

Expanding Universe Notes

In Einstein's Special Theory of Relativity he abandoned the idea of absolute time and space. Relative motion became the important thing. It predicted that the length of an object and the passage of its time should depend on the objects' speed relative to the observer observing it. The theory also showed that matter and energy are the same thing ($E = mc^2$).

Unpack and rewrite the third sentence of the above paragraph.

In his General Theory of Relativity, Einstein extended his Special Theory to include gravity. This theory showed that being in a gravitation field and being in an accelerating frame of reference are the same things. Since the special theory showed that the length and passage of time for an accelerating object should be different to a stationary object, he concluded that a gravitational field must affect the shape of space and the passage of time!

The mass of an object affects the space and time around it. It curves the space and slows the time.

Alexander Friedmann demonstrated that a consequence of the General Theory of Relativity is that the universe is expanding. Galaxies are not moving outward away from each other *through* space, the *space* between the galaxies is expanding. If you reverse time then in the past all the space and matter of the universe must have been located in a tiny dense region. Since it is tiny and dense it must be very hot. And since it is hot it must want to expand, hence it exploded into the expanding universe that we are now in. So, subsequently this model of the universe was called the Big Bang.

Questions

1. Write a short list of the main features of the big bang model.
2. Research and summarise evidence supporting the big bang.
3. Write a sentence or two about how the energy at the beginning of the big bang turned into matter we see now.