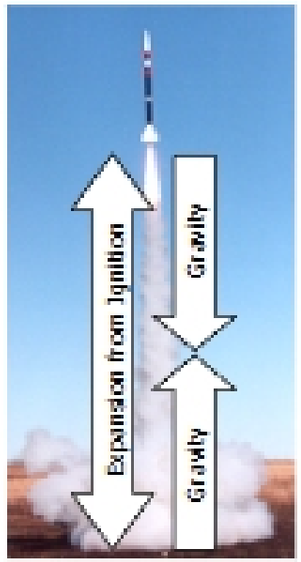
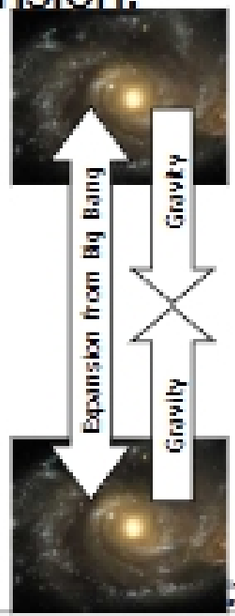
Questions of the Day

- What is the evidence for the cosmological constant?
- What is the Cosmic Microwave Background and how is it produced?
- What produces small ripples in the CMB?
- How does geometry change with the curvature of the Universe?

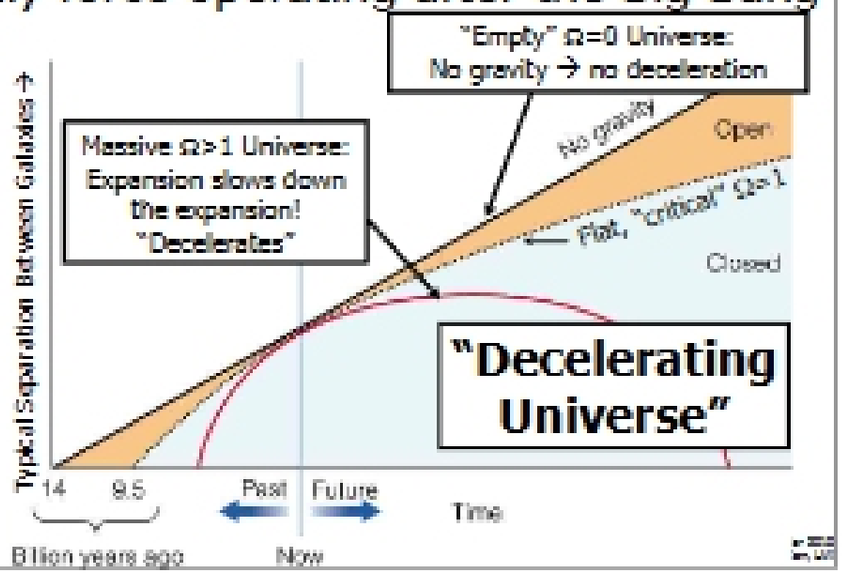
Gravity slows the expansion.



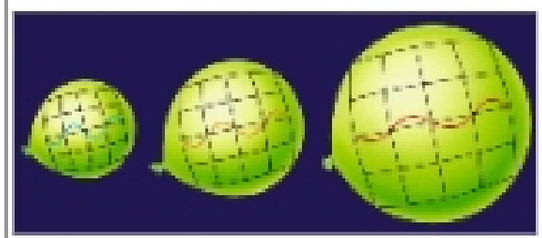
vs.



Expansion vs Time, if gravity is the only force operating after the Big Bang



"Cosmological Redshift"



The redshift of a photon tells you the **factor by which the Universe has expanded** since the photon was emitted

$$\frac{\text{Size of Universe Now}}{\text{Size of Universe Then}} = 1 + z$$

So, at z=1, the typical distance between galaxies was 1/2 the present value!

Note: This is true no matter what the value of H_0 or Ω!

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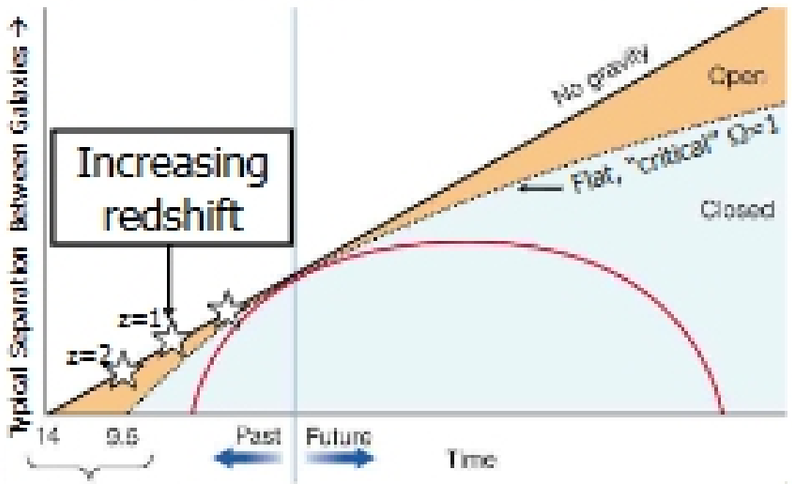
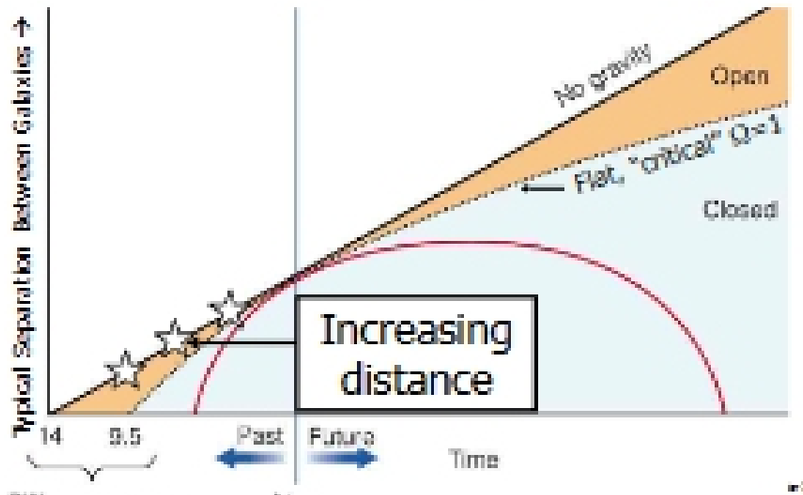


Longer travel time = photons emitted from farther away = appears fainter



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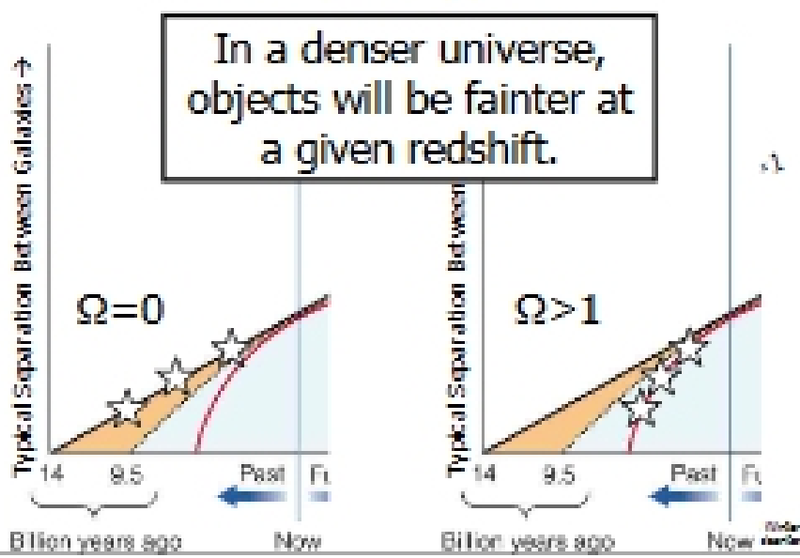
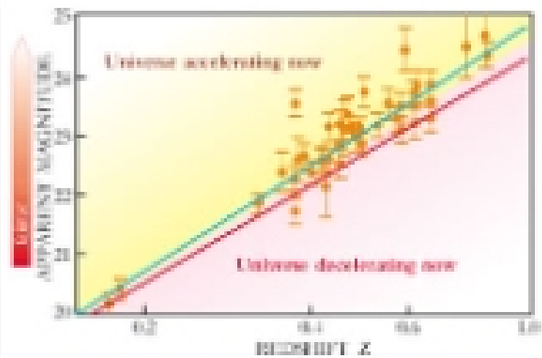
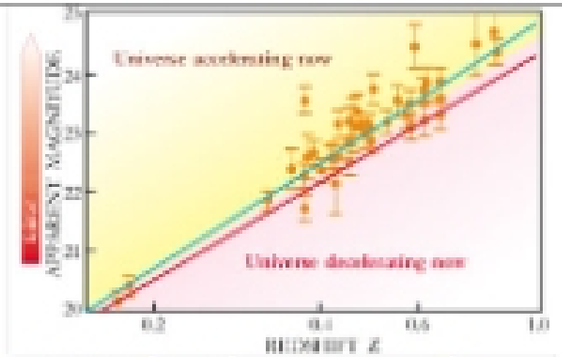


Distant white dwarf supernova are far fainter than any model predicted!



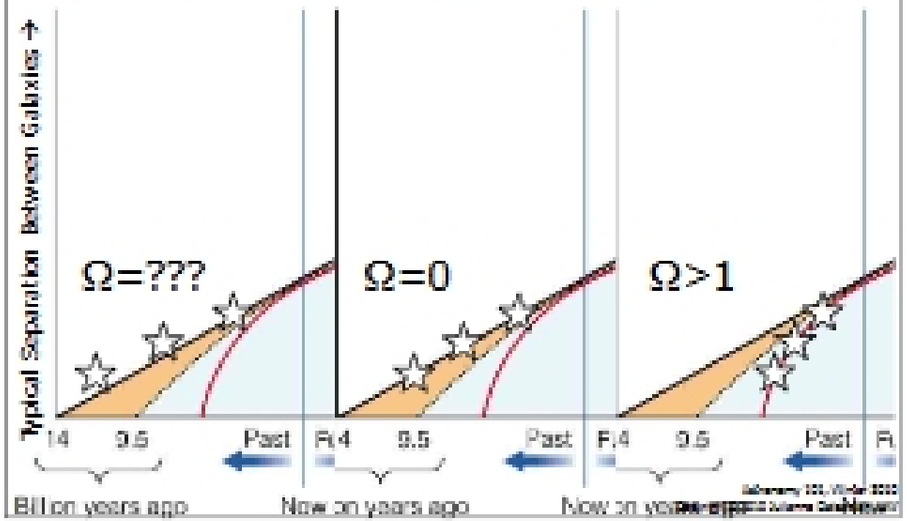
- Fainter → Further than expected!
- Further → Universe is bigger than expected.



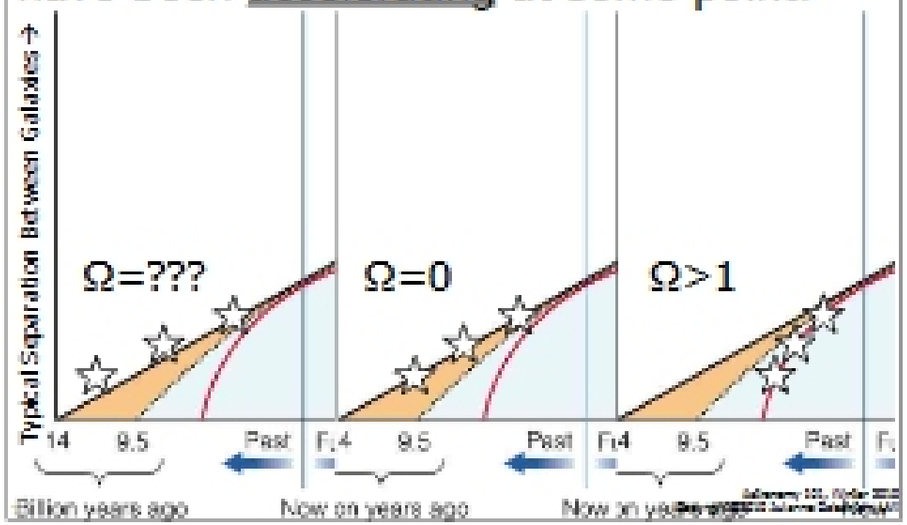
- Fainter → Further than expected!
- Further → Universe is bigger than expected.

The expansion of the Universe must be accelerating!!! Must be some other force pushing space apart!!!

Distant objects are farther away than any decelerating model can predict!



Farther? Then universe has to be much bigger than expected. Expansion must have been accelerating at some point!



More complicated histories possible if there's more physics beyond gravity vs the Big Bang