pair and they quickly annihilate each other. In fact this argument also does not correspond in any clear way to the actual computation. The usual computation involves Bogoliubov transformations. Roughly speaking, one gives you particles and the other gives you antiparticles. More subtly, this splitting is implicit in the very definition of the vacuum of the quantum version of the theory! In other words, if you do the splitting one way, and I do the splitting another way, our notion of which state is the vacuum may disagree! This should not be utterly shocking, just pretty darn shocking. The vacuum, after all, can be thought of as the state of least energy. Now when we are in good old flat Minkowski spacetime, a la special relativity, there are a bunch of "inertial frames" differing by Lorentz transformations. These are Bogoliubov transformations. So if there is a black hole around This is what the guy at the talk said Now in fact when you do a Bogoliubov transformation to the vacuum you get a state in which there are pairs of particles and antiparticles, so this is possibly the link between the math and the heuristic explanation. Hopefully whoever made up the usual heuristic explanation understood the link better than I do! References General Relativity , Sections A good precise introduction to the subject. Hawking, Particle creation by black holes, Commun.

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4: Big Bang, Black Holes, No Math

This Lab Manual is designed for a 1-credit hour companion course that goes with a course that uses Big Bang, Black Holes, No Math. It gives students more of a hands-on understanding of the concepts surrounding the Big Bang and Black Holes in an effort to de-mystify them.

Quantum equation predicts universe has no beginning February 9, by Lisa Zyga, Phys. Note on the left the dramatic expansion not to scale occurring in the inflationary epoch, and at the center the expansion acceleration. The scheme is decorated with WMAP images on the left and with the representation of stars at the appropriate level of development. The model may also account for dark matter and dark energy, resolving multiple problems at once. The widely accepted age of the universe , as estimated by general relativity , is In the beginning, everything in existence is thought to have occupied a single infinitely dense point, or singularity. Only after this point began to expand in a "Big Bang" did the universe officially begin. Although the Big Bang singularity arises directly and unavoidably from the mathematics of general relativity, some scientists see it as problematic because the math can explain only what happened immediately afterâ€"not at or beforeâ€"the singularity. Ali and coauthor Saurya Das at the University of Lethbridge in Alberta, Canada, have shown in a paper published in Physics Letters B that the Big Bang singularity can be resolved by their new model in which the universe has no beginning and no end. Old ideas revisited The physicists emphasize that their quantum correction terms are not applied ad hoc in an attempt to specifically eliminate the Big Bang singularity. Their work is based on ideas by the theoretical physicist David Bohm, who is also known for his contributions to the philosophy of physics. Starting in the s, Bohm explored replacing classical geodesics the shortest path between two points on a curved surface with quantum trajectories. Using the quantum-corrected Raychaudhuri equation, Ali and Das derived quantum-corrected Friedmann equations, which describe the expansion and evolution of universe including the Big Bang within the context of general relativity. Ali and Das also expect their results to hold even if and when a full theory of quantum gravity is formulated. No singularities nor dark stuff In addition to not predicting a Big Bang singularity, the new model does not predict a "big crunch" singularity, either. In general relativity, one possible fate of the universe is that it starts to shrink until it collapses in on itself in a big crunch and becomes an infinitely dense point once again. Ali and Das explain in their paper that their model avoids singularities because of a key difference between classical geodesics and Bohmian trajectories. Classical geodesics eventually cross each other, and the points at which they converge are singularities. In contrast, Bohmian trajectories never cross each other, so singularities do not appear in the equations. In cosmological terms, the scientists explain that the quantum corrections can be thought of as a cosmological constant term without the need for dark energy and a radiation term. These terms keep the universe at a finite size, and therefore give it an infinite age. The terms also make predictions that agree closely with current observations of the cosmological constant and density of the universe. New gravity particle In physical terms, the model describes the universe as being filled with a quantum fluid. The scientists propose that this fluid might be composed of gravitonsâ€"hypothetical massless particles that mediate the force of gravity. If they exist, gravitons are thought to play a key role in a theory of quantum gravity. In a related paper, Das and another collaborator, Rajat Bhaduri of McMaster University, Canada, have lent further credence to this model. They show that gravitons can form a Bose-Einstein condensate named after Einstein and another Indian physicist, Satyendranath Bose at temperatures that were present in the universe at all epochs. Their future work includes redoing their study while taking into account small inhomogeneous and anisotropic perturbations, but they do not expect small perturbations to significantly affect the results. Ahmed Farag Ali and Saurya Das. Volume , 4 February , Pages â€" Saurya Das and Rajat K. Bhaduri, "Dark matter and dark energy from Bose-Einstein condensate", preprint:

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5: ISBN - Big Bang Black Holes No Math Direct Textbook

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Their discovery offers the first direct data on the creation of the universe. Supplied THE Big Bang theory is the widest known and most broadly accepted scientific explanation of the origins of our universe. It emerged in the s when astronomer Edwin Hubble discovered that almost all galaxies were racing away from each other at ever increasing velocities. The universe was in a state of inflation. Wind back that clock This drawing shows the universe expanding from the time of the Big Bang bottom until long past present time top. No one knows how tall or wide this drawing should go And that appears to have happened. At the heart of every galaxy is a supermassive black hole. These poorly understood phenomena are an integral part of our universe. Black holes are weird beasts. They represent the point at which much of our math breaks down: Nor, on the surface, do black holes appear to have anything in common with the rest of the universe. The known universe is expanding. But dial back time, all its matter contracts to a single point beyond which nothing can bee seen. A black hole is an incredibly dense lump of imploded star. This contracts to a point of such intense gravity not even light can escape. But there is no way to see beyond its event horizon. The other hides behind the event horizon of a black hole. With all that mass and energy concentrated in an infinitely small space A computer simulation of a black hole swallowing a fragmented star. One that goes against much established thought. But we have not yet been able to directly observe black holes. Which means alternative arguments may apply. And the annoying mathematical roadblock of infinity may have a bypass. The idea was formulated in by US physicist James Bardeen. He found an alternative explanation for the general relativity equations used to describe black holes. But it just would not be constant. An artists rendering of the tidal disruption event in F, which is 1. The release of gravitational energy as the debris of the star is accreted by the black hole leads to a flare in the optical light of the galaxy. This means mass â€” the stuff the universe is made of â€” still acts as though it has a physical volume, even though it is still squeezed into a singularity-like space. But he argues scale also plays a part. And once this is incorporated in the equations, the Big Bang evaporates. It eliminates the need for the infintessimally small quantum universe to burst out into physical space The cosmic radiation background reveals the state of the infant Universe, just , years after the Big Bang. The universe races outwards until it reaches a tipping point. The space between the widely dispersed mass acts as a rubber band, reversing its motion. This contraction would continue, with galaxies moving ever faster and ever closer towards a common point. They then merge in a Big Crunch, which produces a rebound But can the idea be tested? He says each contraction and expansion event may not eliminate all evidence of the previous state of the universe. Identifying these would clinch the argument and kill-off the Big Bang theory once and for all.

6: Was The Big Bang Just A Black Hole? - Universe Today

PowerPoint Slideshow about 'Big Bang, Black Holes, No Math ASTR/PHYS Dr. David Toback Lecture 10 & 11' - donnan An Image/Link below is provided (as is) to download presentation Download Policy: Content on the Website is provided to you AS IS for your information and personal use and may not be sold / licensed / shared on other websites.

Without a Big Bang beginning, there are no black holes. Without black holes, there is no dark matter and no dark energy. There is, instead, an infinite stable, universe. Envision energy trajectories that curve and cross each other. Now envision energy trajectories that are straight lines and do not cross. Now see an explosion of energy at the points where the curved energy trajectories cross. There you just created an infinitely dense point in space-time. You have created a singularity at the meeting point of multiple curved energy trajectories. In creating a singularity, you have created a black hole. Black holes absorb whatever crosses their event boundary. In theory, that is. But what if black hole singularities are the result of the math applied to curves? What if different math applied to straight lines eradicates black hole singularities? We would also gain a few things. We would gain a universe with no missing density because it would have a stable state. The universe would be stable because there would be no black hole singularity marking its origination point What would be its origination point, then? We would gain a universe that is infinite with no need for dark matter and dark energy to explain missing density, which is only a problem in an unstable, expanding state expanding from the force of the Big Bang, which is now eradicated. Present Model and New Model of the Universe Present model The present model of the universe theorizes a beginning point and an age for the universe. It theorizes that the universe came after the explosion of an infinitely dense point in space-time a singularity that produced a very big bang projecting the universe outward in all directions. The present model is weakened by this inability to explain the beginning point some suggest a fourth dimensional singularity that erupted into our three dimensional reality or the cause for the big bang that resulted in a finite universe, which is still expanding from that propulsion but which will ultimately lose force so the universe collapses back in on itself to form another black hole singularity an infinitely dense point. The theoretical model is disrupted by the observation that the universe is continuing to expand. Enter dark energy and dark matter as the sources of this expansionary push and as the explanation for why the universe is not as dense as the model predicts. New model The new model opposes this theoretical view in its entirety. There is no beginning. There will be no end. The universe has no age. There was no singularity. There was no big bang. There was no initial explosive expansion. There are no black holes. There is no missing density. There is no dark matter. There is no dark energy. There is an infinite universe with stable density. Curved lines and their trajectories are called geodesic lines and geodesic trajectories. Geodesic lines are an element of the geometry of curved surfaces, which posits that lines extending from curved surfaces are themselves curved. Random curved geodesic trajectories of geodesic lines will eventually cross each other because they are not parallel since they curve in response to a curved surface. Straight lines and their trajectories are called Bohmian lines and Bohmian trajectories for David Bohm and describe quantum particle wave functions. Bohmian lines reflect straight line geometry of flat surfaces. Random straight Bohmian trajectories of Bohmian lines cannot cross each other because they are parallel across a flat surface. Singularities appear at the points where the trajectories cross in equations applying geodesic curving trajectories. If trajectories cross, singularities appear in the equations. If trajectories do not cross, no singularities appear in the equations. Singularities do not appear in equations applying Bohmian quantum wave trajectories because there are no points where trajectories cross. If there are no crossing trajectories and no singularities appearing in the equations, then there is a new model of the universe that does not encompass a beginning and an ending, which originate and culminate in singularities big bang beginning and big crunch ending are gone. This gave quantum-correction to the Raychaudhuri equation the foundation of singularity physics making it responsive to quantum, rather than geodesic, trajectories. This resulted in quantum-correction to Friedmann equations significant in representing the expansion of space at the time of and following â€” but not before â€” the Big Bang as a consequence of correcting geodesic to Bohmian trajectories. Mersini-Houghton sought to resolve the Einstein information loss paradox. In the process she mathematically proved that collapsing stars cannot collapse to an infinitely dense point to form black hole singularities. Black hole singularities cannot exist. She concludes that since singularities cannot form, the fabric of space-time needs to be reexamined and the model of the origin of the universe needs to be rethought. These are the two things Ali and Das achieve. They approach space-time as flat, not curved, and they propose a model of the universe without a beginning, without a singularity that explodes. The work not only forces scientists to reimagine the fabric of space-time, but also rethink the origins of the universe.

7: Hawking Radiation

Straight lines in the universe eradicate a big-bang beginning to the universe. Without a Big Bang beginning, there are no black holes. Without black holes, there is no dark matter and no dark.

Original by Philip Gibbs, Is the Big Bang a black hole? This question can be made into several more specific questions with different answers. Why did the universe not collapse and form a black hole at the beginning? Sometimes people find it hard to understand why the Big Bang is not a black hole. After all, the density of matter in the first fraction of a second was much higher than that found in any star, and dense matter is supposed to curve spacetime strongly. At sufficient density there must be matter contained within a region smaller than the Schwarzschild radius for its mass. Nevertheless, the Big Bang manages to avoid being trapped inside a black hole of its own making and paradoxically the space near the singularity is actually flat rather than curving tightly. How can this be? The short answer is that the Big Bang gets away with it because it is expanding rapidly near the beginning and the rate of expansion is slowing down. Space can be flat even when spacetime is not. So the total curvature of spacetime is related to the density of matter, but there is a contribution to curvature from the expansion as well as from any curvature of space. The Schwarzschild solution of the gravitational equations is static and demonstrates the limits placed on a static spherical body before it must collapse to a black hole. The Schwarzschild limit does not apply to rapidly expanding matter. What is the distinction between the Big Bang model and a black hole? These can describe open or closed universes. Black holes also have singularities. Furthermore, in the case of a closed universe no light can escape, which is just the common definition of a black hole. So what is the difference? The first clear difference is that the Big Bang singularity of the FRW models lies in the past of all events in the universe, whereas the singularity of a black hole lies in the future. The Big Bang is therefore more like a "white hole": According to classical general relativity white holes should not exist, since they cannot be created for the same time-reversed reasons that black holes cannot be destroyed. But this might not apply if they have always existed. A white hole has an event horizon that is the reverse of a black hole event horizon. Nothing can pass into this horizon, just as nothing can escape from a black hole horizon. Roughly speaking, this is the definition of a white hole. Notice that it would have been easy to show that the FRW model is different from a standard black- or white hole solution such as the static Schwarzschild solutions or rotating Kerr solutions, but it is more difficult to demonstrate the difference from a more general black- or white hole. The real difference is that the FRW models do not have the same type of event horizon as a black- or white hole. Outside a white hole event horizon there are world lines that can be traced back into the past indefinitely without ever meeting the white hole singularity, whereas in an FRW cosmology all worldlines originate at the singularity. Even so, could the Big Bang be a black- or white hole? In the previous answer I was careful only to argue that the standard FRW Big Bang model is distinct from a black- or white hole. The real universe may be different from the FRW universe, so can we rule out the possibility that it is a black- or white hole? I am not going to enter into such issues as to whether there was actually a singularity, and I will assume here that general relativity is correct. The black hole singularity always lies on the future light cone, whereas astronomical observations clearly indicate a hot Big Bang in the past. The possibility that the Big Bang is actually a white hole remains. The major assumption of the FRW cosmologies is that the universe is homogeneous and isotropic on large scales. That is, it looks the same everywhere and in every direction at any given time. There is good astronomical evidence that the distribution of galaxies is fairly homogeneous and isotropic on scales larger than a few hundred million light years. The high level of isotropy of the cosmic background radiation is strong supporting evidence for homogeneity. But the size of the observable universe is limited by the speed of light and the age of the universe. We see only as far as about ten to twenty thousand million light years, which is about times larger than the scales on which structure is seen in galaxy distributions. Homogeniety has always been a debated topic. The universe itself may well be many orders of magnitude larger than what we can observe, or it may even be infinite. Astronomer Martin Rees compares our view with looking out to sea from a ship in the middle of the ocean. As we look out beyond the local disturbances of the waves, we see an apparently endless and featureless seascape. From a ship the horizon will be only a few miles away, and the ocean may stretch for hundreds of miles before there is land. When we look out into space with our largest telescopes, our view is also limited to a finite distance. No matter how smooth it seems, we cannot assume that it continues like that beyond what we can see. So homogeneity is not certain on scales much larger than the observable universe. We might argue in favour of it on philosophical grounds, but we cannot prove it. In that case, we must ask if there is a white hole model for the universe that would be as consistent with observations as the FRW models. Some people initially think that the answer must be no, because white holes like black holes produce tidal forces that stretch and compress in different directions. Hence they are quite different from what we observe. This is not conclusive, because it applies only to the spacetime of a black hole in the absence of matter. Inside a star the tidal forces can be absent. A white hole model that fits cosmological observations would have to be the time reverse of a star collapsing to form a black hole. To a good approximation, we could ignore pressure and treat it like a spherical cloud of dust with no internal forces other than gravity. Stellar collapse has been intensively studied since the seminal work of Snyder and Oppenheimer in and this simple case is well understood. It is possible to construct an exact model of stellar collapse in the absence of pressure by gluing together any FRW solution inside the spherical star and a Schwarzschild solution outside. Spacetime within the star remains homogeneous and isotropic during the collapse. It follows that the time reversal of this model for a collapsing sphere of dust is indistinguishable from the FRW models if the dust sphere is larger than the observable universe. In other words, we cannot rule out the possibility that the universe is a very large white hole. Only by waiting many billions of years until the edge of the sphere comes into view could we know. It has to be admitted that if we drop the assumptions of homogeneity and isotropy then there are many other possible cosmological models, including many with non-trivial topologies. This makes it difficult to derive anything concrete from such theories. But this has not stopped some brave and imaginative cosmologists thinking about them. One of the most exciting possibilities was considered by C. Hellaby in , who envisaged the universe being created as a string of beads of isolated while holes that explode independently and coalesce into one universe at a certain moment. This is all described by a single exact solution of general relativity. There is one final twist in the answer to this question. It has been suggested by Stephen Hawking that once quantum effects are accounted for, the distinction between black holes and white holes might not be as clear as it first seems. This is due to "Hawking radiation", a mechanism by which black holes can lose matter. See the relativity FAQ article on Hawking radiation. A black hole in thermal equilibrium with surrounding radiation might have to be time symmetric, in which case it would be the same as a white hole. This idea is controversial, but if true it would mean that the universe could be both a white hole and a black hole at the same time. Perhaps the truth is even stranger. In other words, who knows? Misner, Thorne and Wheeler, Gravitation, Freeman An excellent book giving a comprehensive guide to inhomogeneous cosmologies including white hole solutions is Andrzej Krasinski Inhomogeneous cosmological models, Cambridge University Press The seascape analogy of Martin Rees can be found in his excellent book: Before the Beginning, Our universe and others, Simon and Schuster, My thanks go to Andrzej Krasinski for useful information about inhomogeneous cosmologies.

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8: Physicist Claims to Have Proven Mathematically That Black Holes Do Not Exist | IFLScience

The Big Bang is therefore more like a "white hole": the time-reversed version of a black hole. According to classical general relativity white holes should not exist, since they cannot be created for the same (time-reversed) reasons that black holes cannot be destroyed.

Was the Big Bang just a black hole? Paul Matt Sutter â€" why do we call the Big Bang a singularity, when we also call black holes singularities? The universe is filled with coincidences. Or like the plot of Force Awakens and every other Star Wars movie, the coincidences are everywhere. Follow along with me here. Singularity, singularityâ€¦ where have we heard that word before? Apart from Ray Kurzweil and his crew of technological singularitarians. That word comes up when we discuss the formation of the universe; the Big Bang. Back at the beginning, And then, in a fraction of a second, everything expanded outward. Astronomers call this region of infinite density the Big Bang singularity. Was the Big Bang singularity just a really big black hole singularity? A black hole with all the mass of the universe inside it? Did the whole universe start off from a really massive black hole? In as far as we know, these kinds of things, these breakdowns in the mathematics, happen in two places. But in the early universe, we have a different solution â€" we have a different thing going on. But in the early universe, things are changing. Either the stuff in the universe causes the stuff to collapse and contract, or the stuff in the universe causes the universe to expand. And it depends on what the universe is made of, and it turns out, handily enough, that the universe is made of the kind of stuff that makes it expand. Black Hole Grabs Starry Snack 3. Could Black holes have formed in the Early universe because it has such high densities? Oh yeah, very clever, Fraser. Maybe in those early microseconds. But in order to make that black hole form, you had to have a little bit of extra stuff like in a pocket, like an extra gas cloud or a star, a little bit higher density than normal. Then gravity can work, and start pulling in more stuff, and more stuff, and more, building and building until you get the gravitational collapse that leads to a black hole. But in the early universe , everything was uniform. There were no differences in gravity. It all cancels each other out. Right now the universe is expanding â€" will it someday collapse? And that, well, that kinda sucks. If you took the mass and energy of the entire universe and turned it into a black hole, it would have almost the exact same density as the universe itself, and an event horizon larger than the observable universe. So does that mean that we are, in fact, living inside a black hole? Could we tell the difference?

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No black hole - they don't come onto the scene until much, much later in the evolution of the universe, and by that time, the universe is so big, the black holes can't affect the overall.

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