On Black Holes and Inflation

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This paper / essay is derived from ideas I conceived about year 2000 or before and dramatically improved on 27 December 2016. That is when I made the leap from the concept of a black hole having an upper limit to what that might mean for the universe, the big bang, and the fabric of space time.

The concepts proposed here are a bit radical. The reader is asked to "suspend disbelief" to some degree before reading this for the first time. If, on first reading, your intent is to shoot it down, then feel free to declare success (at shooting this down) and stop now. On the other hand, are you are at least a bit receptive to new ideas? Are you are able to think: Ok, this is different, but maybe the basic concept is possible. Are you able to wonder: What if? Maybe for a little while? If so, please continue.

Black Holes

Begin this concept with all the rules and laws you know about physics. Do not change anything. Add one more law:

There is an upper limit to the size of a black hole. An upper limit means that there is some limit to the mass than can be placed within a single location of space time. There simply cannot exist more matter than this limit within some confines of space time. That creates an immediate paradox. Presume there is a black hole near that upper limit. Presume further that there is additional mass moving towards that black hole, and that when the masses are combined they exceed the upper limit. How is that resolved?

I have no estimate for that upper limit, but a thought experiment may proceed with incomplete knowledge.

Discussion

The conditions inside of a black hole are an unknown. They can be said, to understate the case, to be extreme. I presume that the greater the mass of the black hole the greater than extremes inside it. I then presume that as a black hole becomes ever larger, and the internal conditions become ever more extreme, there comes a point where the conditions are so extreme that matter simply cannot exist. Matter is energy, a solidified state of energy. If we were able to squeeze matter so hard that it could not exist, there is only one possible result:

The matter translates into energy.

What happens then?

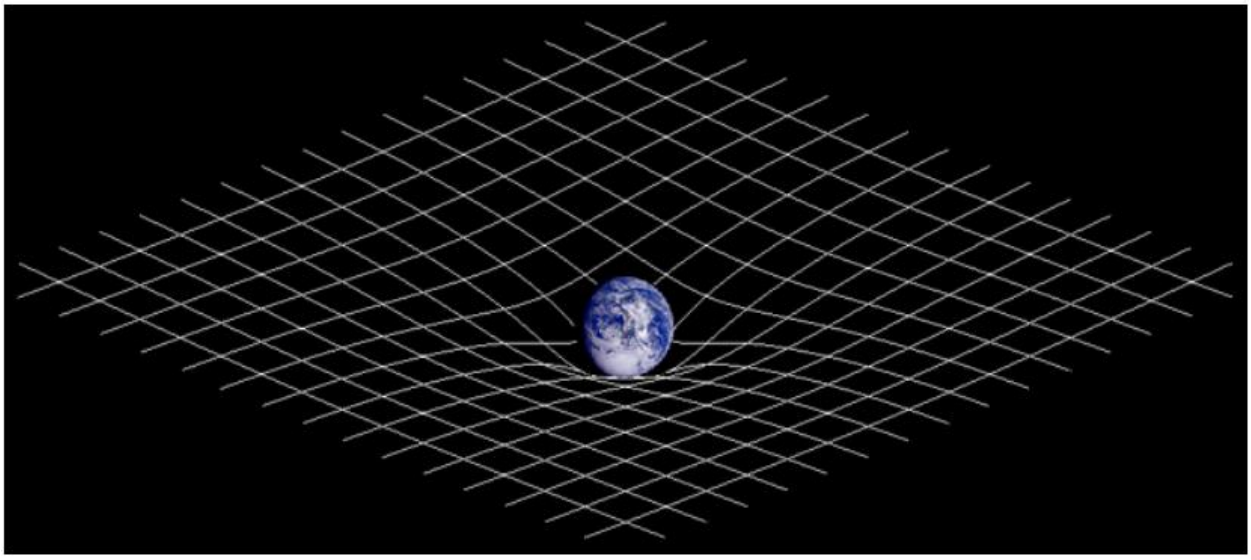
There is now no mass. There is no gravity. Just a huge amount of energy. In a relatively small space. What happens next? The energy is unconstrained and begins expanding. It explodes. It explodes with the energy of thousands to billions of galaxies. Not billions of solar masses, billions of galaxies.

Space Time Distortion

Before considering the results of this explosion, consider the often used metaphor for how mass distorts space-time.

Here is a nice site: http://physics.stackexchange.com/questions/3009/how-exactly-does-curved-space-time-describe-the-force-of-gravity

From that page is this screen capture:



We see that the lines are stretched and distorted by the mass of the earth in the center. Several items merit discussion. The image is shown relative to earth surface gravity with the image of the earth weighing down and stretching the lines representing space. A knowledgeable observer is aware that the distortion is not "down" but is expressed in all directions. It is a two dimensional drawing of a three dimensional concept.

The more important part is that, close to the image of earth, the lines representing space, and I presume, time, are not stretched as shown in the drawing. Rather the distortion should be shown such that the lines of space are drawn in towards the mass and compressed. The mass of earth, in a sense, reaches out and draws in space itself. Those lines should be drawn closer together near the earth. As one moves further from the earth, the effects of the mass of earth are reduced, the lines will be stretched apart rather than compressed. When we moves sufficiently far from earth the lines return to then "normal" spacing and are once again straight resuming their **normal** spacing.

Increase the mass up to that of one solar mass. Adjust the scale of our drawing such that at the edges the lines of space resume their normal paths, that is to say the paths they would have taken without the mass of the sun. The lines of space near the sun are more distorted and the areas than can easily be seen as distorted will extend out further. If the lines at the edges of the drawing show undistorted space and time then the lines maybe halfway between the sun and the edge of the drawing are spread apart.

Increase the mass until there is a black hole in the center of our space time map. Now, I presume, at the event horizon the lines of space time are outright broken and rejoin to form circles around the black hole. Maybe the black hole created new lines of space time, again resulting in circular lines around the black hole. In either case, there would be a line of demarcation, from the circular lines at and within the black hole and its event horizon, to the bent lines that approach the event horizon but still go around it then continue their journey.

Begin increasing the mass of the black hole and calculating and observing the lines of space time around it. As the mass of the black hole increases, more and more of the lines of space time will be drawn in towards it. Space time much further away will be stretched out. Increase the mass to one billion solar masses and beyond. At some point there will, or might be, be a million or more light years of space time compressed into, maybe, what we would have drawn as one light year when there was no mass present.

Increase the mass of that black hole to that of an entire galaxy, and then to thousands of galaxies and even the mass of a billion galaxies. A billion light years of space time might be compressed in the space that is normally occupied by a few

light years, or maybe less than one light year. The pull of this monstrous black hold will stretch out past a billion light years. Space time near and/or in the black hole is compressed to degrees that are truly unimaginable[1].

Now presume that our black hole has the mass of something that approximates all the mass of the universe that we can currently detect and can currently, and reasonably, postulate. That is huge. Maybe rather than just one there might be a cluster or set of these large black holes that together represented the mass of the known universe.

Presume also that at some point in time one or more of them was near the upper limit for a black hole. And that one of them absorbed just a bit more mass and passed that limit. There is now all the mass of the universe consolidated into a single relatively small location. The conditions in that black hole become so extreme, mass can no longer exist as mass.

The mass translates into energy.

Now there exists a huge amount of energy in a small space, no longer constrained by gravity. The result is similar to: **The Big Bang**.

The result is a rather large explosion. The shock wave of that explosion, and the resultant ripples in space time will be equally huge. Nearby black holes of similar size, noting that nearby is a relative term, will be hit by that shock wave and may well be forced to detonate.

Presume there are dozens or more of these huge black holes. The largest ones might detonate or be blown apart. The smaller ones further from the first detonation might endure. The multiple detonations and the colliding shockwaves would cause incredible fluctuations in space time and in the distributions of the mass and energy.

Inflation

In the midst of the conflagration, the previously compressed lines of space time, that is to say extremely compressed, have been released and are expanding back out to something approaching, for lack of a better word, normal. Space time is expanding from billions of light years compressed into what were few light years, or maybe less than one, back out to its normal size. Everything is moving with it, but those things are not moving. Space time itself is expanding. Rather than calling it expanding, we can think of it **rebounding** to a more natural state. A state with significantly less mass per unit of volume.

We might call this: **Inflation**.

Maybe this is why the early universe underwent the period we call inflation. After being hugely compressed by the absolutely huge black holes, space time is rebounding to its normal state.

Returning to our just destroyed black hole, there is a huge amount of energy in a very small space. We might measure that energy via what we call temperature. The temperature at that instant, the moment that all that mass translated into energy, would be extremely high, much more than a measly few hundred million degrees. It might be an energy level that transcends the simple measurement that we call temperature.

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[1] I do not use the word **unimaginable** lightly. When the evening news reports an event of unimaginable horror that is patently false. I can always imagine an event even worse. When we try to think of a black hole with the mass of a billion galaxies, and space time compressed into that relatively small volume, that does becomes unimaginable. Yes, we can calculate numbers that represent that, but numbers such at 10^{50} and 10^{-50} are so large and so small that I suspect few people can really understand them. At that point they do become unimaginable. Well, for me they really are. The ability to do the arithmetic does not guarantee understanding.

The newly liberated energy immediately begins expanding. It expands for two reasons. First, it expands because it is so hot and there is nothing to restrain it. In that case it expands through space time. Second, or maybe first, because space time itself is expanding. When space time itself expands two objects can become further apart at a rate that is greater than C, maybe much greater than C. They do this because they are not moving through space faster than light but because space itself is expanding.

Rebound

Maybe space time is not expanding. That implies that at some point, such as before the big bank, there was no space time. Change perspectives a bit. Maybe it is rebounding. Rebounding to what it was before all that mass was gathered together causing space time to compress. That is in accordance with the concept that there was a time before that black hole became so large. A time during which that black hole accumulated mass. A time before the big bang.

Recycling

The concept here is that the universe, as we imagine the universe, may be a recycling universe. But there is a problem here. Cosmologists of today have concluded that the universe is not only expanding but is expanding at an increasing rate. Than implies that it will not collapse back down into what some call the big crunch or a repeat of the big bang.

Always More Stuff

We humans continue to improve the tools we use to examine the universe. We increase the energy gathering capability of our telescopes to detect ever smaller amounts of energy (radiation) from remote regions of space. We increase the size of those tools increasing their resolution. We create virtual telescopes and radio telescopes to synthesize apertures far larger than we can possibly build physically.

Every time we improve our telescopes, we find more and more galaxies out there, further and further away. Everywhere we look, we find more and more: ***stuff***.

According to this site:

https://phys.org/news/2015-10-big-universe.html

The universe is about 46 billion light years from us to the most distant things we can detect. The light we see from those objects was emitted some 13 billion years ago and is just now reaching us. During those 13 billion years those galaxies have been moving further from us through space time and, I conjecture, space time has continued to expand moving them even further away.

As space time is expanding, if there is something beyond those furthest galaxies it would not have been possible for light to have reached us. This leads to additional thought.

More Universes

Here we arrive at a problem with the definition of the words we use. A quick search for definition of universe yields this definition:

All existing matter and space considered as a whole; the cosmos. The universe is believed to be at least 10 billion light years in diameter and contains a vast number of galaxies; it has been expanding since its creation in the Big Bang about 13 billion years ago.

A pedantic view means that the word universe includes all things. That view includes all things that we cannot detect and maybe even cannot imagine, or just have not yet imagined. With that view anything we might imagine is already part of the universe.

However, it has not been long since we thought of our earth and sun as being all that existed. The stars we saw were nothing more than decorations put in our one and only sky. We even thought that the sun was here just for the earth. We gradually expanded our view to our solar system, then our Milky Way galaxy, and now to all the galaxies that we can detect. All that is included within the concept of our universe. It may now be time to expand our view again. What we think of as the universe may be only one segment of all that exists. There may well be more "universes" out there somewhere. Our definition of the word universe as containing everything that exists may well be far too self-centric. There may well be more "universes" out there.

Consider this possibility. Suppose we were able to move in a straight line some 46 billion light years from here. Would we then see the edge of the universe? I posit: No. We would see: **more stuff**. Maybe we would see someone else's universe out there. Maybe there are galaxies from their universes coming this way. As our universe expands, it does not expand into cold nothingness. There is other stuff out there, coming this way. I posit that this concept continues on without end. There is no end of the existence. Maybe use the plural to state there are no end of the universes. We might jump 46 billion light years from here expecting to find the edge of our universe only to discover than we are not at the edge of our universe. Instead we find the junction of our universe and our neighbor's universe.

Galaxies from other universes meet up with our galaxies. Galaxies collide, merge, and big black holes form. Big black holes meet up and become huge black holes. And everything starts over again. This may take more time than we can imagine. (Reference my footnote about unimaginable.) But that's ok. Time is inexhaustible.

Maybe there was no beginning. Maybe there is no end.