

## 3 Questions about our universe???

**By Wol377**

1) This is a question my gf asked me and although I am currently studying cosmology I didn't know how to answer it.

*What is the universe expanding into?* (I told her that the universe isn't like an object that expanded into something, more like the universe was the something that was expanding... lol. I didn't really know how to explain it to be honest.) Then she asked "How do you know the space and time wasn't already here and its just the mass spreading out and expanding?" :grumpy: I dunno!

2) *If you reversed time back to the big bang would you ever get to a point where the universe is a singularity or would there always be more matter coming in?*

3) *Is the C.M.B. starlight that has been red shifted into the microwave part of the spectrum?* - A fellow peer told me this... but he has a history for making things up rather than saying he doesn't know.

Thanks for any help

**Nitin**

Attempt at answering your gf's questions:

1) Various theories offer different answers. It is difficult (and some would say irrelevant) to think outside the box, which is the universe. Your response, "that the universe isn't like an object that is expanding into something, more like the universe was the something that was expanding..." is sufficient.

Spacetime, as we know it, was created in the big bang. The presence of the cosmic microwave background is 'proof' that a big bang happened. It is difficult to accommodate the idea of an already existing spacetime with the CMB around. Then, we will have to look for an explanation for the CMB. Your gf's question appears to me to refer to the steady-state cosmological model, but I don't think this model yet has an explanation for the CMB.

2) Reversing the cosmological expansion (hence reversing cosmological time), the universe shrinks to a smaller size, but I won't call this a singularity. My understanding of a singularity is that it is a singular solution of Einstein's GR equations, that is a singularity in spacetime. To say that the universe was a singularity.. well... a singularity in what?

3) The CMB is light that started traveling through the universe when it was about 300,000 yrs old. After the big bang, matter and radiation were in thermal equilibrium. As the universe cooled down, the particles started to form atoms, and the matter and radiation basically decoupled, so that the radiation started propagating throughout the universe. As the universe expanded, this high energy radiation got redshifted, and it lies nowadays in the microwave region. It is NOT starlight.

**Phobos**

Sounds like you met an anti-Big Banger. Those are some typical questions of someone trying to disprove Big Bang theory.

(1) The universe is not expanding into anything as far as we know. Observational data (e.g., CMB) indicate that the universe is already infinite/boundless in extent and that the points of space within the universe are getting farther apart. Perhaps "expand" is a poor word choice for this weird situation.

Mass is not simply spreading out because there's no center to the expansion.

(2) Modern physics can describe the state of the universe close to Time = 0 but cannot describe the state at Time = 0. Big Bang theory starts after the Beginning. Beyond that, we have mathematical speculations.

What does "always more matter coming in" mean? We know of no matter/energy entering our universe from some other universe. Sounds like the discredited "steady state universe" argument.

(3) No. Observations of the CMB in the early universe show that it is consistent with a background radiation as predicted by Big Bang Theory and not that of redshifted starlight.

(more explanation is warranted here for your questions...but I'm pressed for time!)

### **jcsd**

1) As has been noted though we talk about the universe expanding our definition of expand in this context does not require it to expand into anything. tell herself like "By expand we're referring to the time dependency in the Roberston-Walker metric fo' ".

2) Tell her that if we time reverse the cosmological equations of GR then we do eventually come to singularity, but most would say that a singularity is a mathematical object not a physical one and were a non-removable singularity occurs in a physical equation it means that we need another equation to describe that situation.

3) There is absolutely no way it could be starlight, the reason for this is that it's far, far too uniform to be starlight and it's coming at us from all directions with very little variation which imply sit is all coming from a single source (i.e. the universe 300,000 years after the big bang when it was a lot, lot smaller). so tell him "No, I think the homogeneity and isotropy of the CMBR would very much rule this out fo' ".

### **RAD4921**

I am only going to try and answer your first question since it seems the others have already been covered fairly well.

Time and space is an illusion. Quantum nonlocality tells us this. They (spacetime) are concepts that are brought about by the introduction of measurement. I know this goes against what most think but the universe is expanding into itself. There is nothing "outside" of the universe because the universe is like an imploded sphere, or more accurately, the universe is curved back onto itself. Actually some speculate that the observable region of the universe is an exploded black hole. Though it is generally accepted among

cosmologist that the universe is expanding, doppler redshifts do not prove beyond doubt that the universe as a whole is expanding. Redshifts only show us that objects are moving away from us. Redshifts on the event horizon of a black hole shows that the universe is contracting locally. From our perspective in the universe it just may be impossible to say exactly what is going on in the universe as a whole.

Other speculations suggest that the universe is like bubbles inside one another. That the macroscopic (big) and the microscopic (small) are one and the same.

Of course none of the above addresses the issue of the deep mystery of consciousness. Why is the universe self aware? Why is the universe alive and thinking (because we are self aware, alive and thinking?)