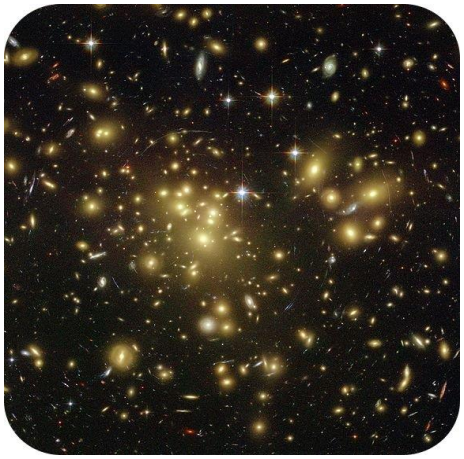
Dark Matter

Dark Matter

- Dark matter emits no electromagnetic radiation, which means we cannot see it directly. Certain observations on spiraling galaxies and gravitational lensing, however, can only be explained by the presence of a lot of mass.
- Scientists believe that some dark matter may be like objects we know (MACHOs), while others may be completely different from what we know (WIMPs).
    - Massive Astrophyiscal Compact Halo Objects are ordinary objects that do not give off light, such as black holes, neutron stars, and brown dwarfs.
    - Weakly Interactive Massive Particles appear to be particles that have gravity, but don't appear to interact with other particles.
- We still do not know what dark matter really is or what it is made of.

Study Tip

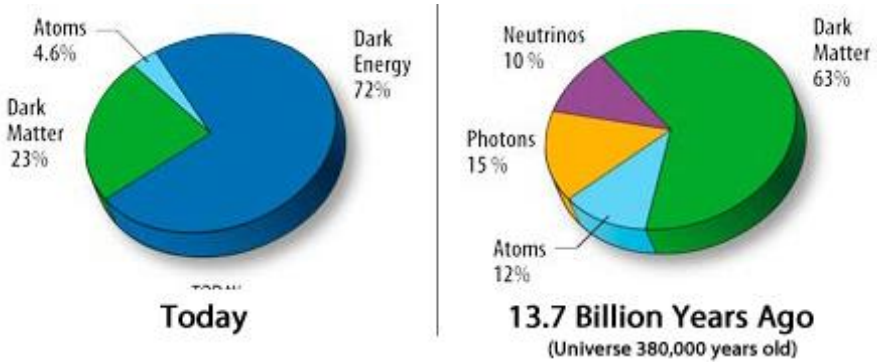
"MACHOs" are more popular than "WIMPs," and therefore scientists know more about MACHOs than WIMPs.



Gravitational lensing: gravitational force from dark matter can bend light around galaxies.

Dark Energy

- Scientists have discovered that the rate at which the universe is expanding is increasing.
- Some scientists believe that the explanation behind this is **dark energy**, which makes up 72% of the total energy in the universe.
- We also do not know much about dark energy yet.



Composition of the universe today and 13.7 billion years ago

Concept Check

- Why can we not see dark matter? Why do we still know it exists?
- What are two theories that scientists think dark matter is made up of?
- What is important about dark energy?