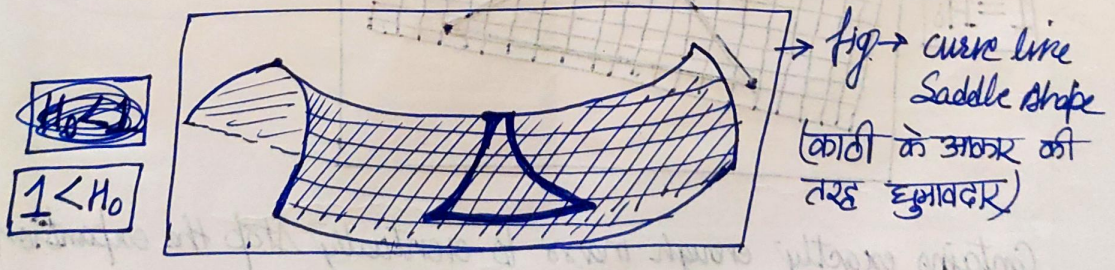


⇒ Shape of the Universe → According to Einstein's theory of General Relativity, space itself can be curved by mass. As a result, the density of the Universe (how much mass it has spread over its volume) determines its shape, as well as its future. For this, Scientists have calculated "CRITICAL DENSITY" of the universe. The critical density is proportional (directly) to the square of the Hubble Constant ( $H_0$ ), which is used to measuring the Expansion rate of the Universe. ( $H_0$  is about 67 km per second per megaparsec) Comparing the critical density to the actual density can help scientists to understand the Cosmos →

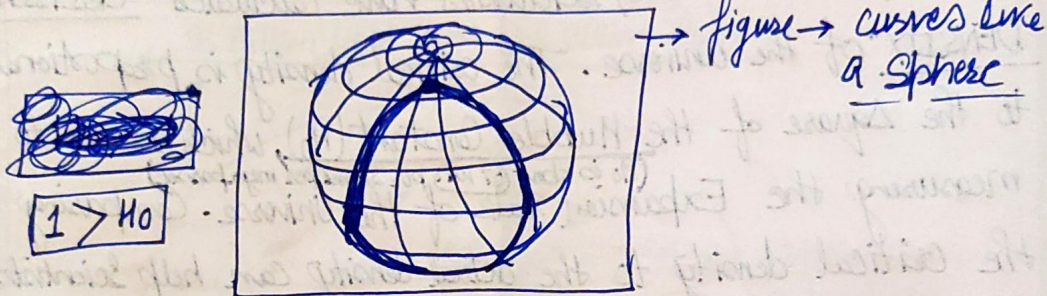
Case I → If the Actual Density of the Universe is less than the critical density, then there is not enough matter to stop the expansion of the Universe and it will expand forever. The resulting shape is curved like the surface of a saddle. This is known as an OPEN Universe. →



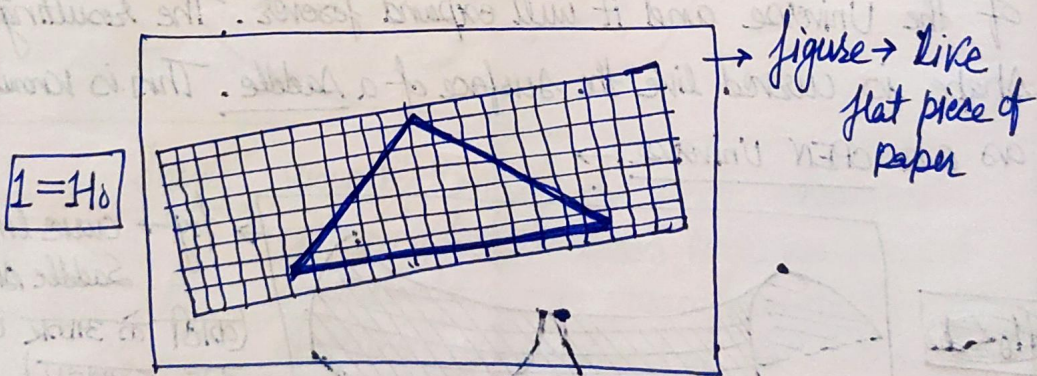
Case II → If the Actual density of the Universe is greater than the critical density, then it contains enough mass to eventually stop its expansion. In this case, the Universe is CLOSED & FINITE, though it has no end, and has a Spherical shape. once



the universe stops expanding, it will begin to contract. Galaxies will stop receding and start moving closer & closer together. Eventually, the universe will undergo the opposite of the Big Bang, often called the "Big Crunch". This is known as a closed universe.



Case III → However, if the Actual density of the universe is equal to the critical density, as scientists think  $H_0$  is, then it will extend forever like a flat piece of paper. If the universe



contains exactly enough mass to eventually stop the expansion, the actual density of the universe will equal the critical density. The expansion rate will slow down gradually, over an infinite amount of time. In such a case, the universe is considered flat and infinite in size.



Measurements indicate that the Universe is Flat, suggesting that it is also infinite in size. The speed of light limits us to viewing the volume of the universe visible since the Big Bang, because the universe is approximately 13.8 billion years old, scientists can only see 13.8 billion light-years from Earth.

⇒ Components of the Universe

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(Steady-State theory) In Cosmology, the Steady-State theory is a Theoretical Model in which the "Universe is constantly expanding but with a fixed average density". In this universe model, matter is always created to form stellar bodies at the same speed as the old ones become destroyed @ their relative distance & recession velocity increase. So, there is NO overall beginning @ end for a steady state universe.