

A BIG RING ON THE SKY

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OVERVIEW

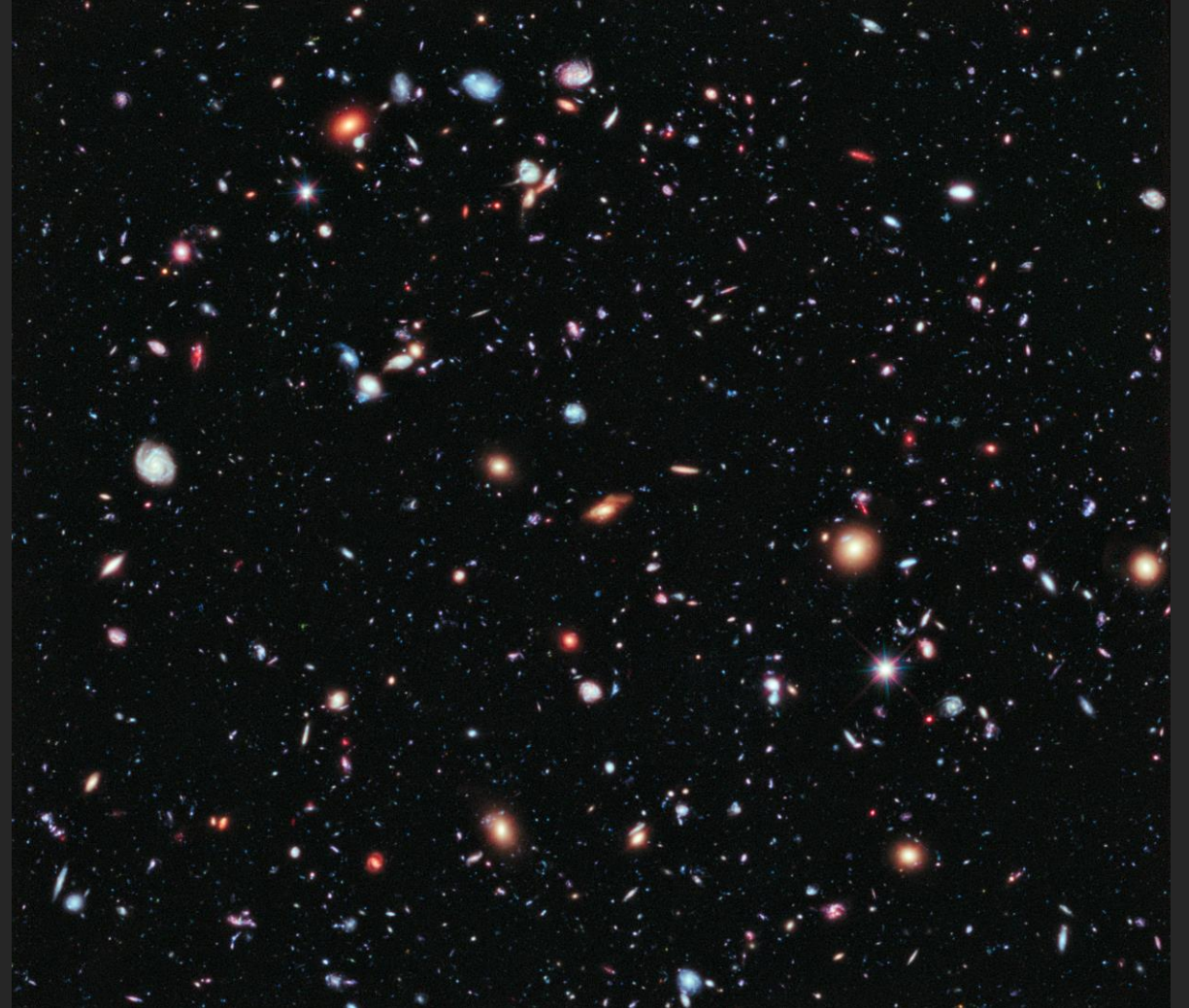
BACKGROUND

METHOD

A BIG RING

WHAT DOES IT MEAN?

SUMMARY



OVERVIEW

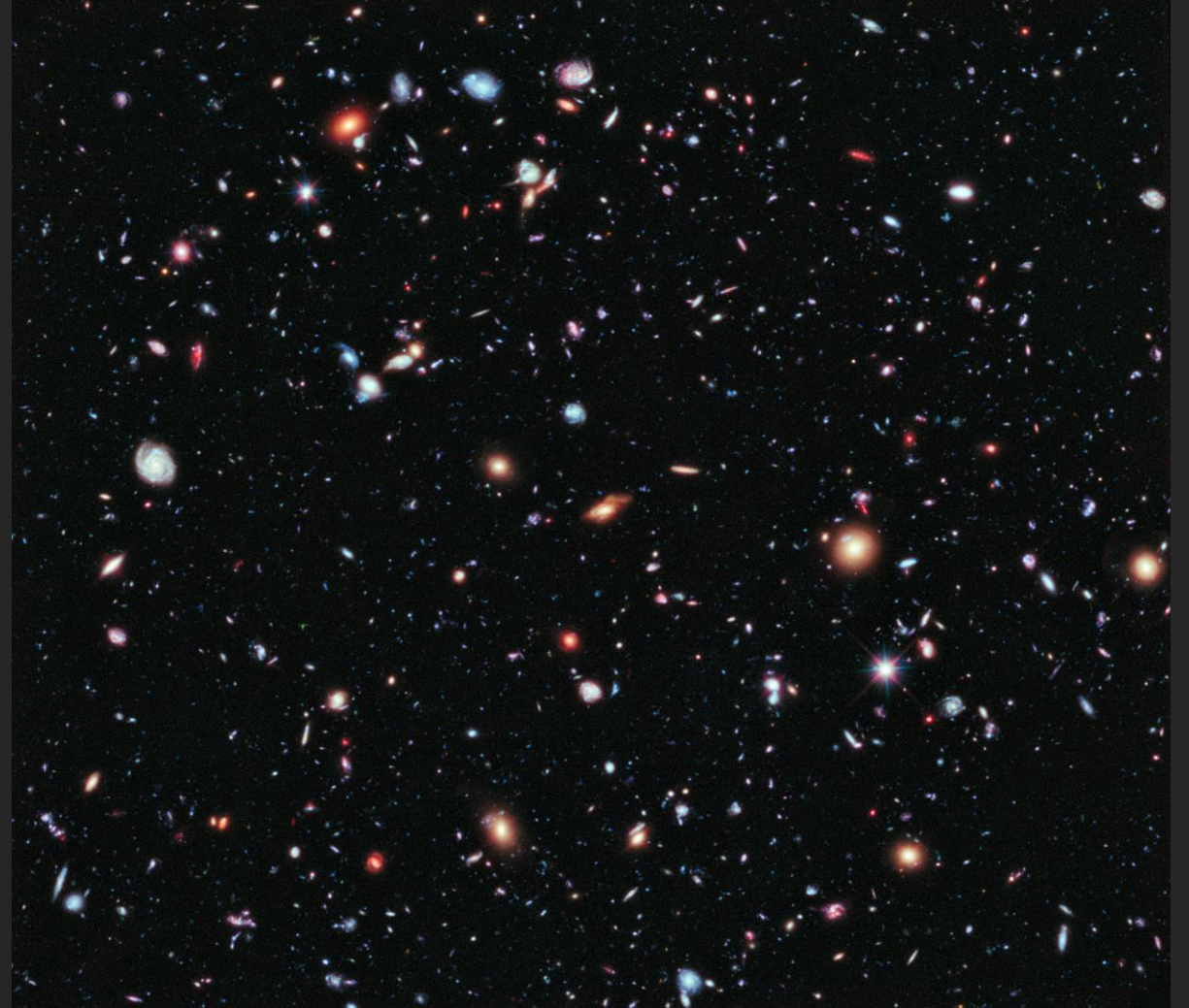
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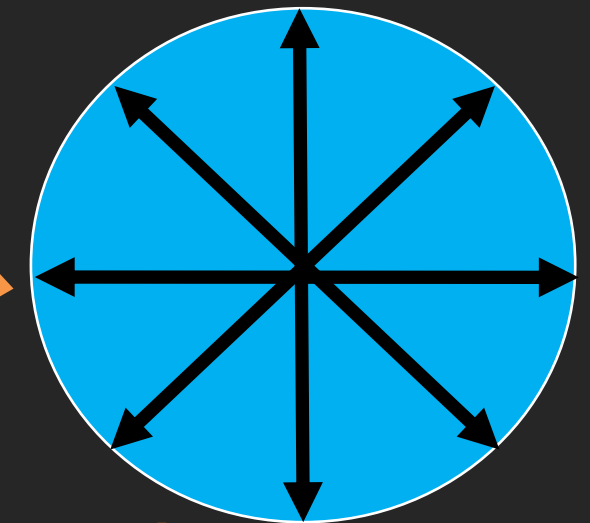
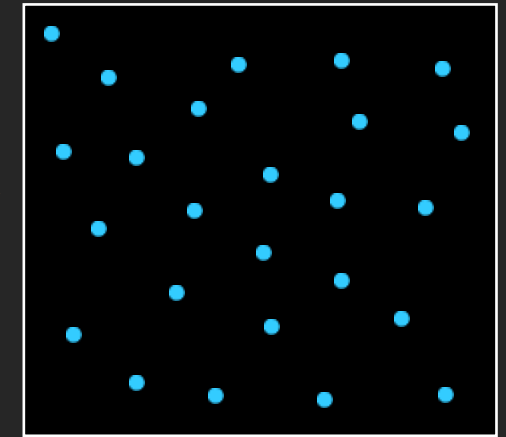
SUMMARY



STANDARD MODEL OF COSMOLOGY - Λ CDM

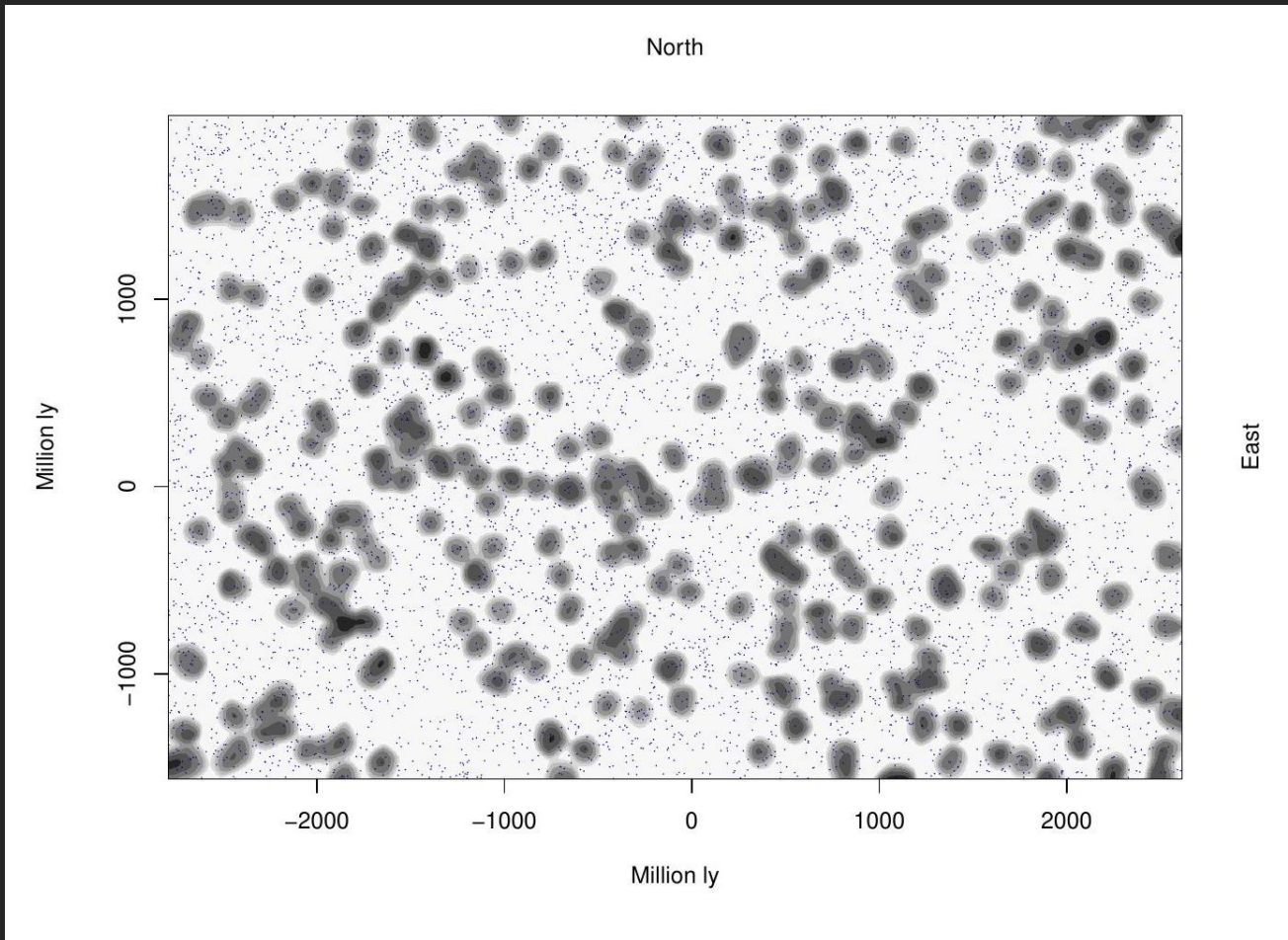
- The Standard Model of Cosmology describes our whole Universe
- Cosmological Principle
- Standard Model built from an assumption
- Scale of homogeneity **1.2 billion ly**

Homogeneous



Isotropic

PREVIOUSLY...



- ***A GIANT ARC ON THE SKY***
- **Size: 3.3 billion ly**
- **Located: 9.2 billion ly**
- **Challenges the Cosmological Principle**

OVERVIEW

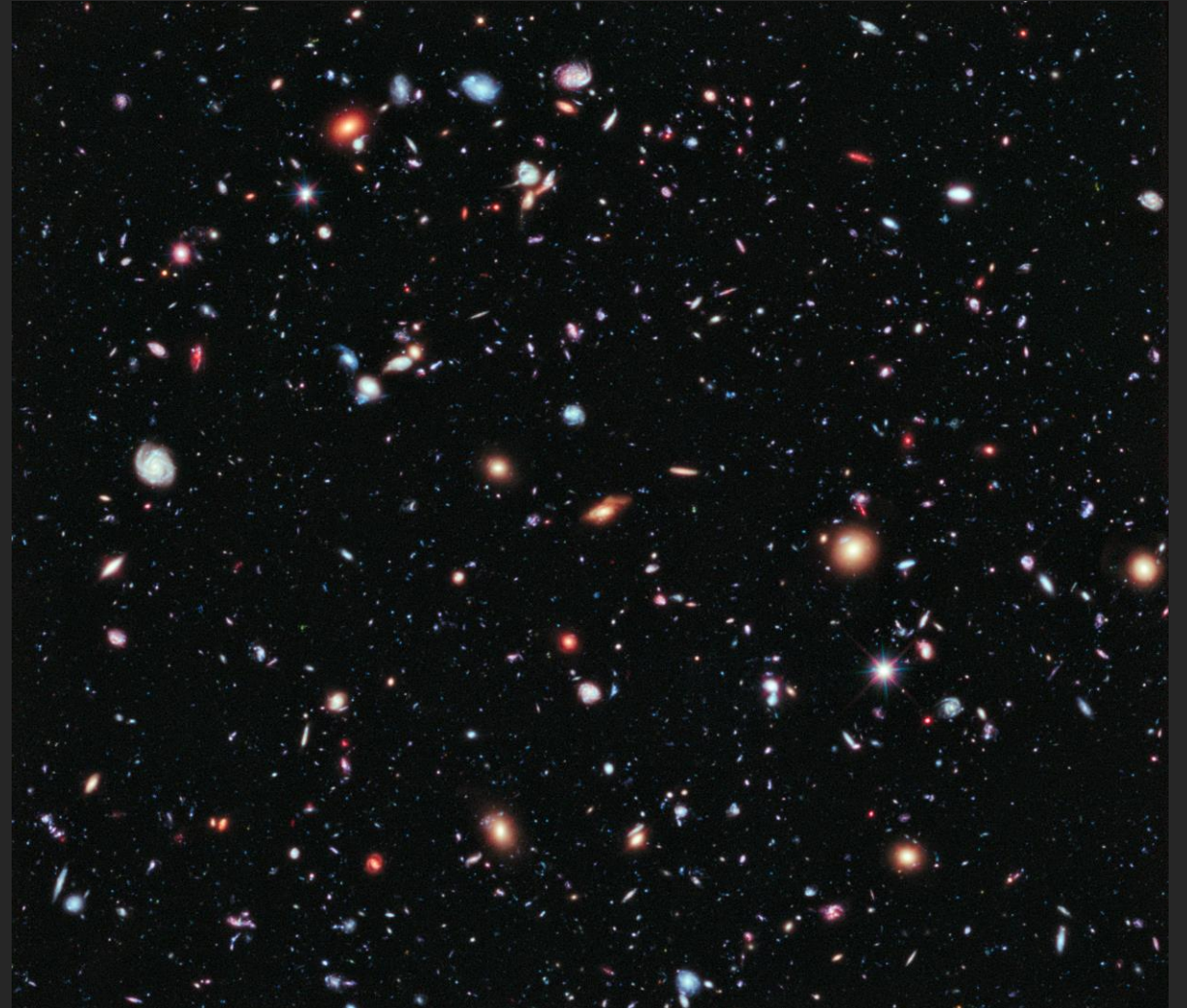
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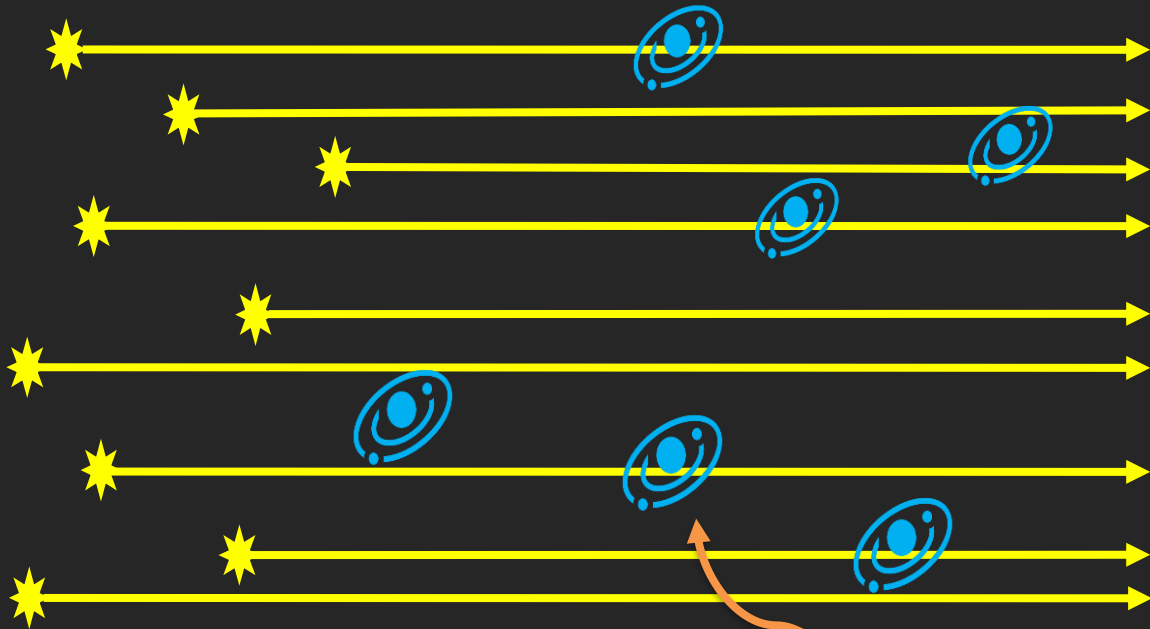
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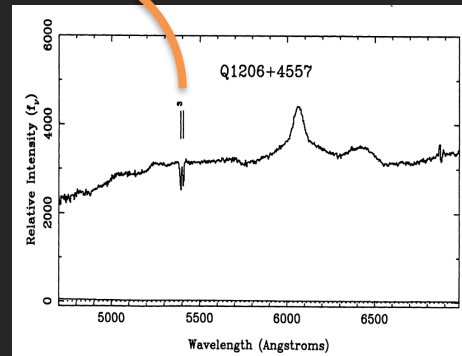


THE METHOD

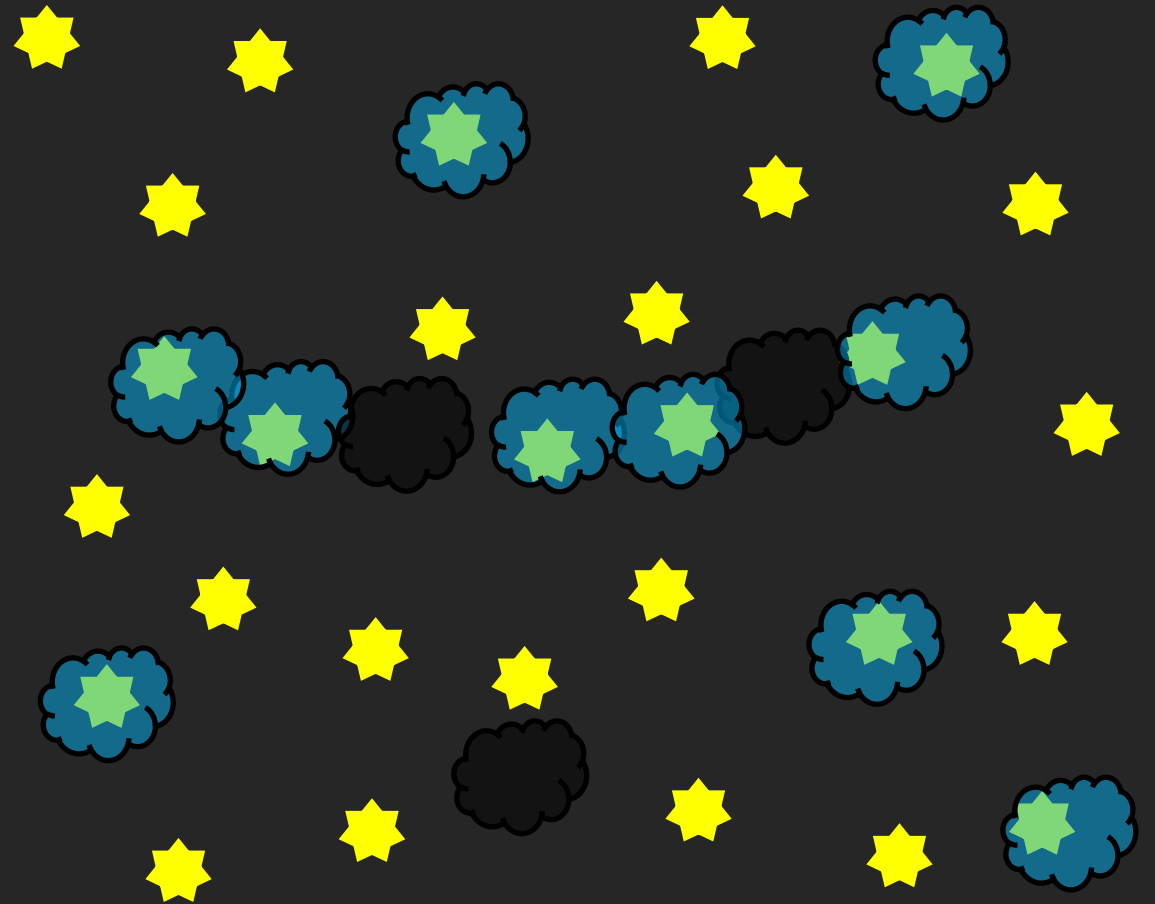
Side-on view



Distinct feature in the measured light from the quasar



Face-on view



THE METHOD

- Position of the galaxy

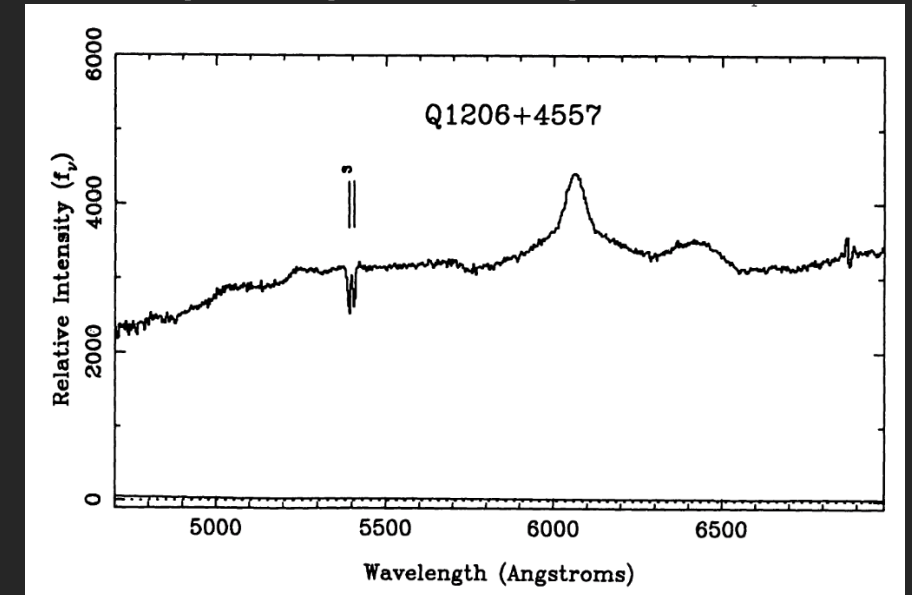


- Distance of the galaxy using wavelength of **MgII absorbers**



- We have a 3D map

Example quasar spectrum



OVERVIEW

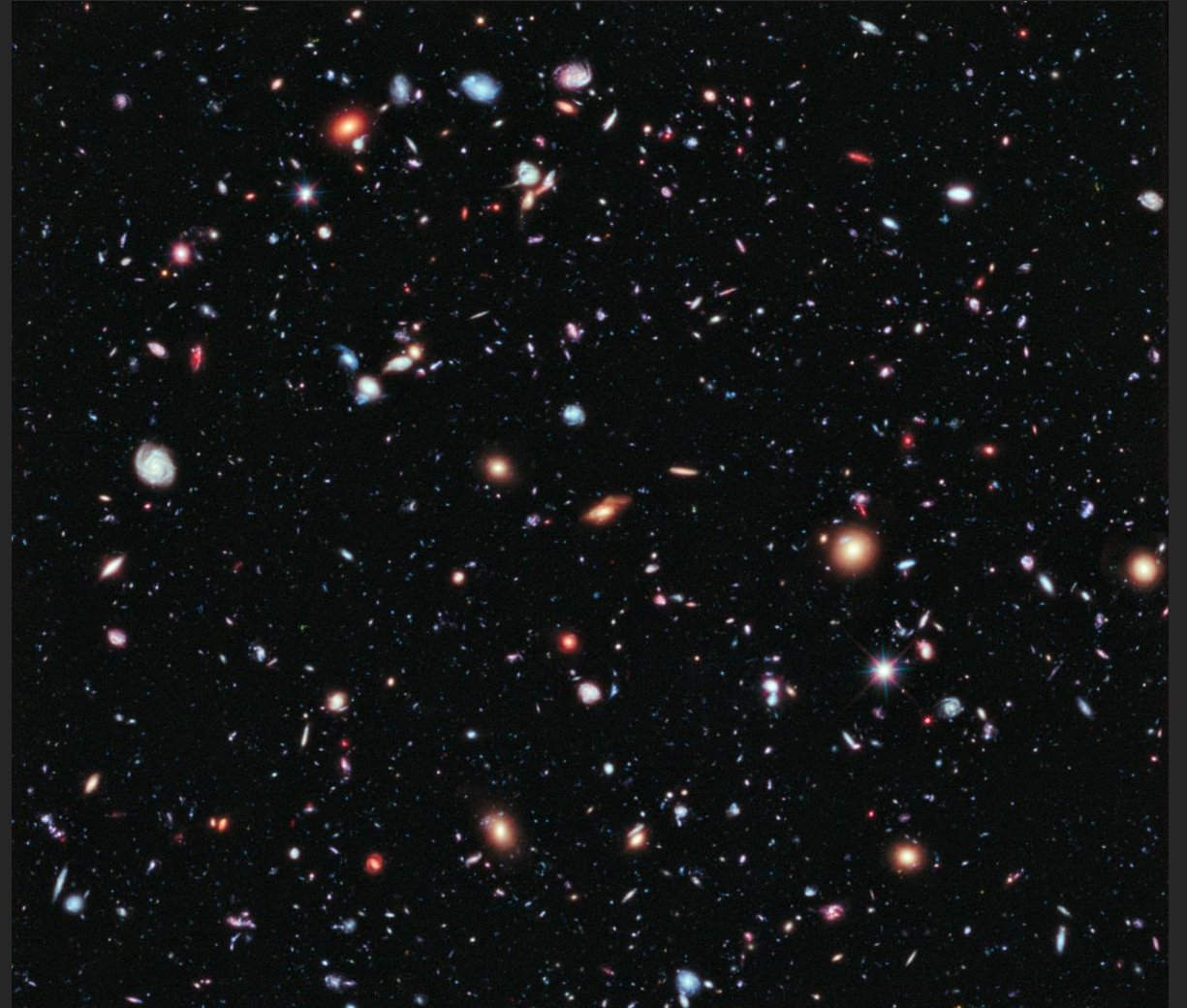
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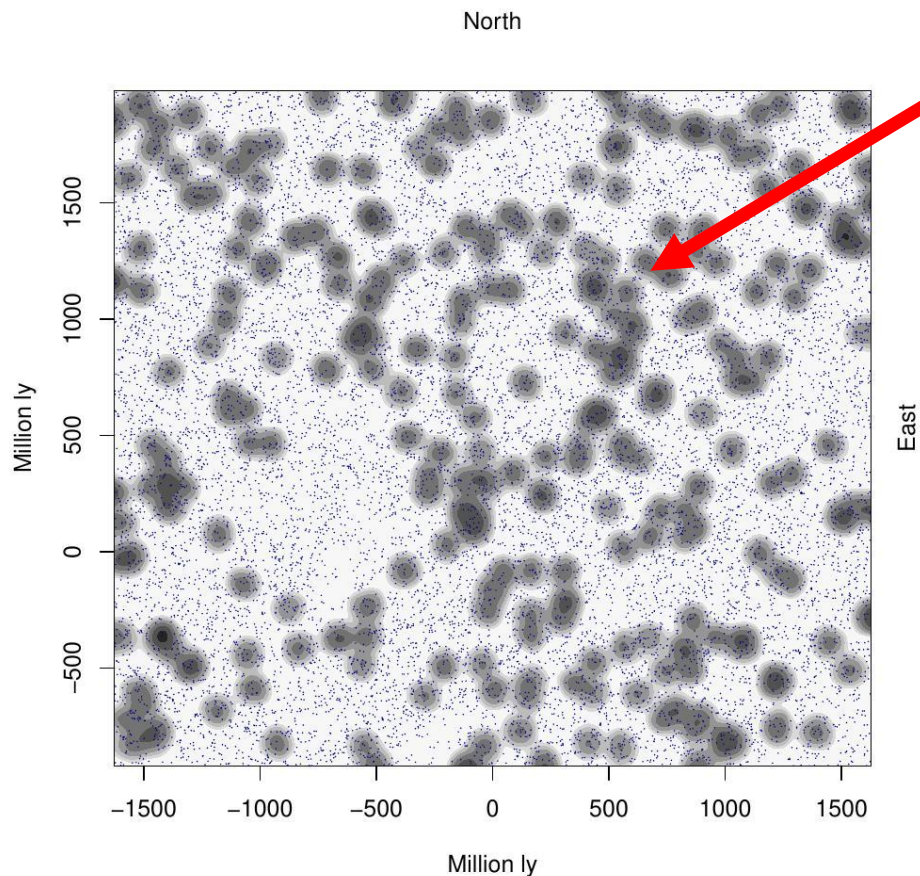
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WHAT DOES IT MEAN?

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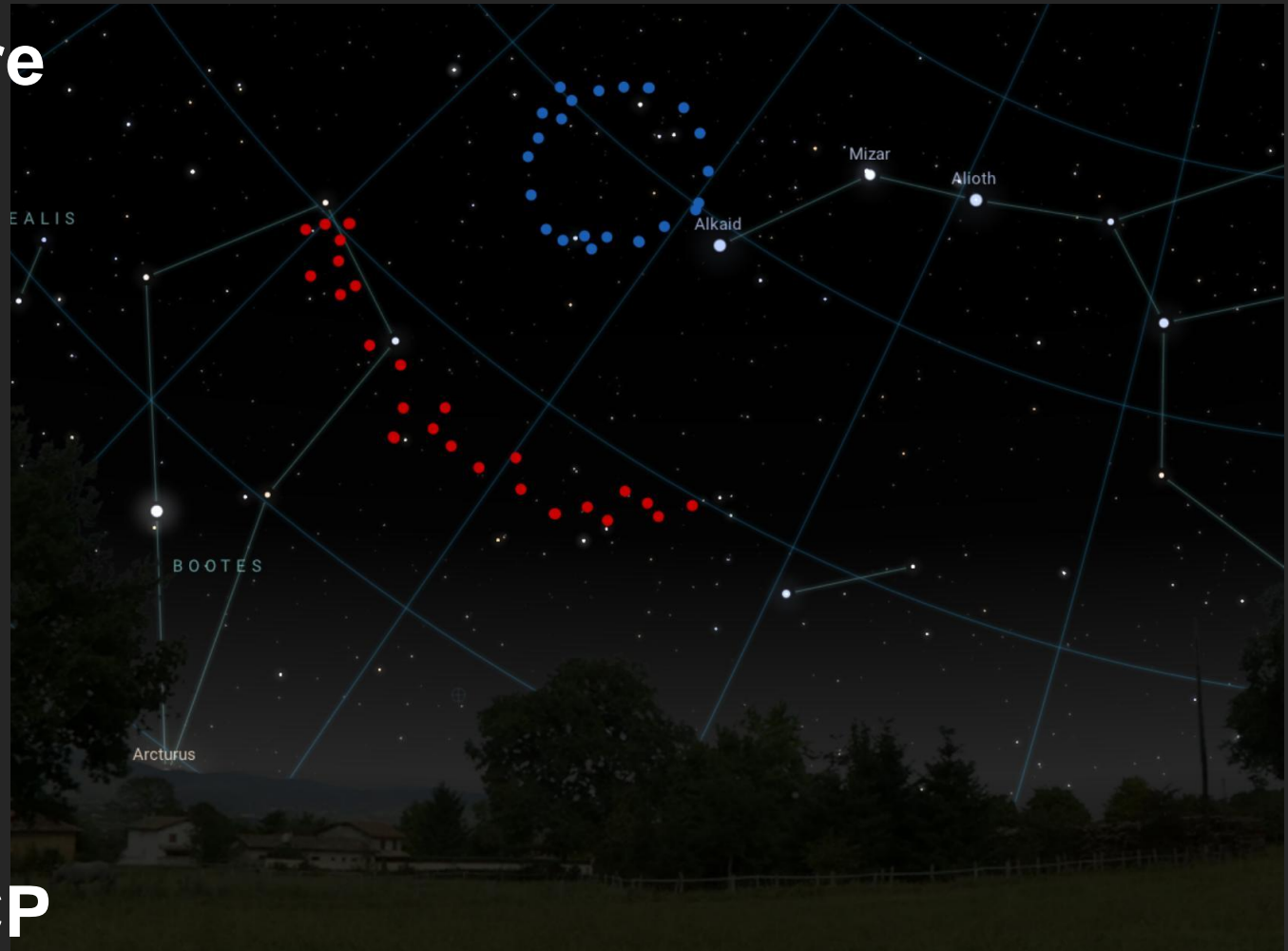
A BIG RING!



- Diameter = **1.3 billion ly**
- Circumference = **4.1 billion ly**
- Distance = **9.2 billion ly**
- Grey contours = Faint matter
- Small dots = Quasars (*spotlights*)

A BIG RING!

- Second ultra-large structure found with MgII method
- Only $\sim 12^\circ$ separation
- BR circumference is comparable to the GA
- Statistics give 5.2σ !
- Together challenging the CP



OVERVIEW

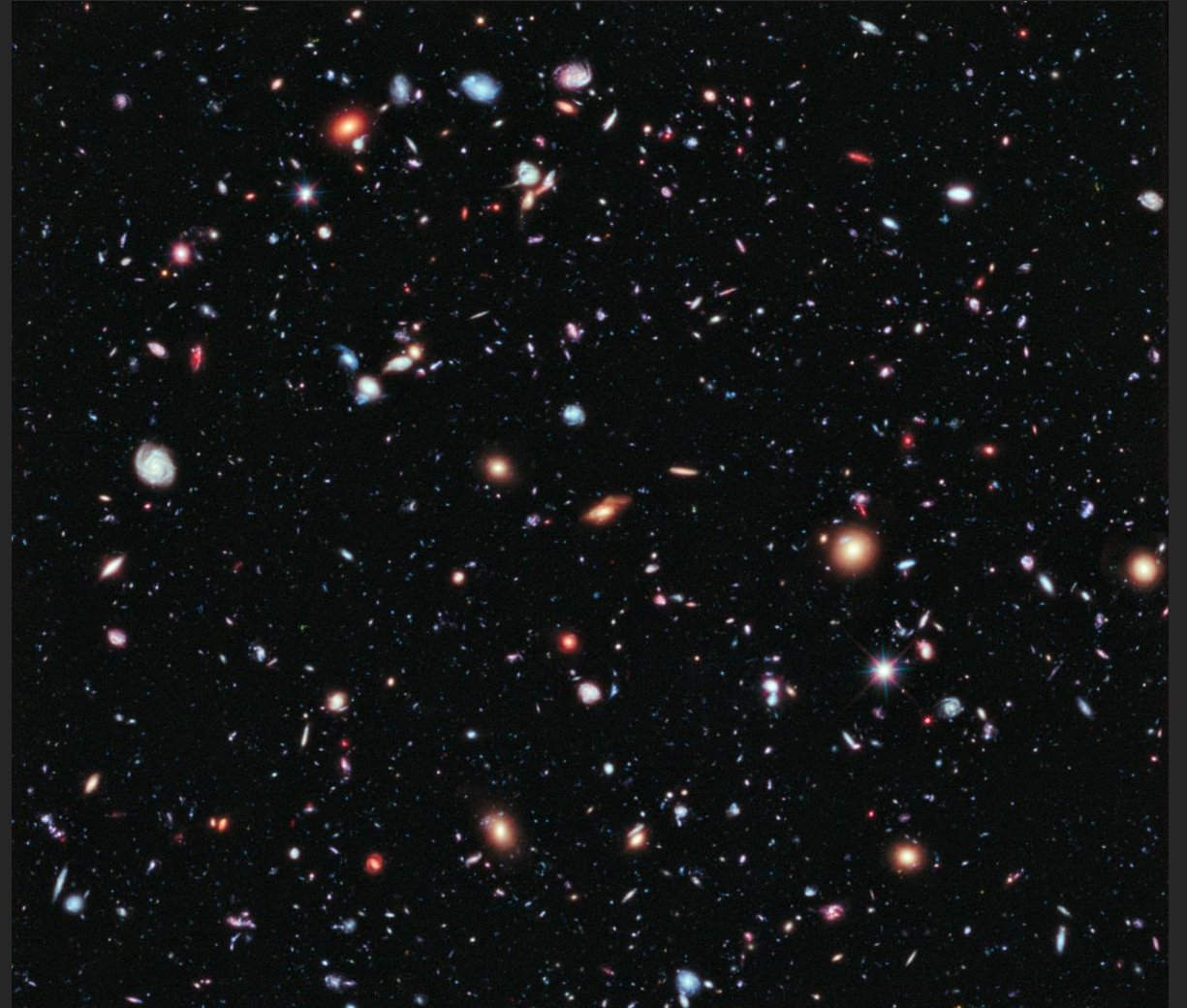
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WHAT DOES IT MEAN?

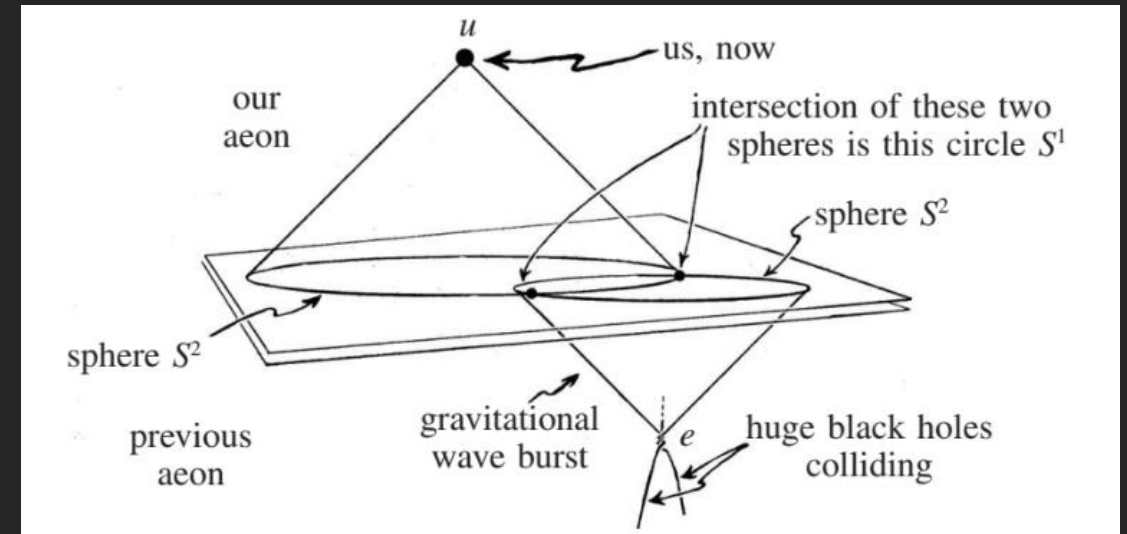
SUMMARY



WHAT DOES IT MEAN?

- Can the Universe really be homogeneous?
- Is the Cosmological Principle at doubt?
- Will our Standard Model hold?

- Turning to new avenues
- Cosmic strings
- Conformal Cyclic Cosmology



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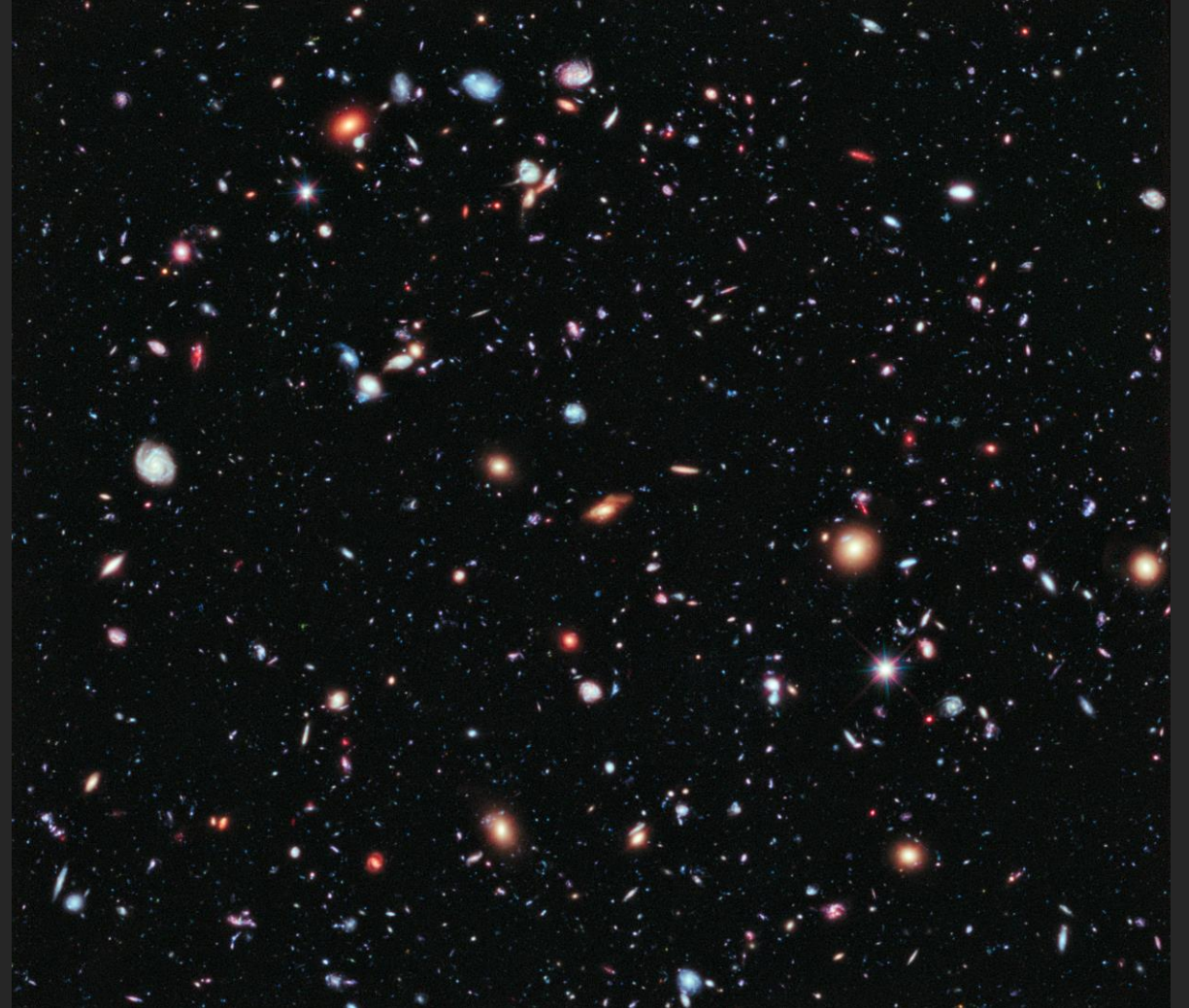
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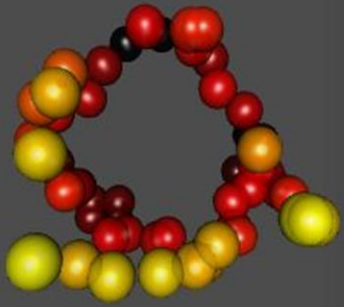
METHOD

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STATISTICS

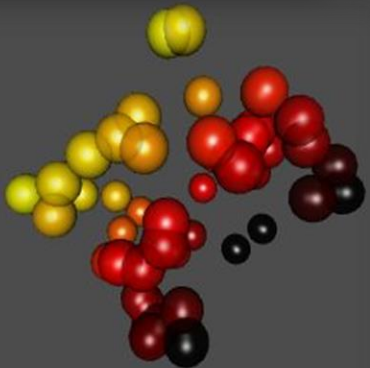
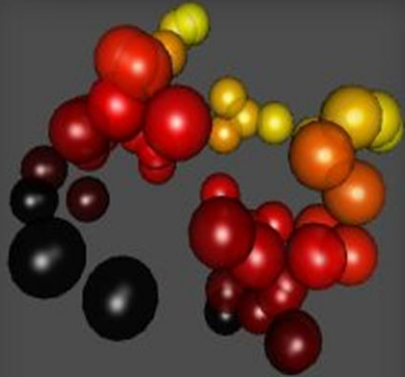
SUMMARY





SUMMARY

- Second ultra-large structure found with MgII method
- A Big Ring spanning 4.1 billion ly in circumference
- Challenge to Cosmological Principle
- Do we need a *new standard model*?



THANK YOU

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For press release see:

<https://www.star.uclan.ac.uk/~alopez/>