

A BEGINNER'S GUIDE TO THE BIG BANG



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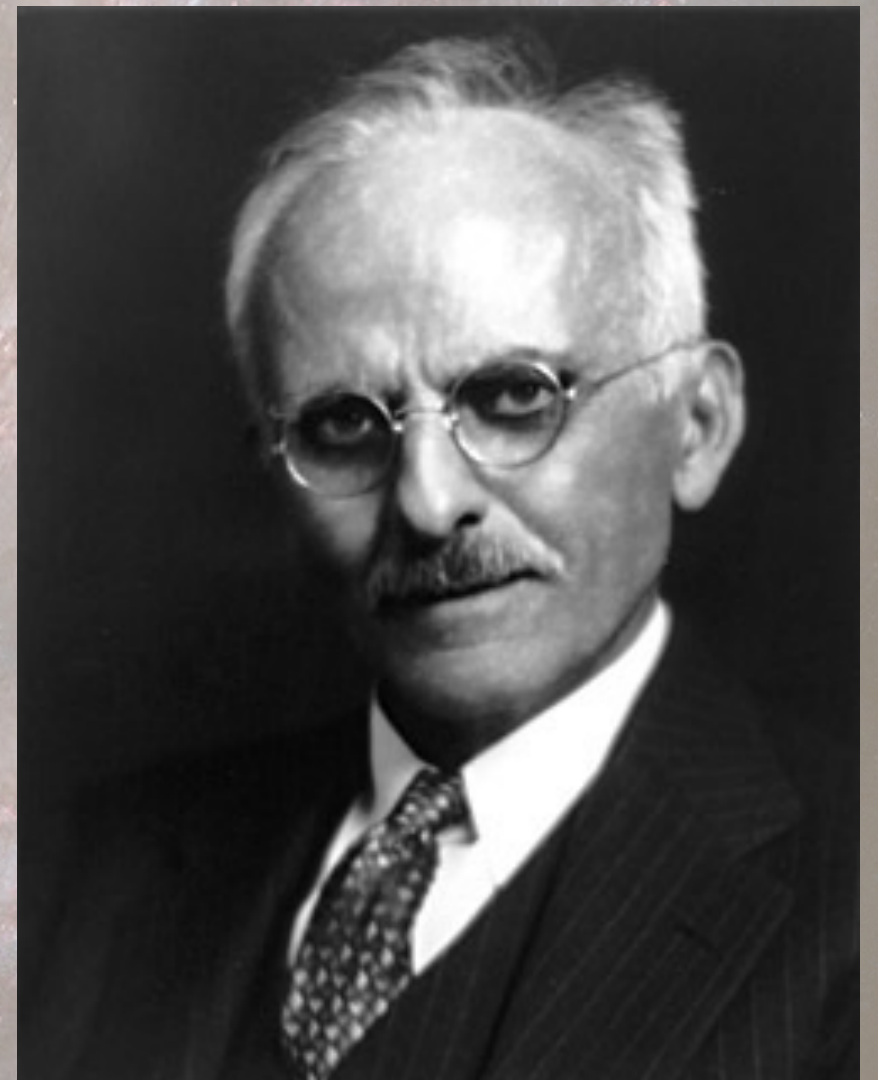


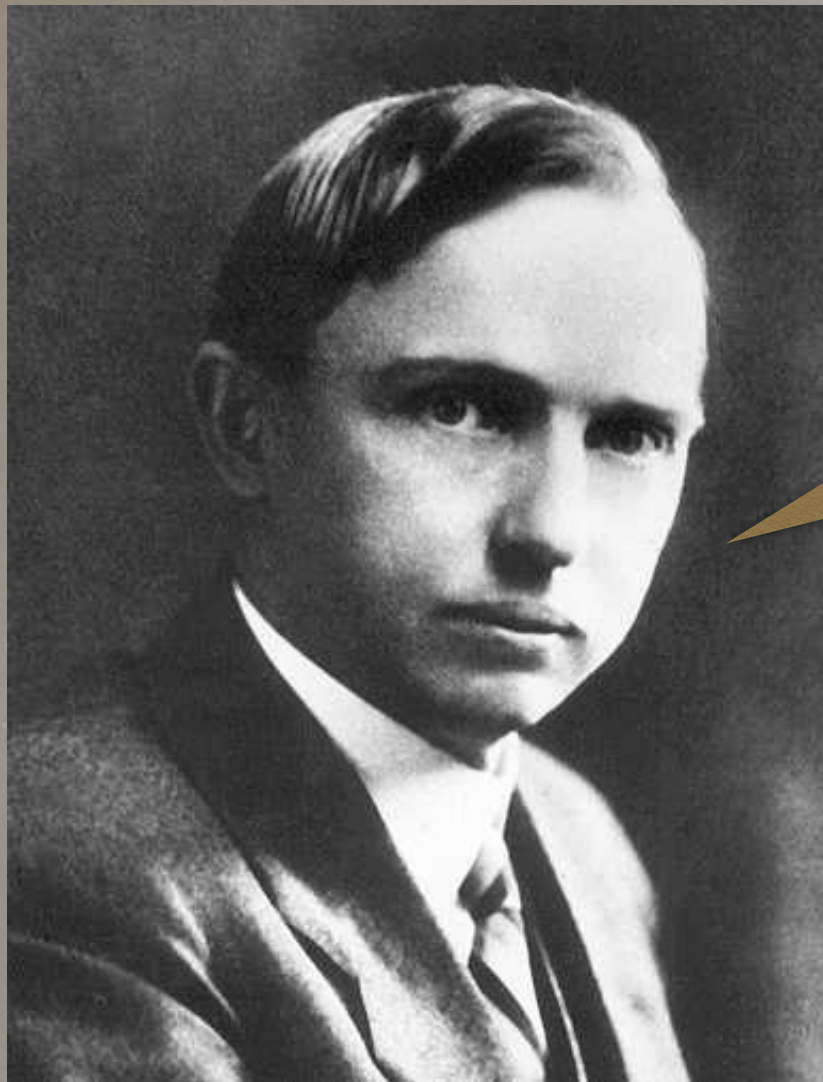


Harlow Shapley

Vs.

Heber Curtis



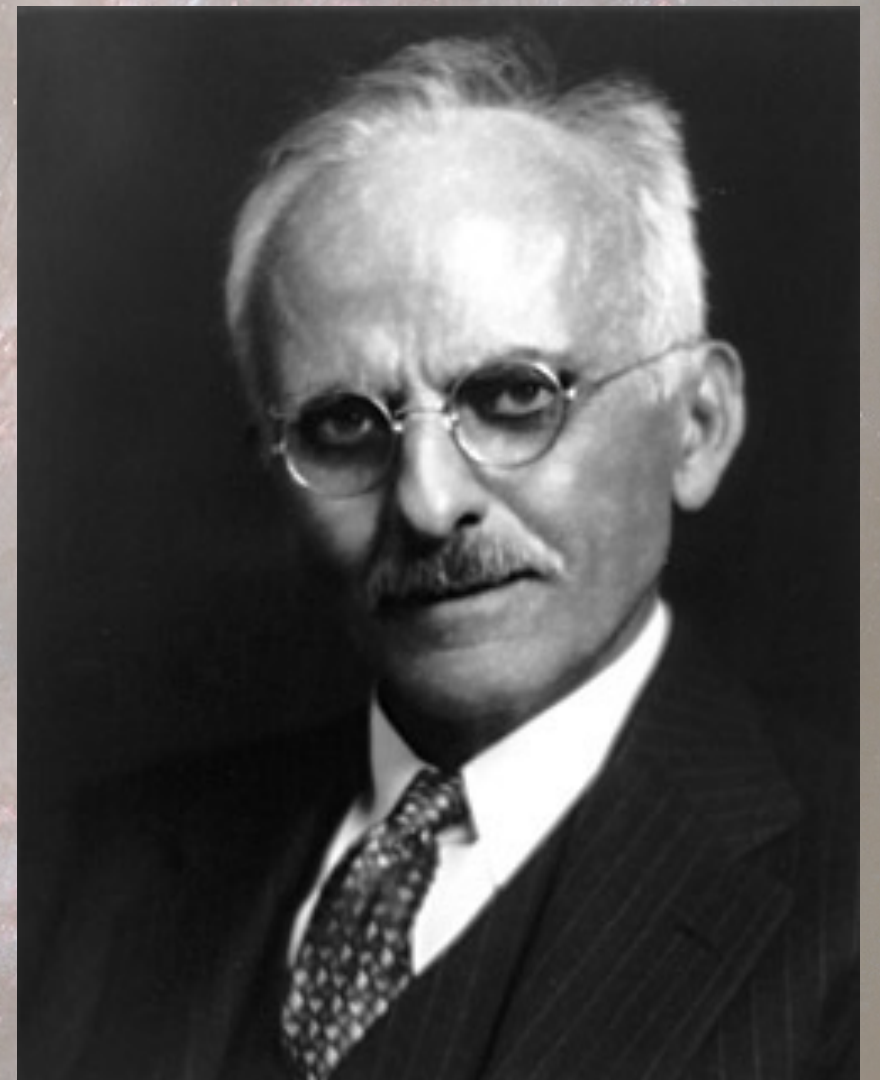


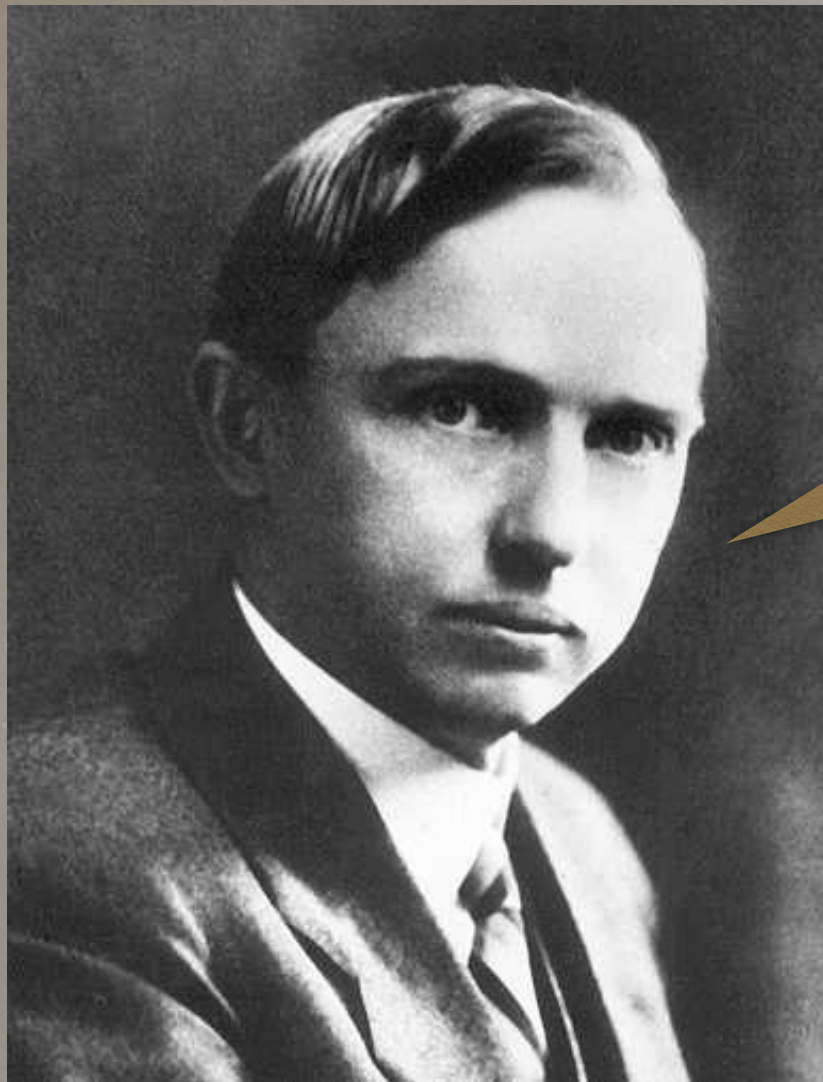
Harlow Shapley

The Milky Way is the
entire Universe!

Vs.

Heber Curtis





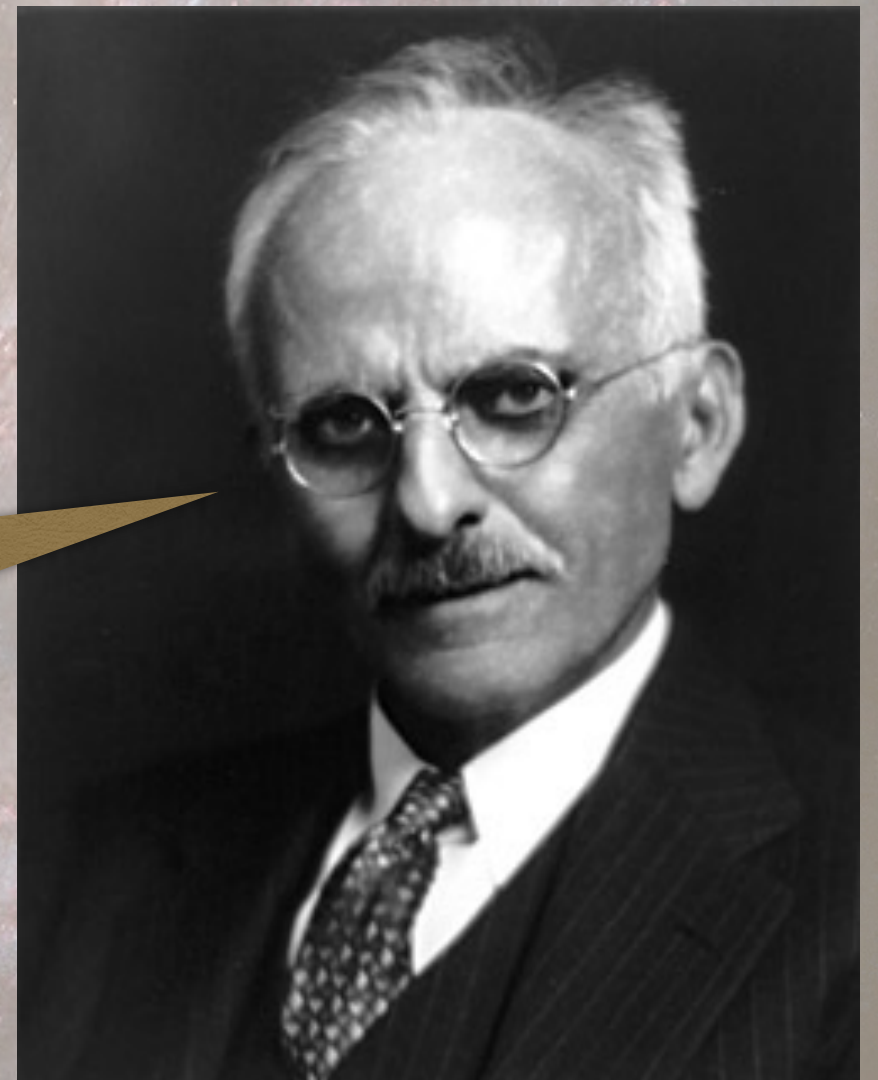
Harlow Shapley

The Milky Way is the
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Vs.

The Milky Way is just
one galaxy among many!

Heber Curtis





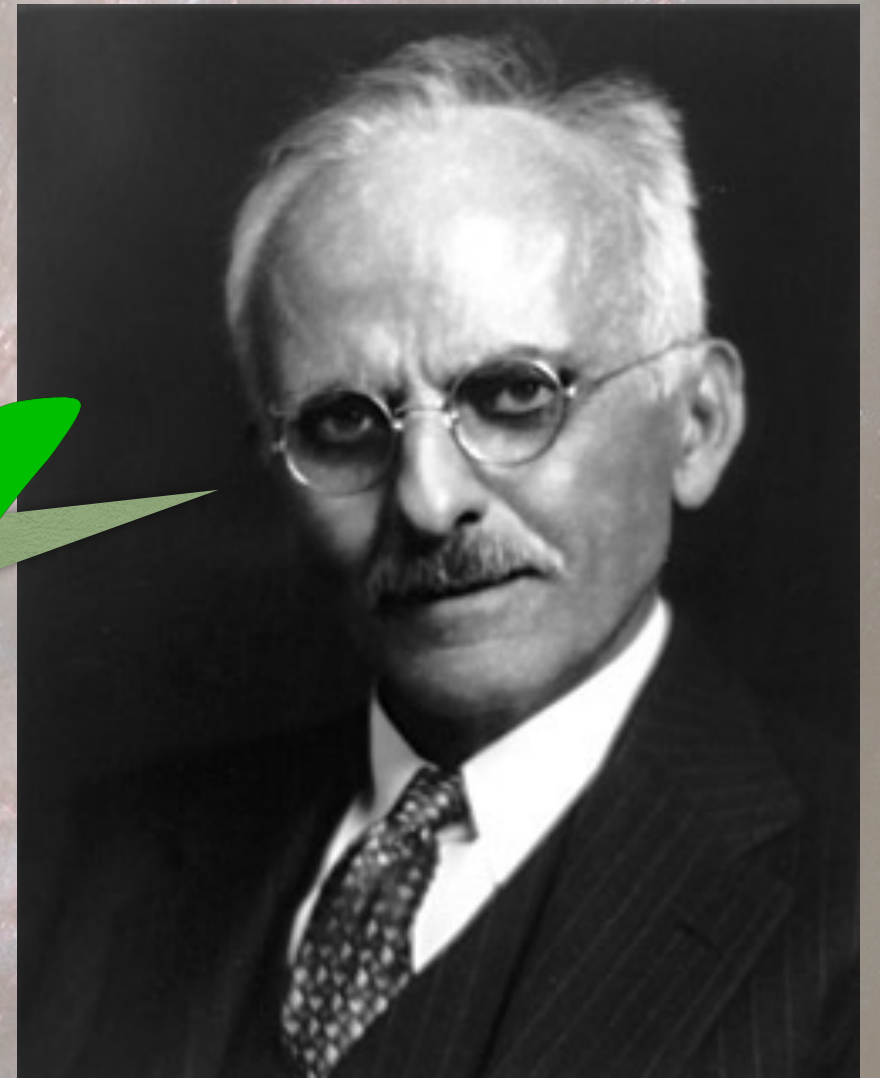
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HOW WAS THIS SETTLED?

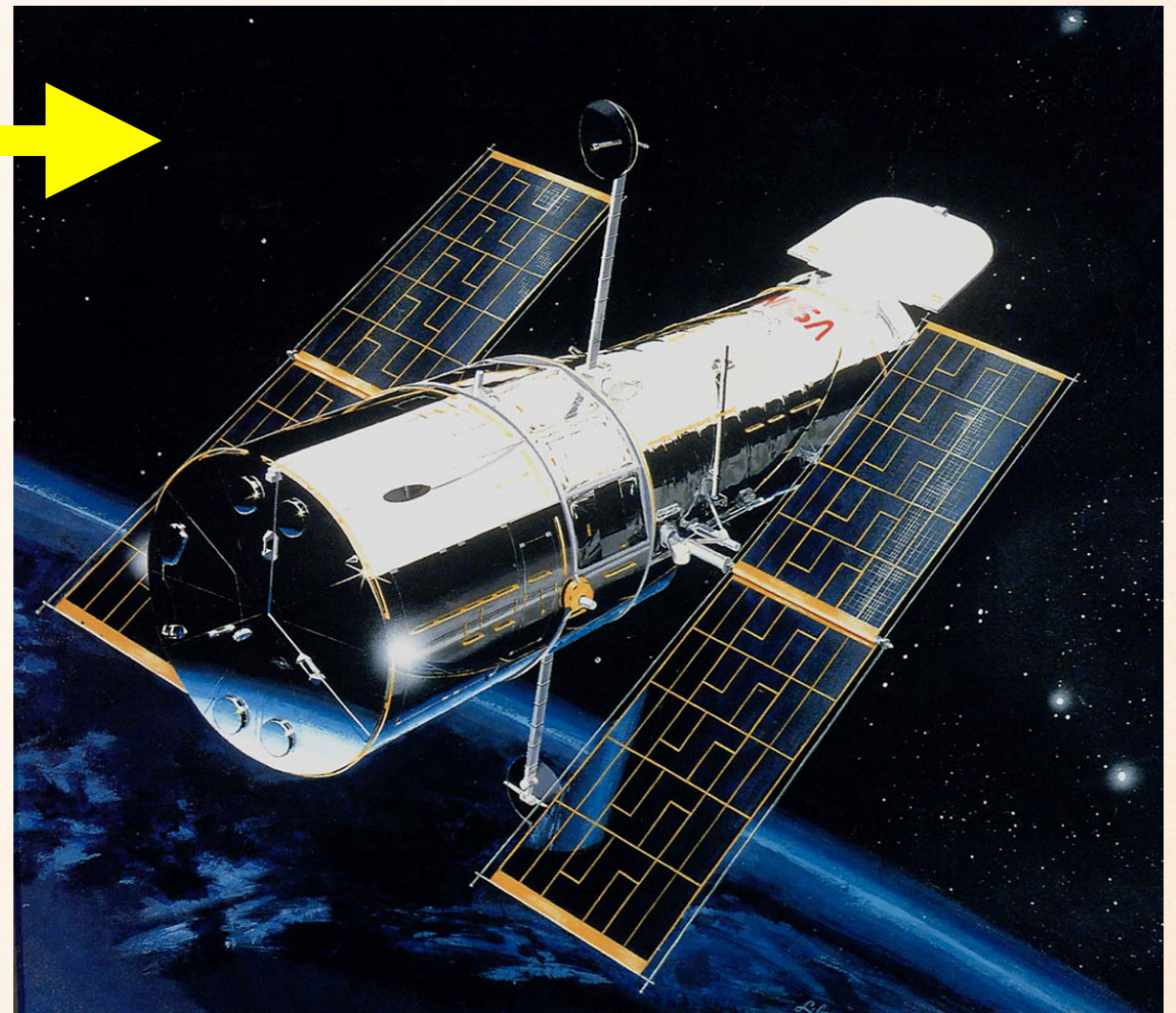
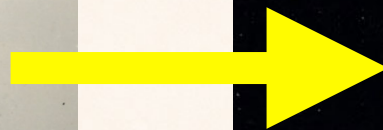


Edwin Hubble

HOW WAS THIS SETTLED?



Edwin Hubble



Hubble Space Telescope

HOW WAS THIS SETTLED?



Edwin Hubble

Hubble breakthrough was to measure **accurate** distances to nearby galaxies, proving they were outside the Milky Way

HOW WAS THIS SETTLED?



Edwin Hubble

Washington, Nov. 22. Confirmation of the view that spiral nebulae, which appear in the heavens as whirling clouds, are in reality distant stellar systems, or 'island universes', has been obtained by Dr. Edwin Hubbell of the Carnegie Institution's Mount Wilson Observatory, through investigations carried out with the observatory's powerful telescopes. The number of spiral nebulae, the observatory officials have reported to the institution, is very great, amounting to hundreds of thousands, and their apparent sizes range from small objects, almost star-like in character, to the great nebula in Andromeda, which stretches across an angle of some 3 degrees in the heavens, about six times the diameter of the full moon.

New York Times,
22 November 1924

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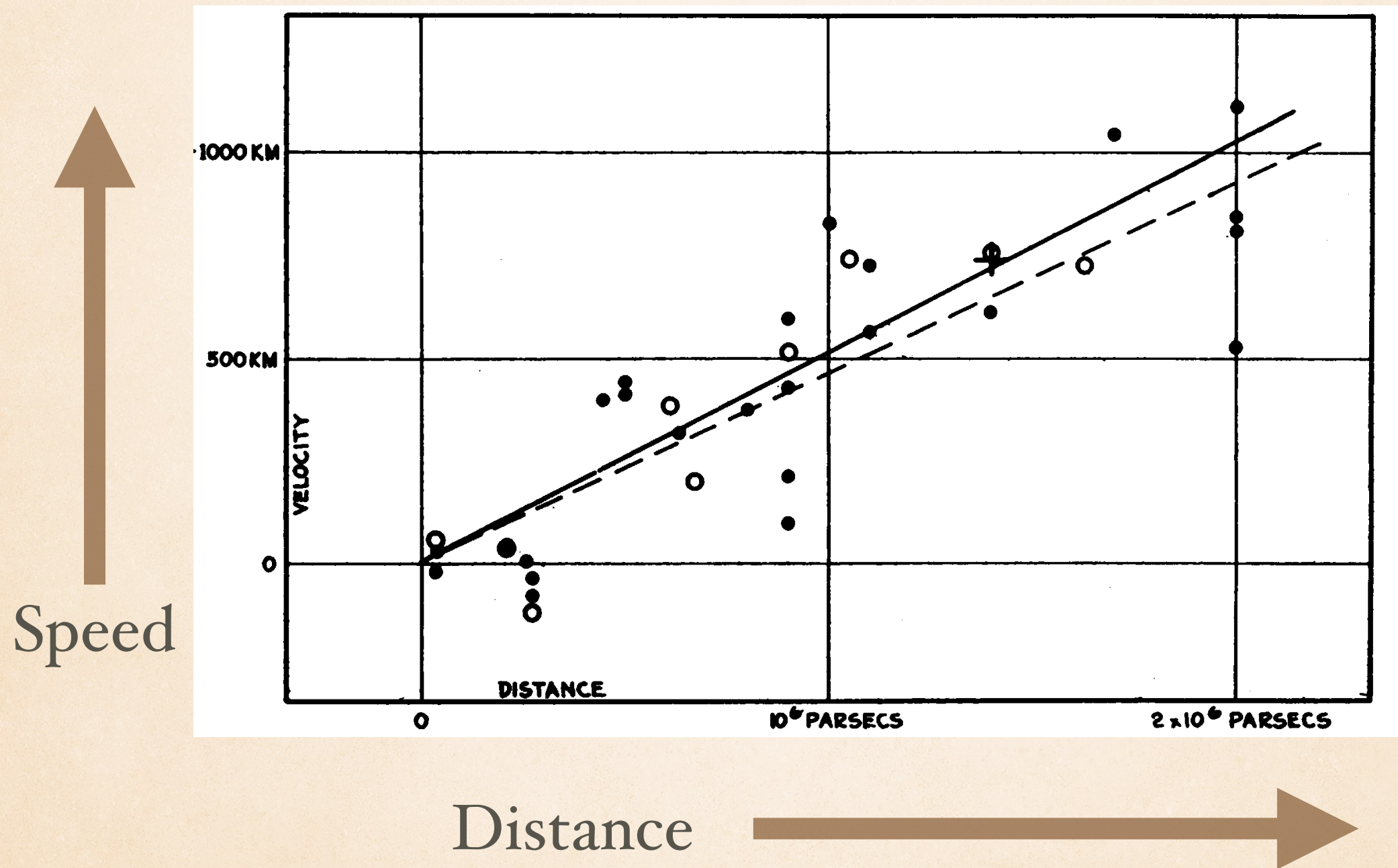


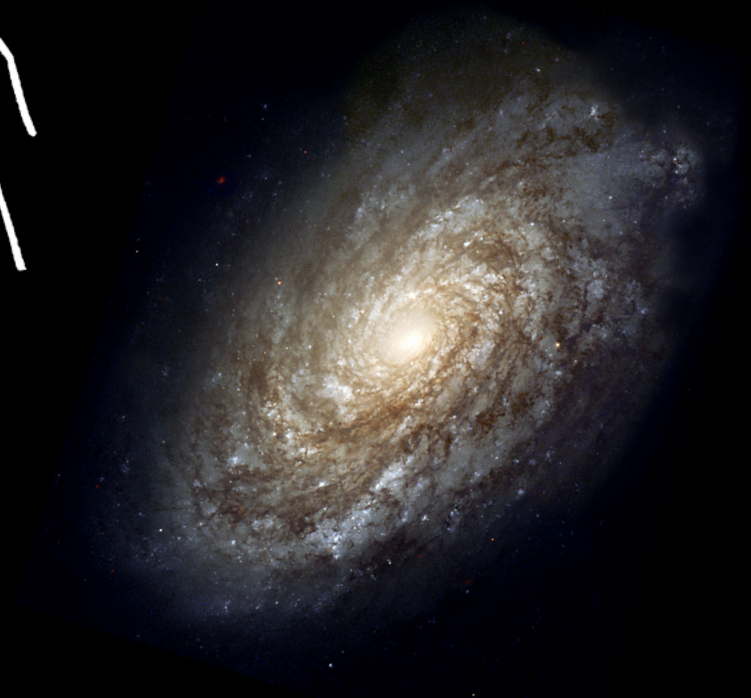
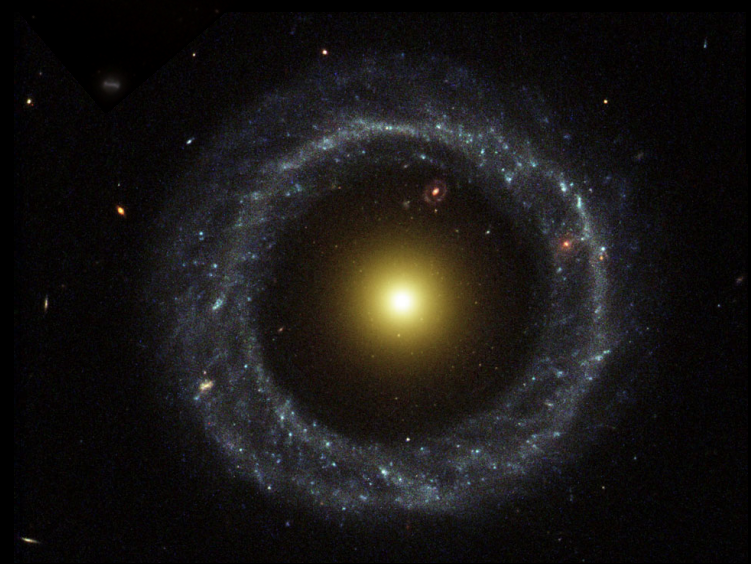
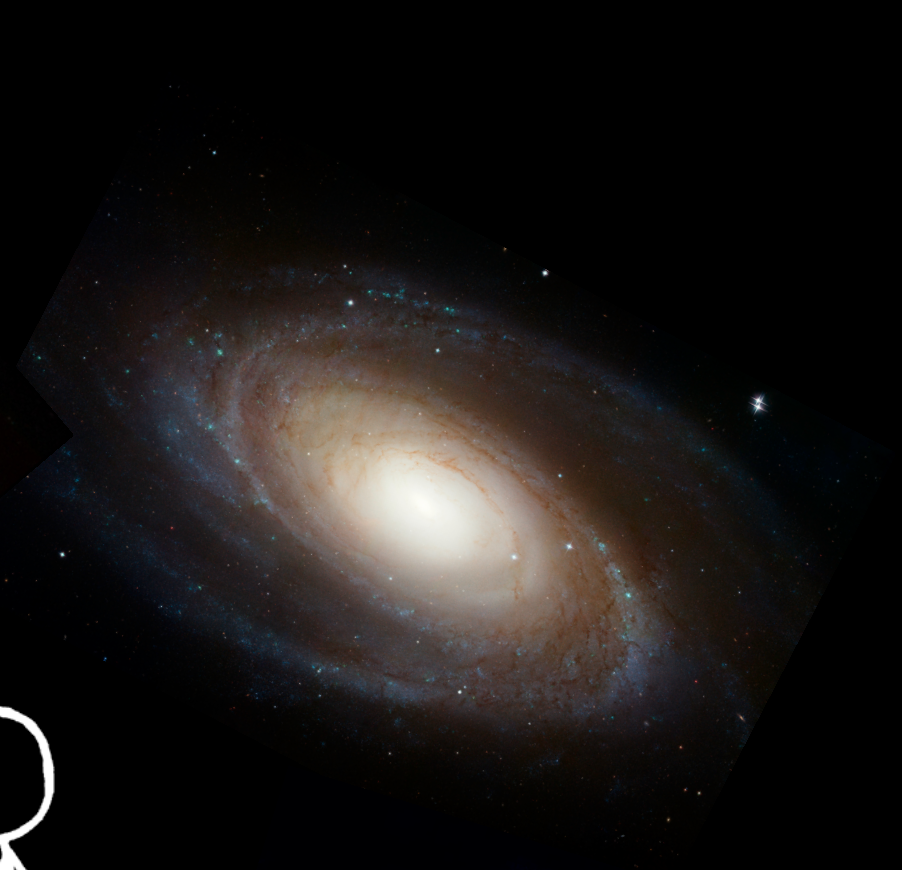


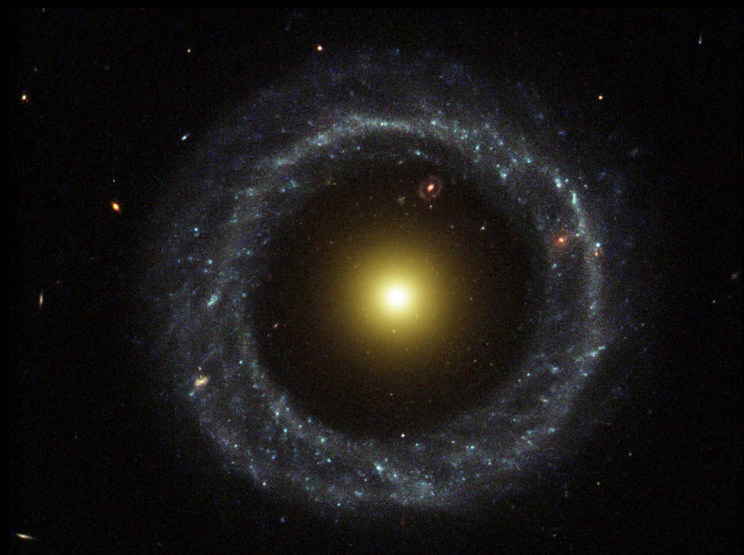
THINGS GET MORE INTERESTING...

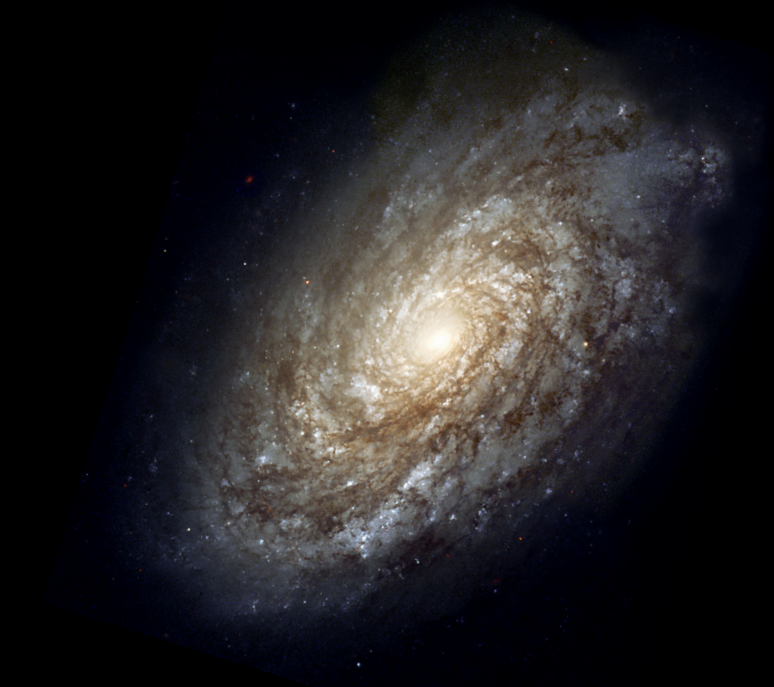
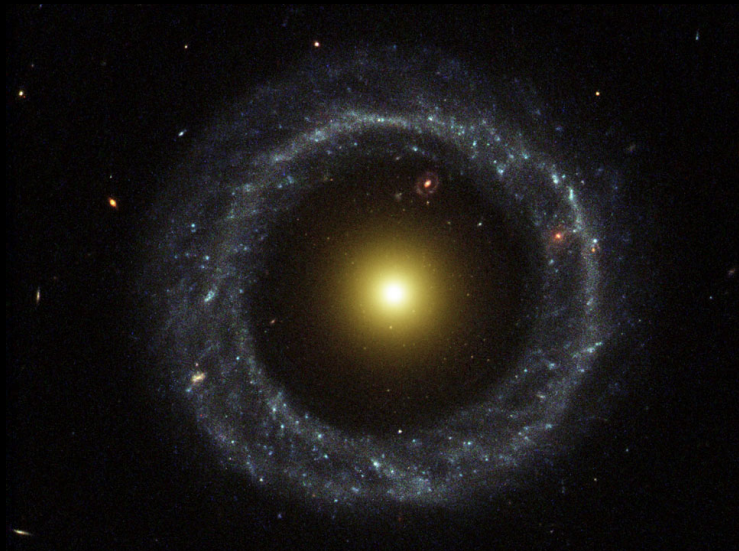
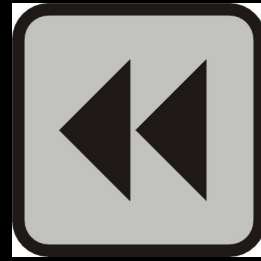
- ❖ Hubble had found a way to accurately measure *distances* to galaxies
- ❖ Astronomers already knew how to measure the *velocity* of galaxies

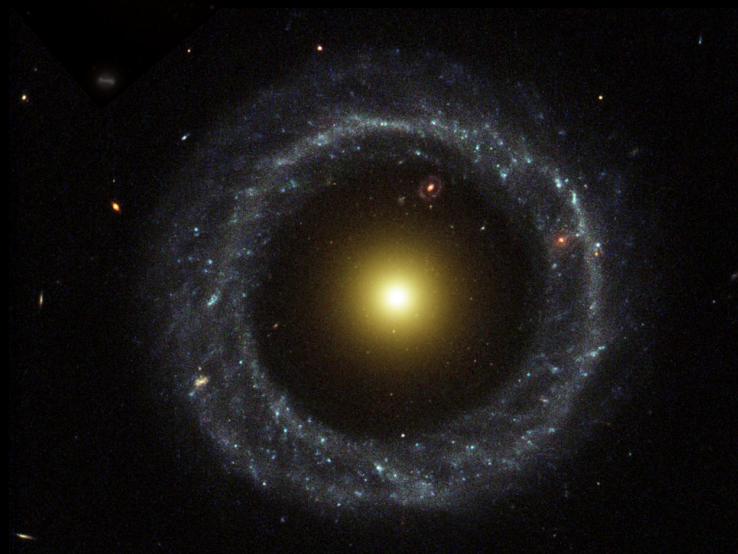
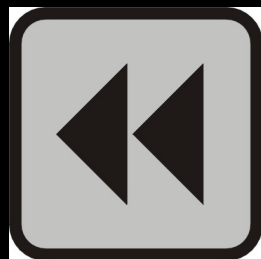
THE UNIVERSE IS EXPANDING!

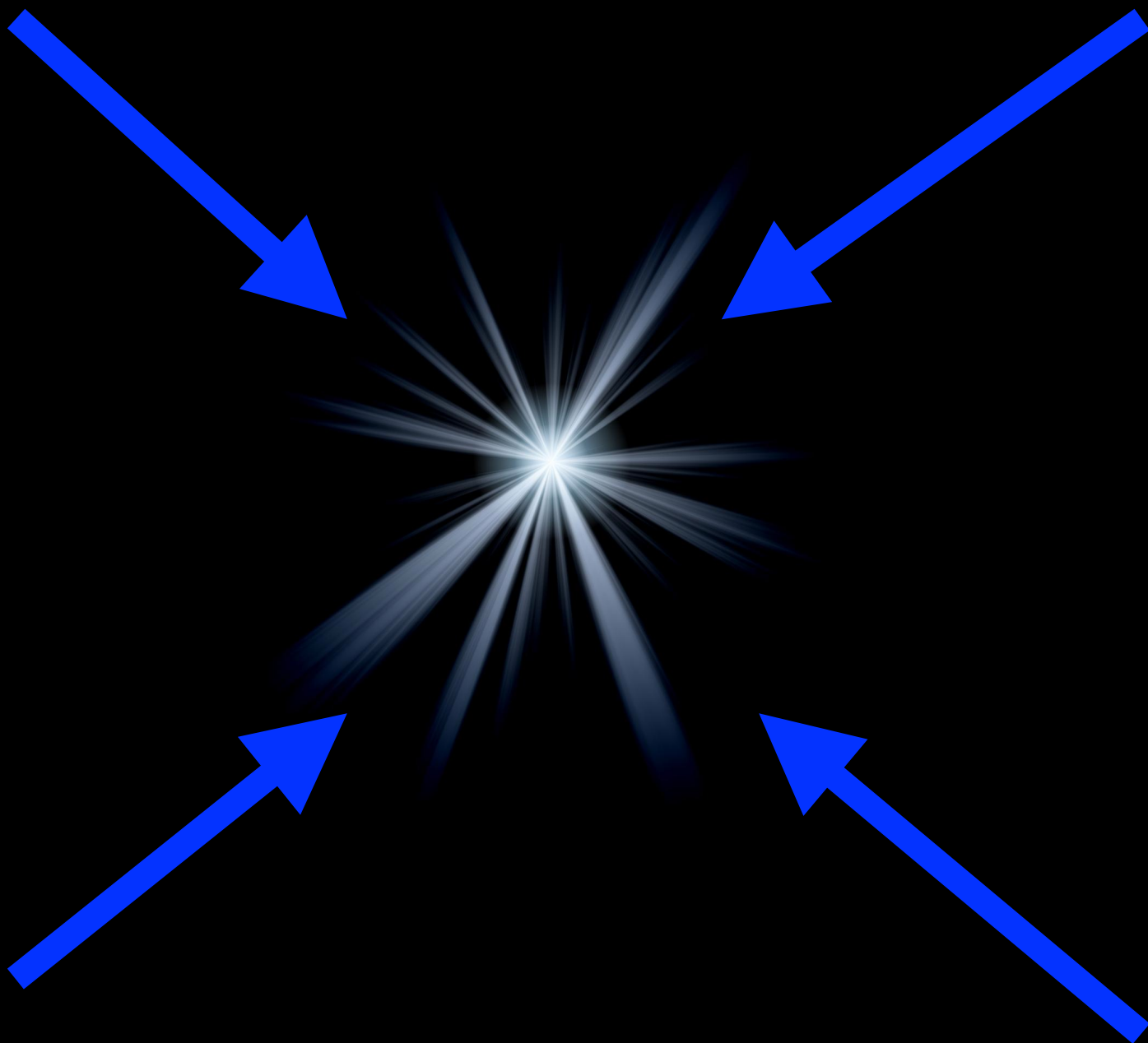
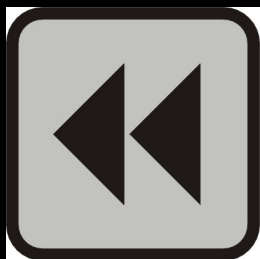












... did the Universe have a beginning?

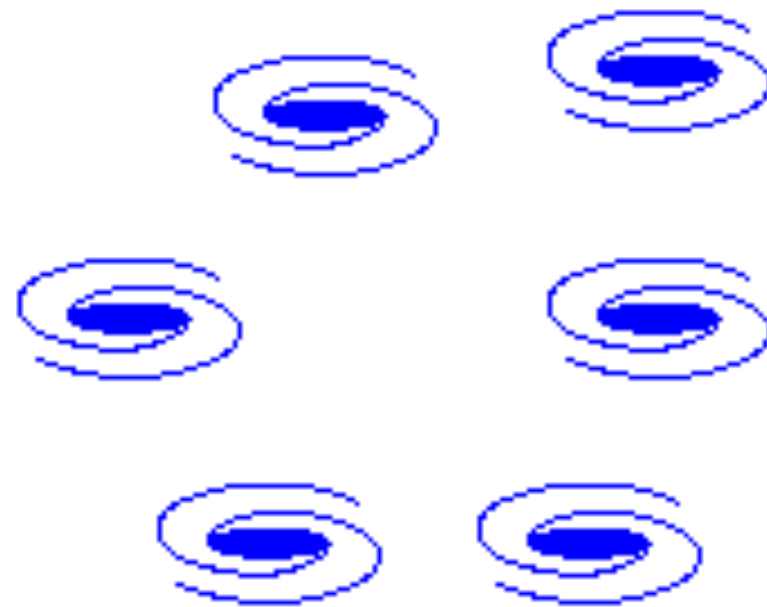




“Big Bang”



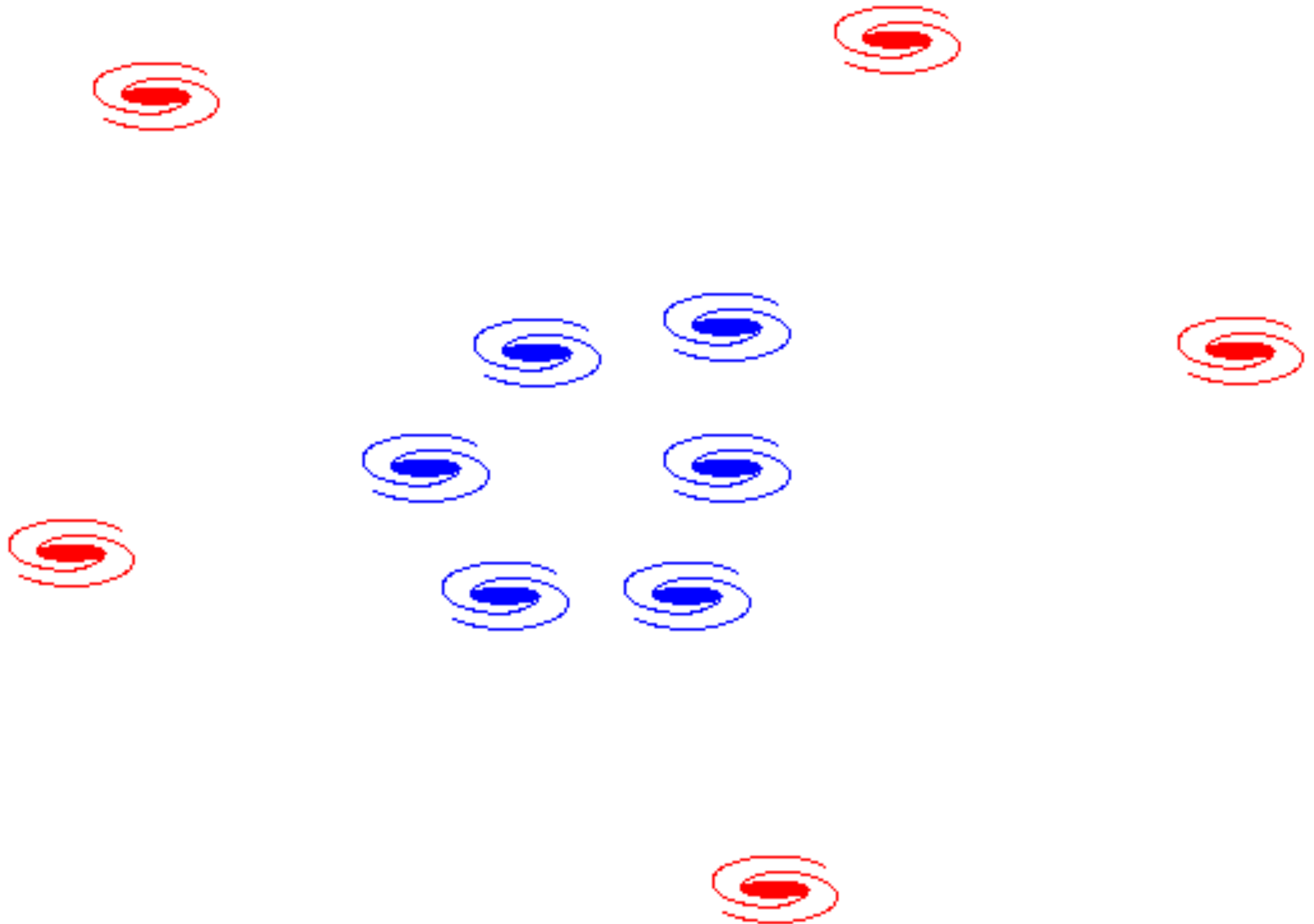
A UNIVERSE WITHOUT A BIG BANG?



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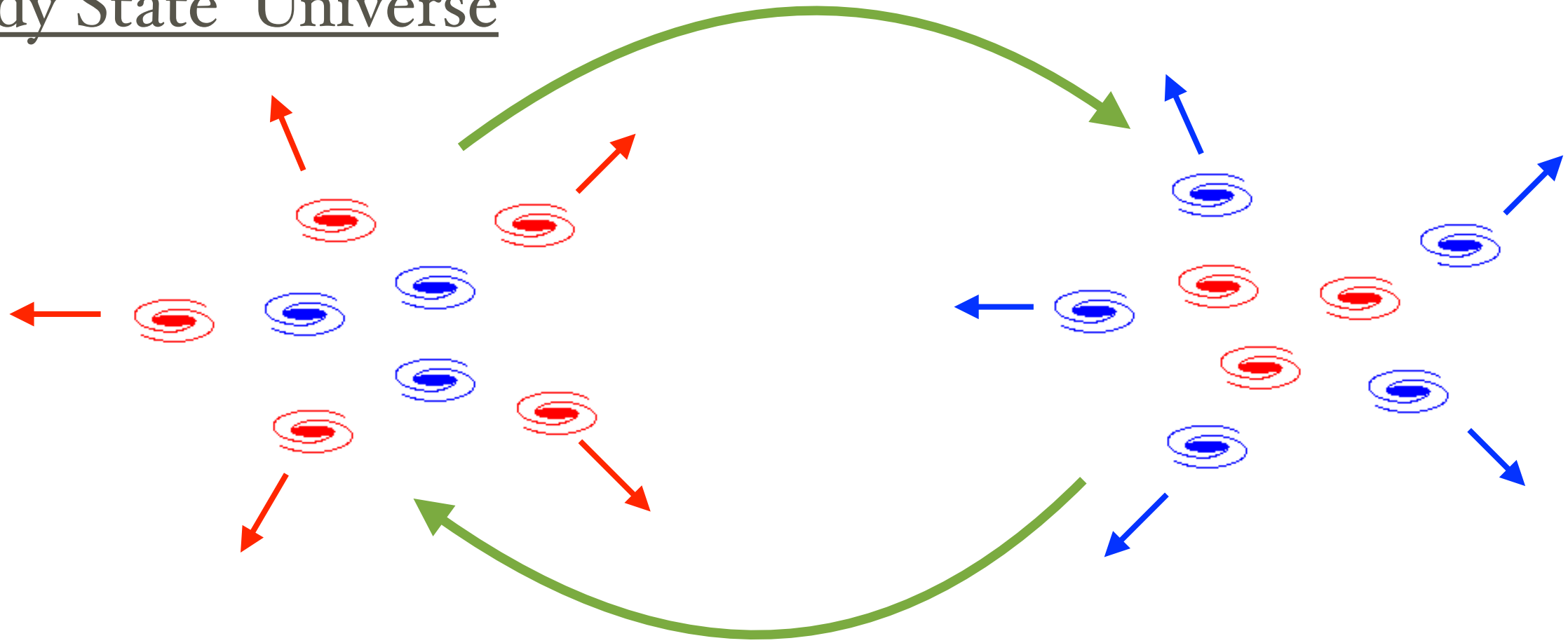


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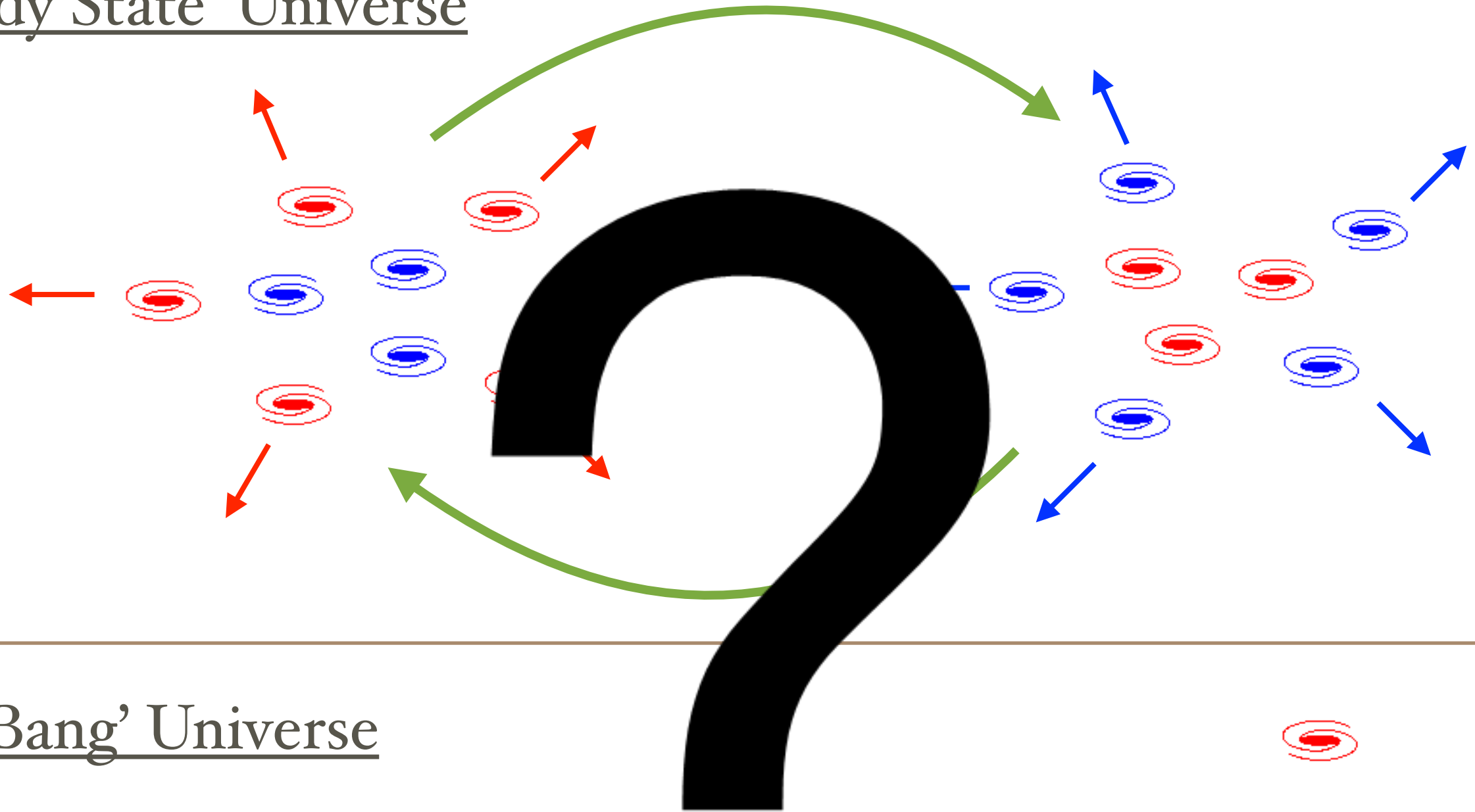


‘Steady State’ Universe

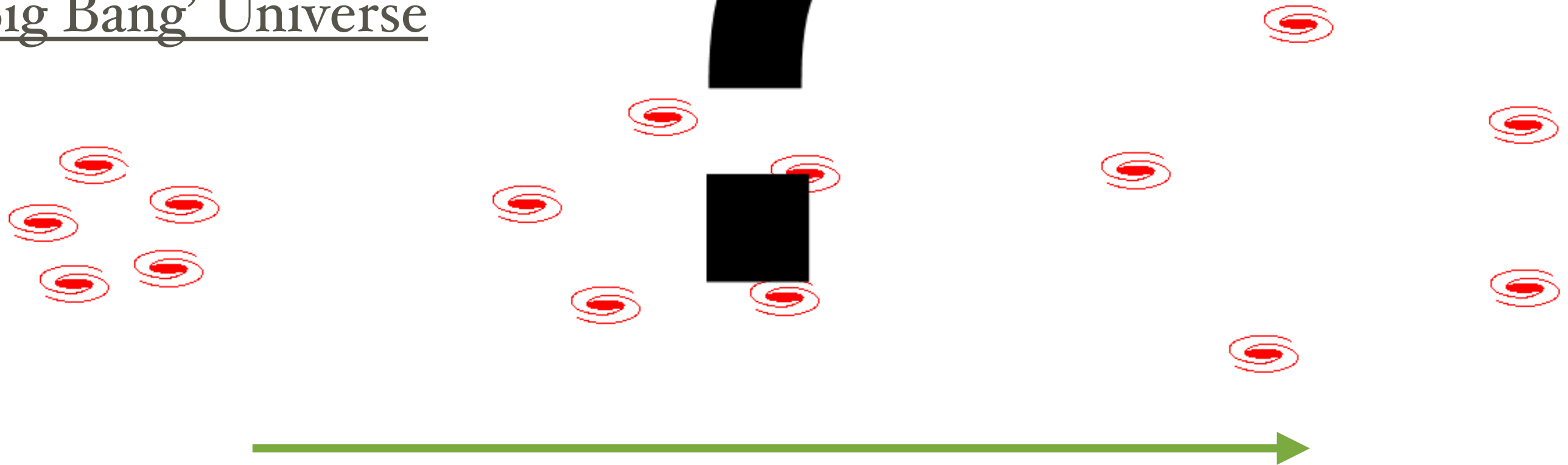
'Steady State' Universe

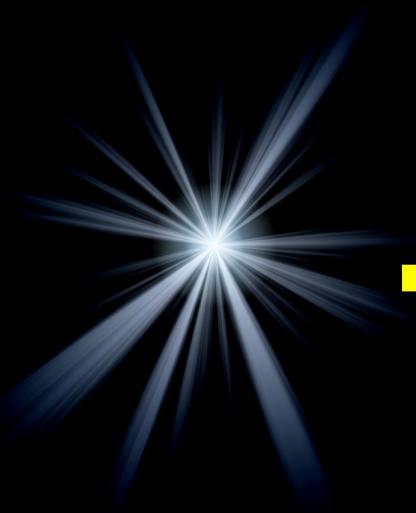


'Steady State' Universe



'Big Bang' Universe





Time



Hot
+
Dense

Time

