

STRUCTURE

THE RISE (AND INFALL) OF DARK MATTER

MARK WYMAN

74TH COMPTON LECTURE SERIES

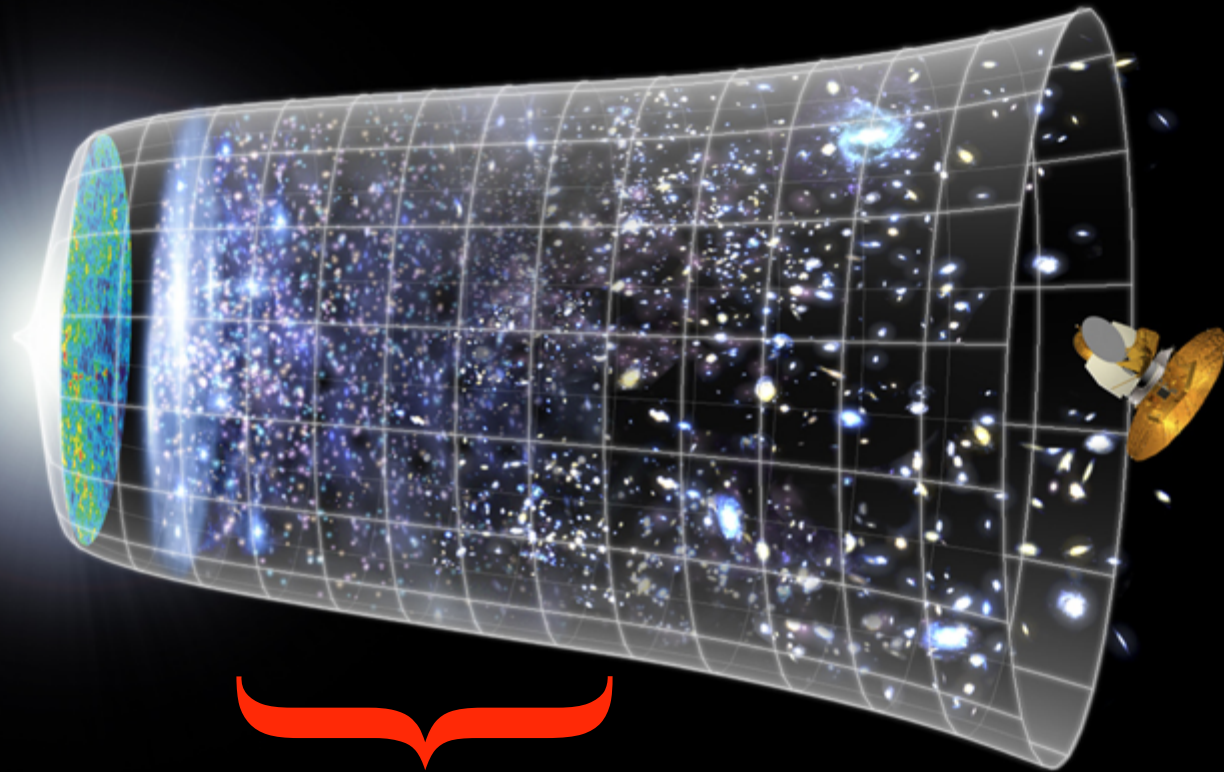


ADVERTISEMENT: BRINSON LECTURE

Nobel laureate John Mather

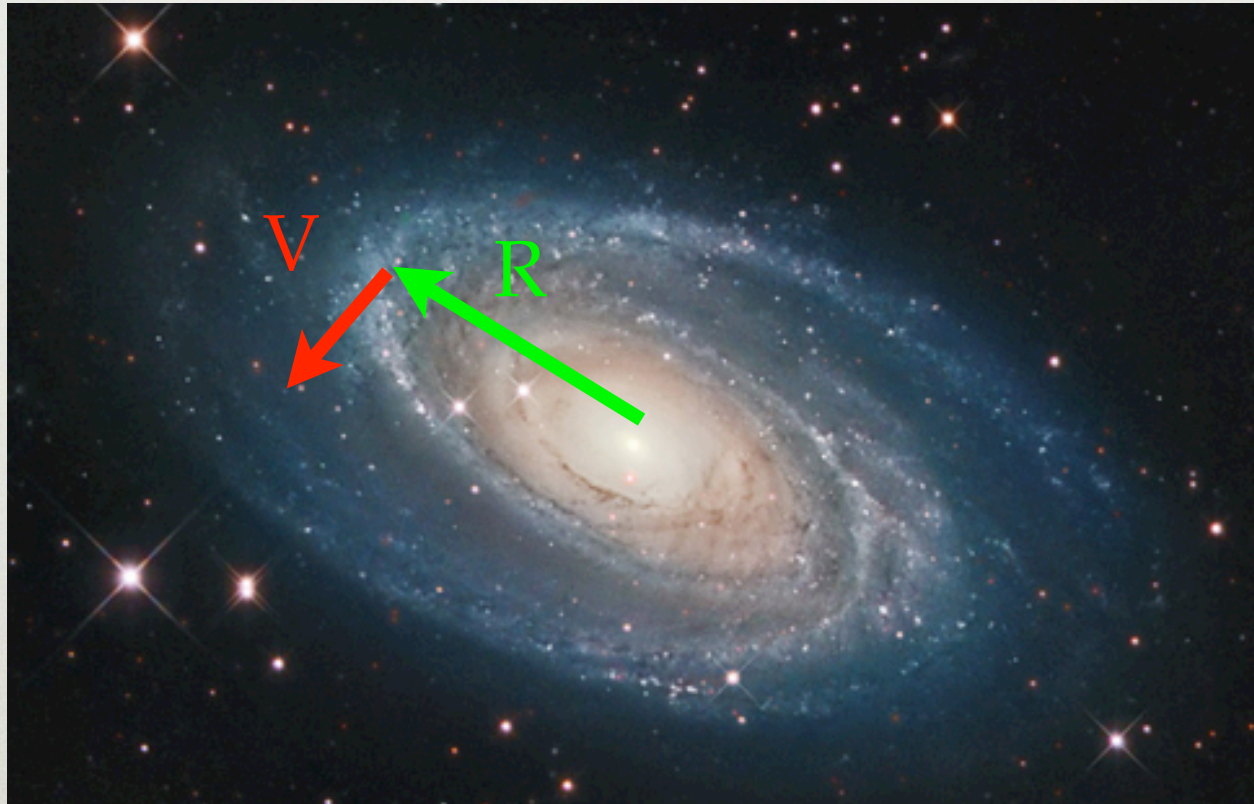
**History of the universe in a nutshell:
from the Big Bang to life and the end
of time"**

Tuesday, Nov. 1st, 6:00 pm: School of the Art Institute of
Chicago, 112 South Michigan Ave., MacLean Ballroom

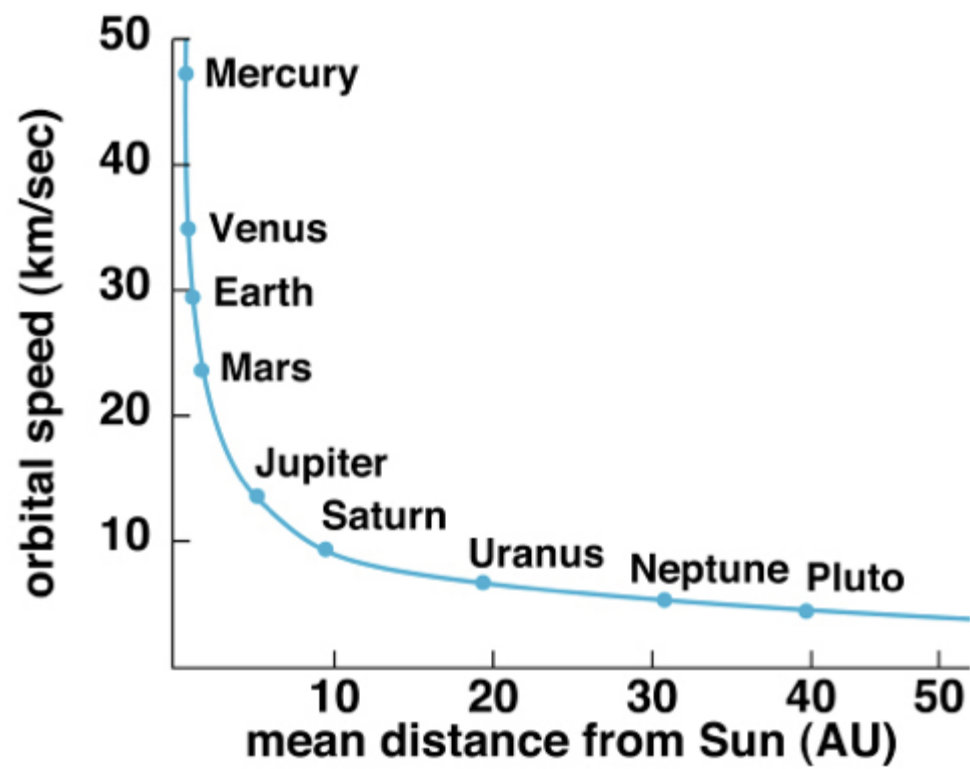


TODAY'S TOPIC

WHAT IS DARK MATTER?



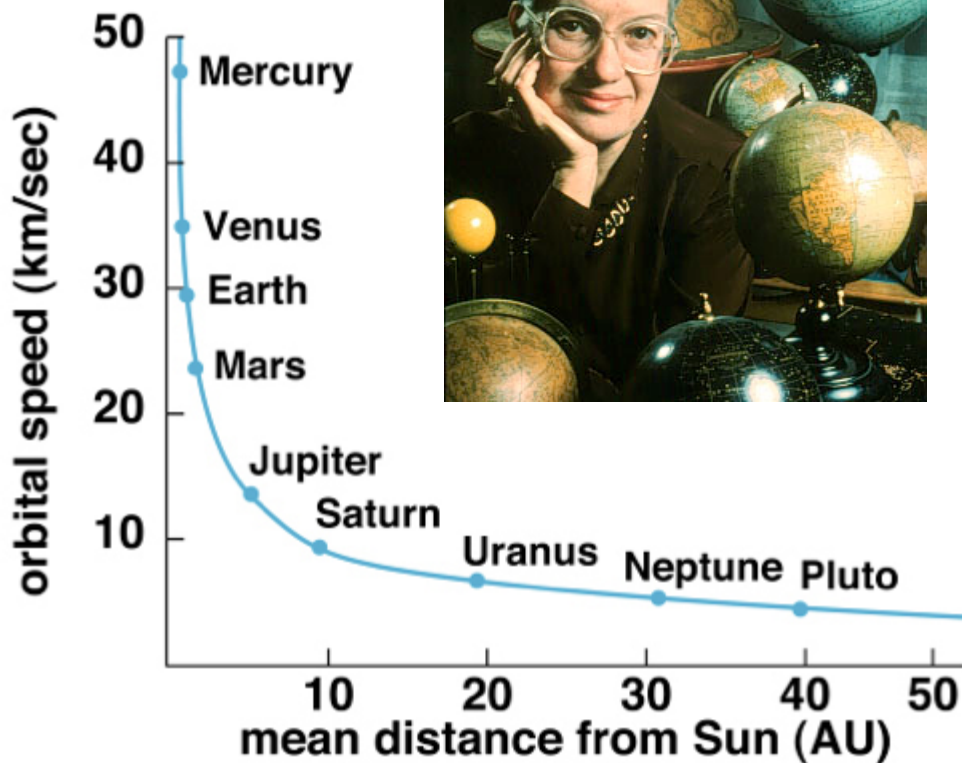
~1960



(b)

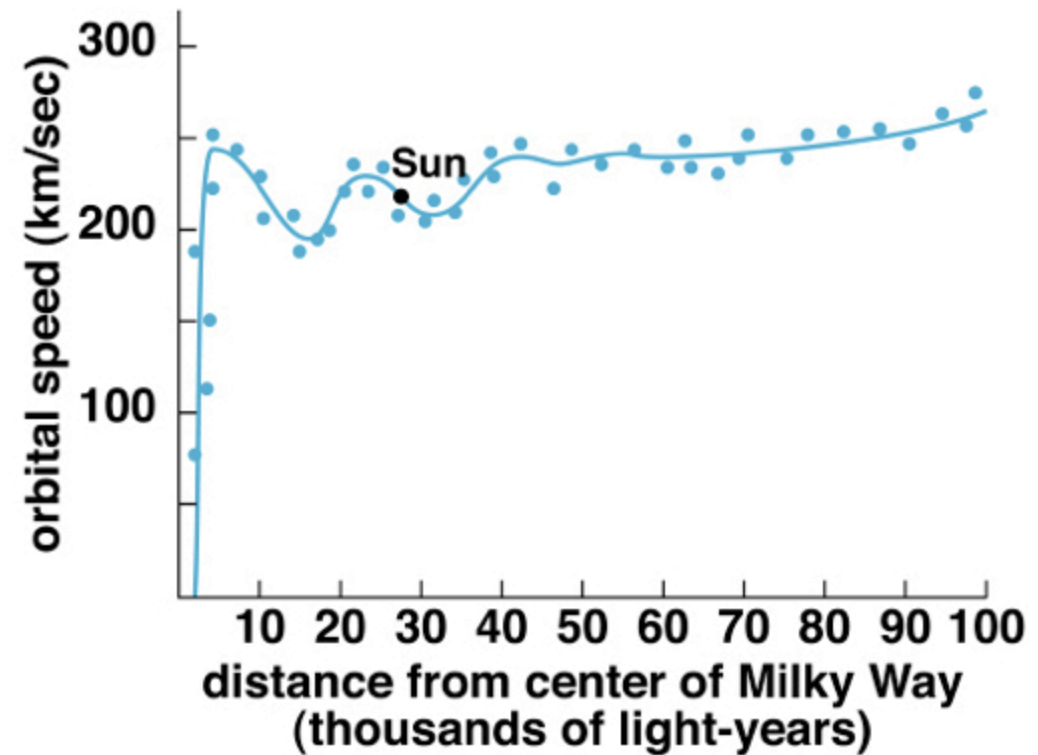
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THERE'S MORE DM THAN REGULAR MATTER!



(b)

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(c)

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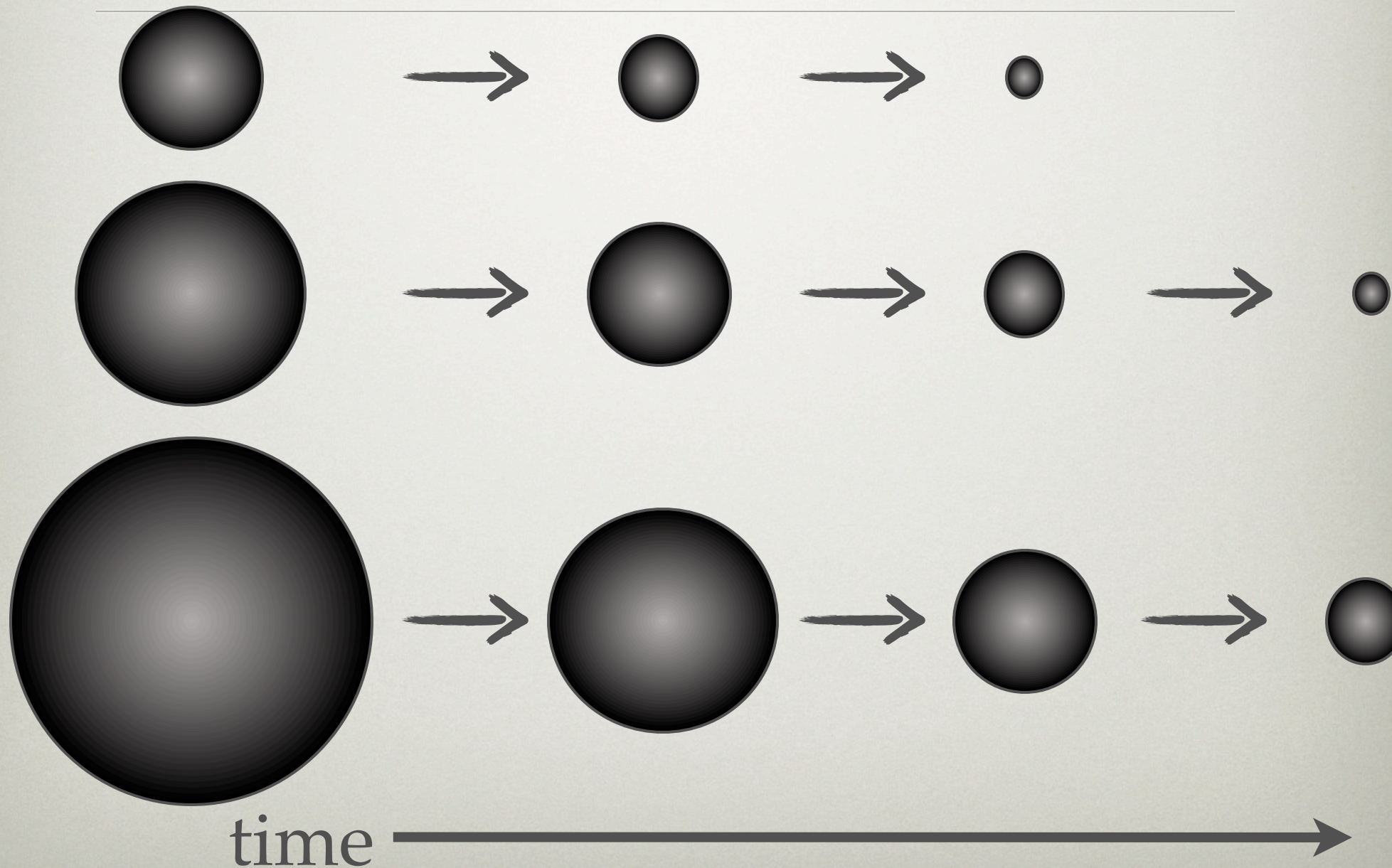
“MISSING MATTER” WAS A BAD NAME



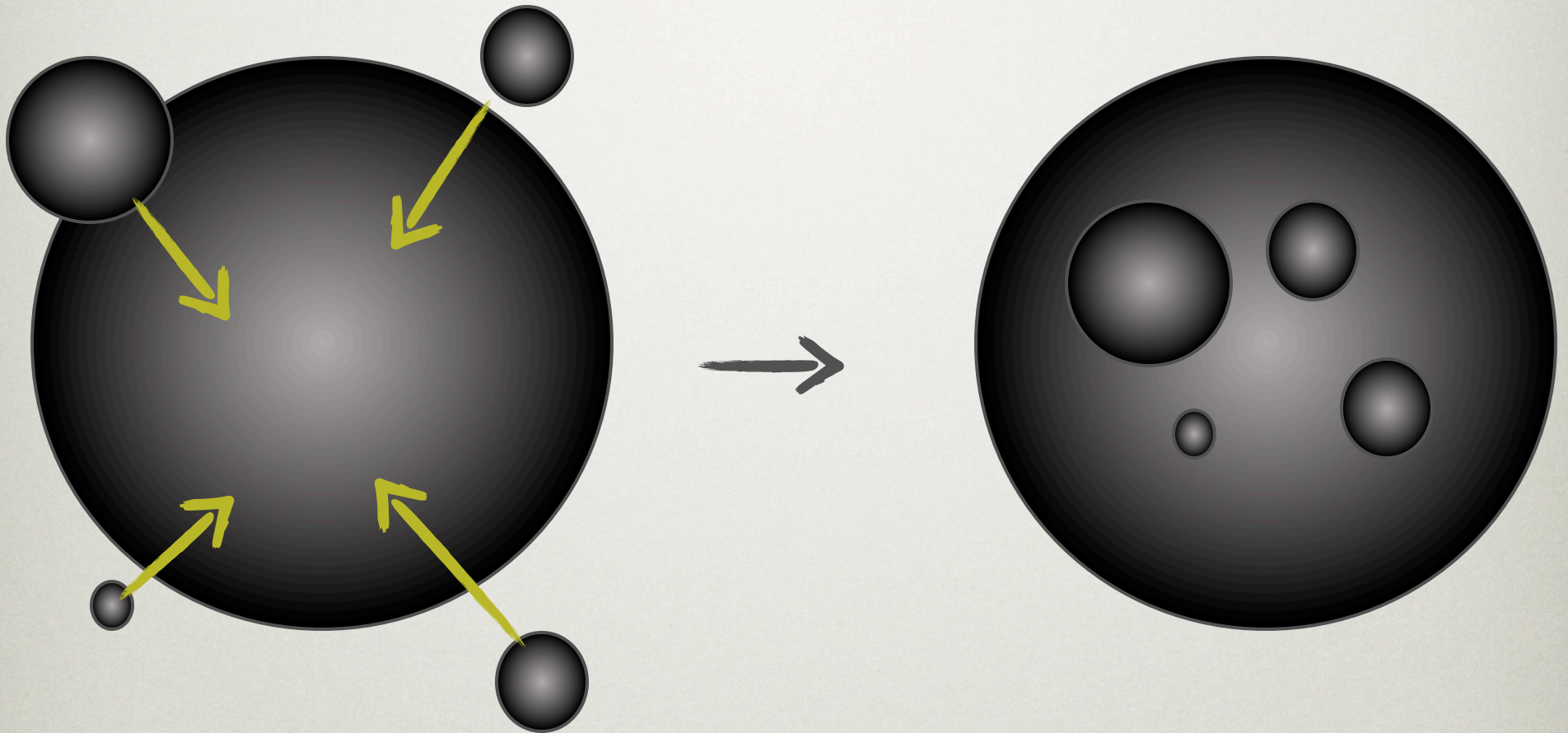
Fritz Zwicky, 1930s

HIERARCHICAL STRUCTURE FORMATION

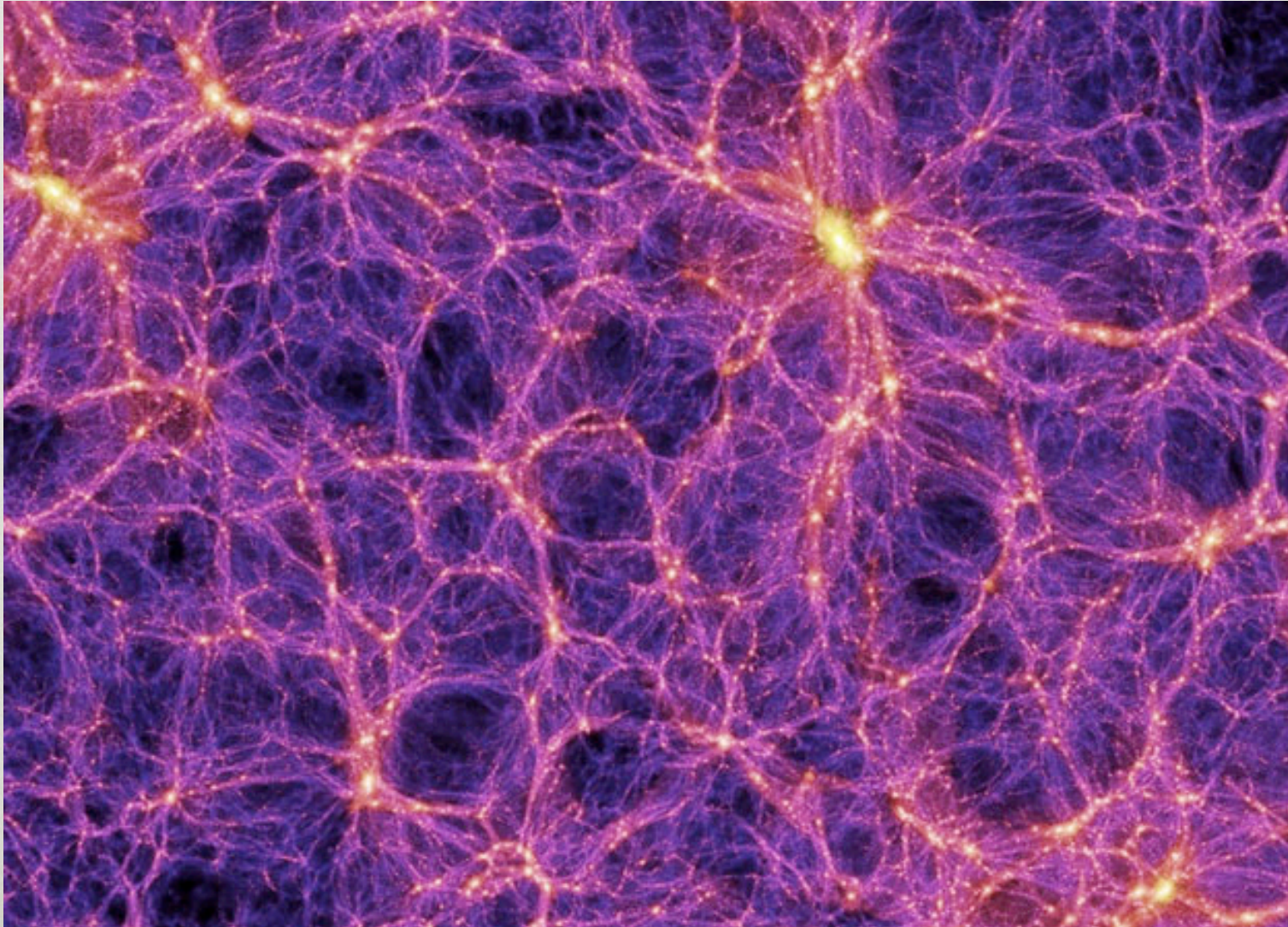
SMALL STUFF COLLAPSES FIRST

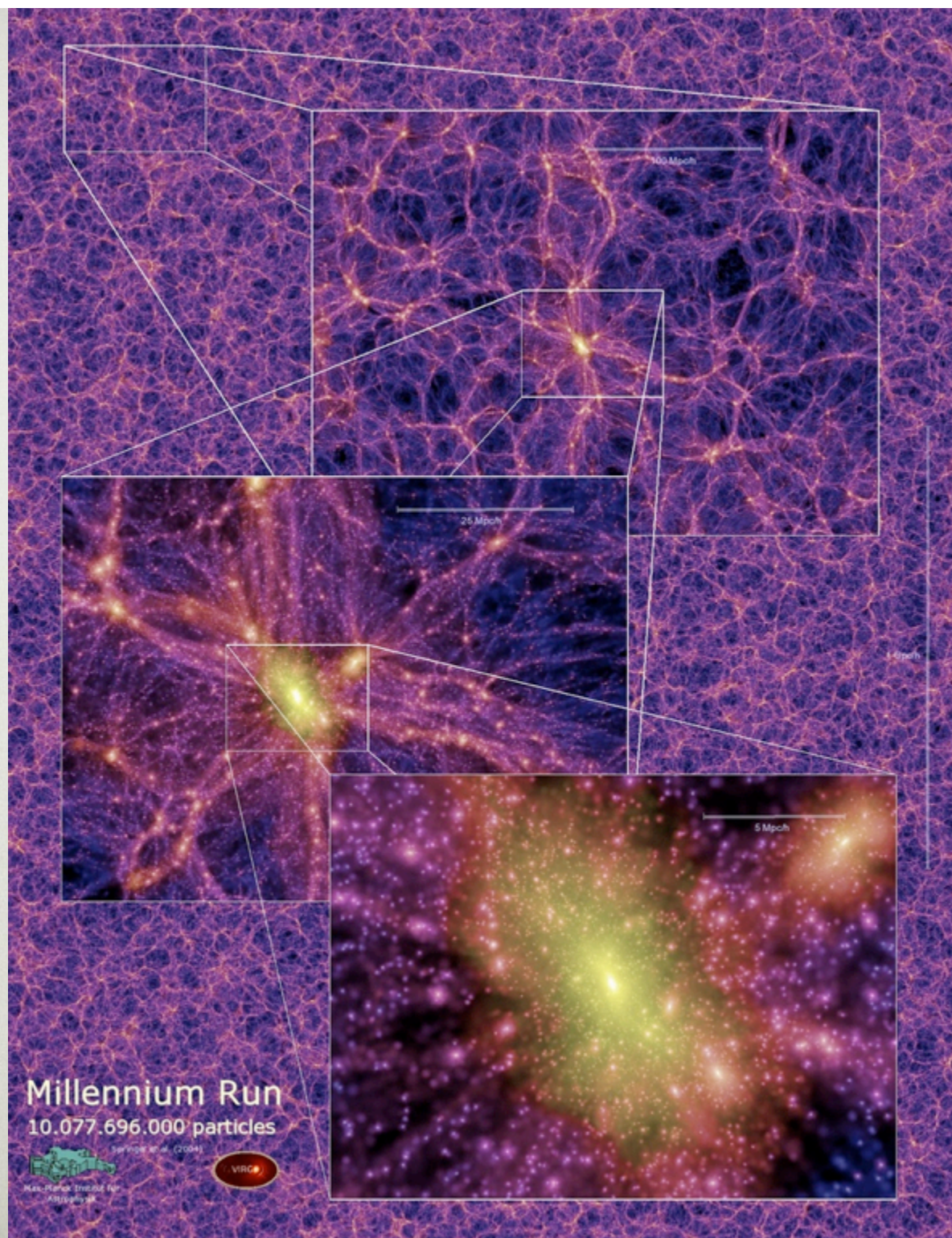


BIG OBJECTS ARE MADE OF SMALLER ONES

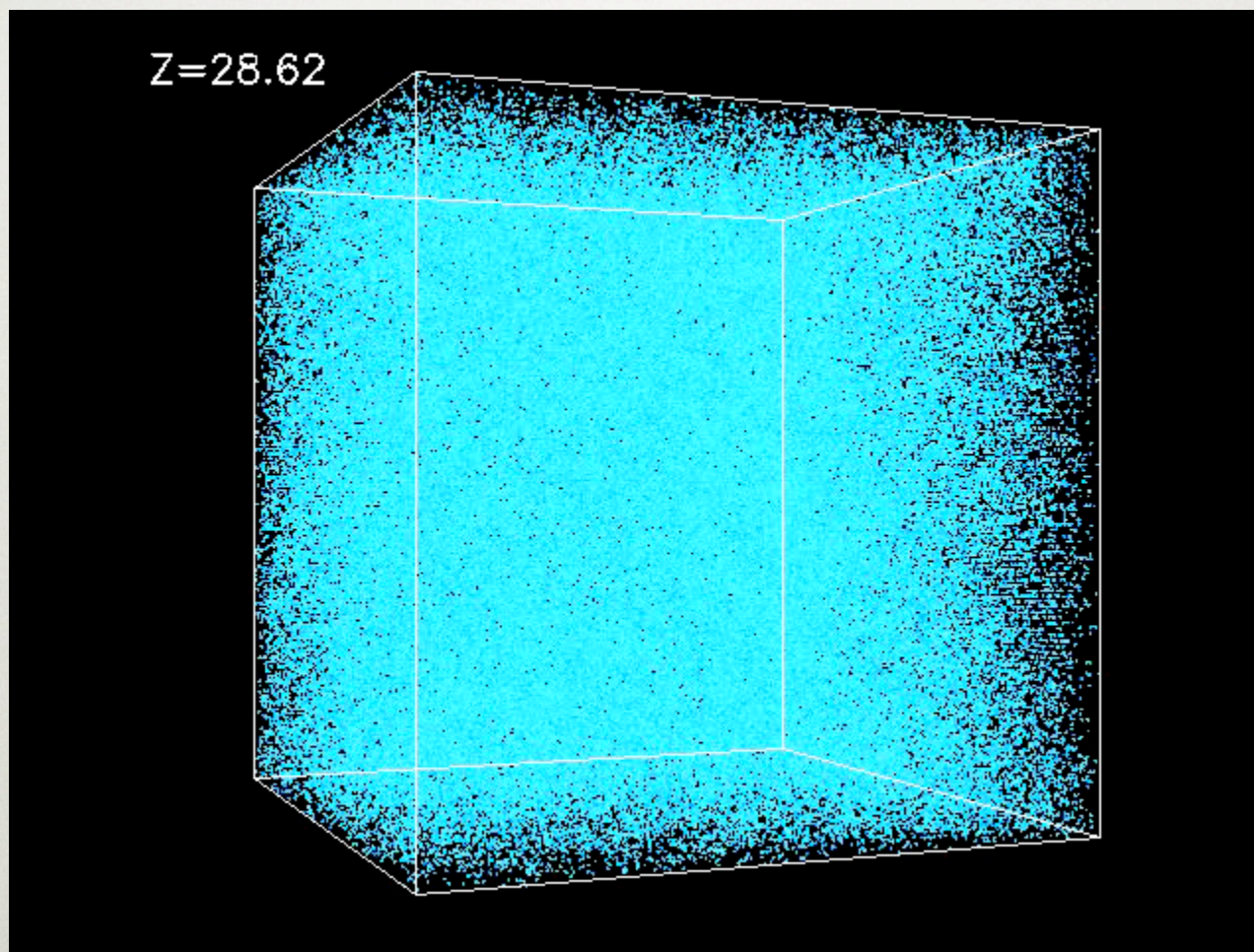


RESULT: COSMIC WEB





DARK MATTER MOVIE



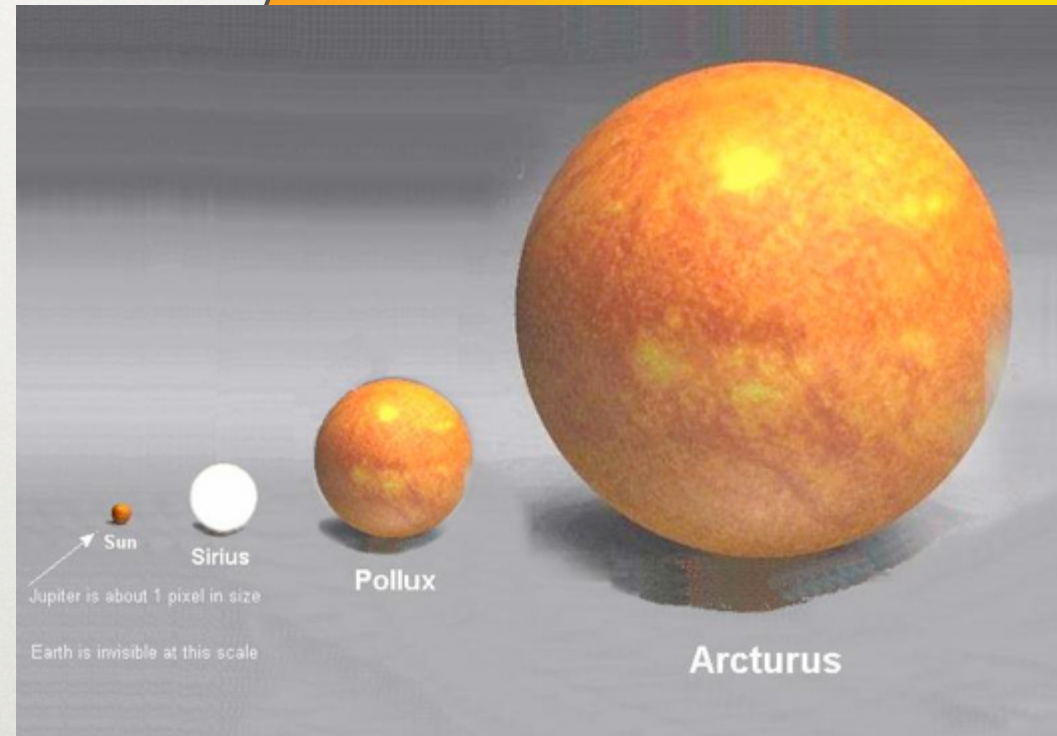
CONSEQUENCES

SOURCE OF FIRST NEW LIGHT?



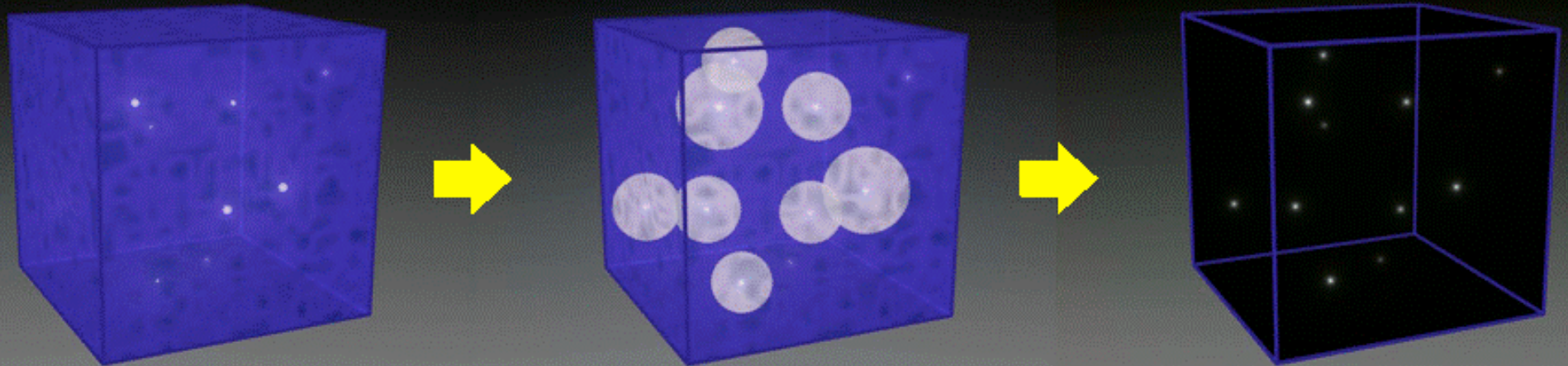
quasar?

or

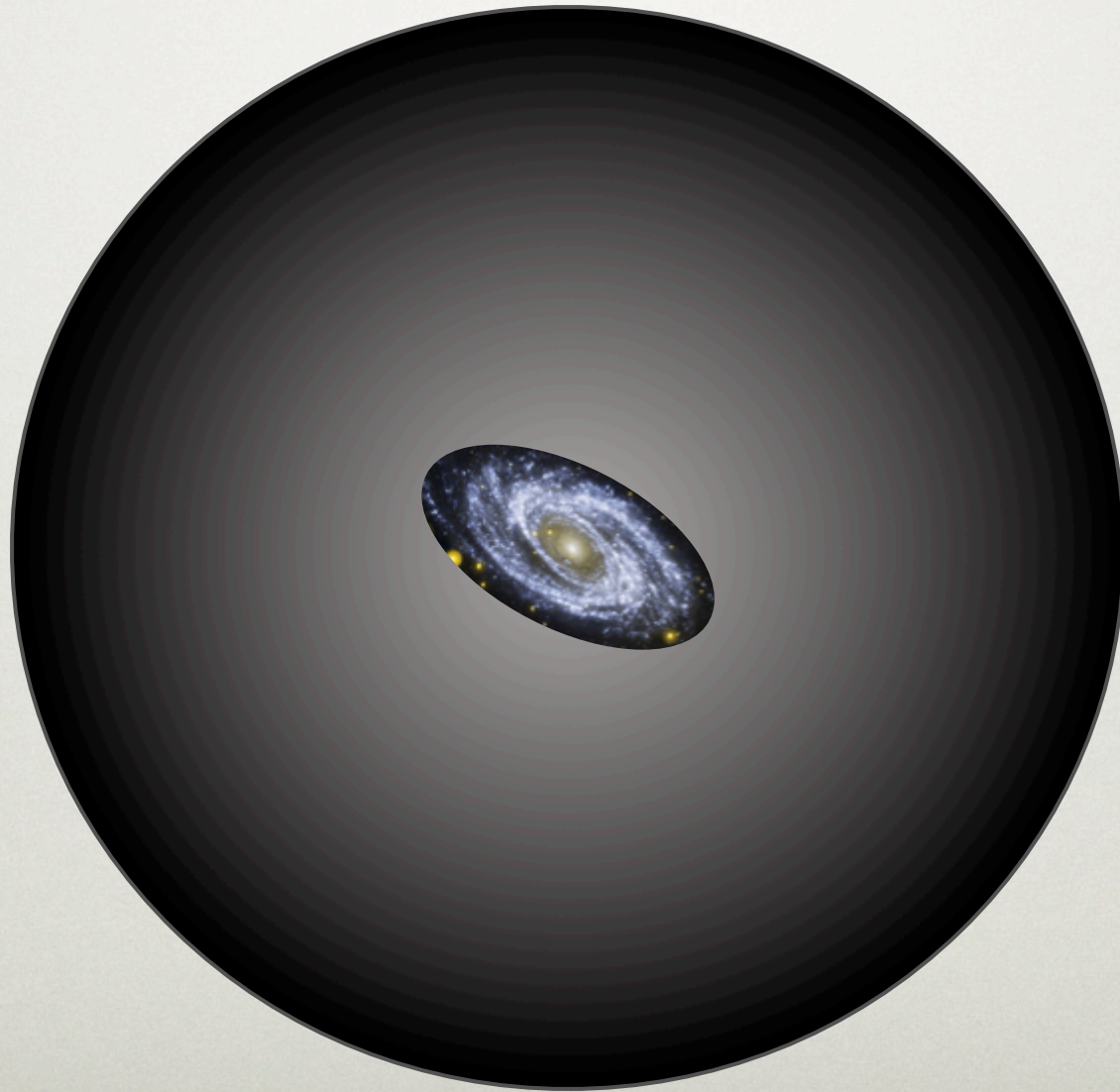


Pop III star?

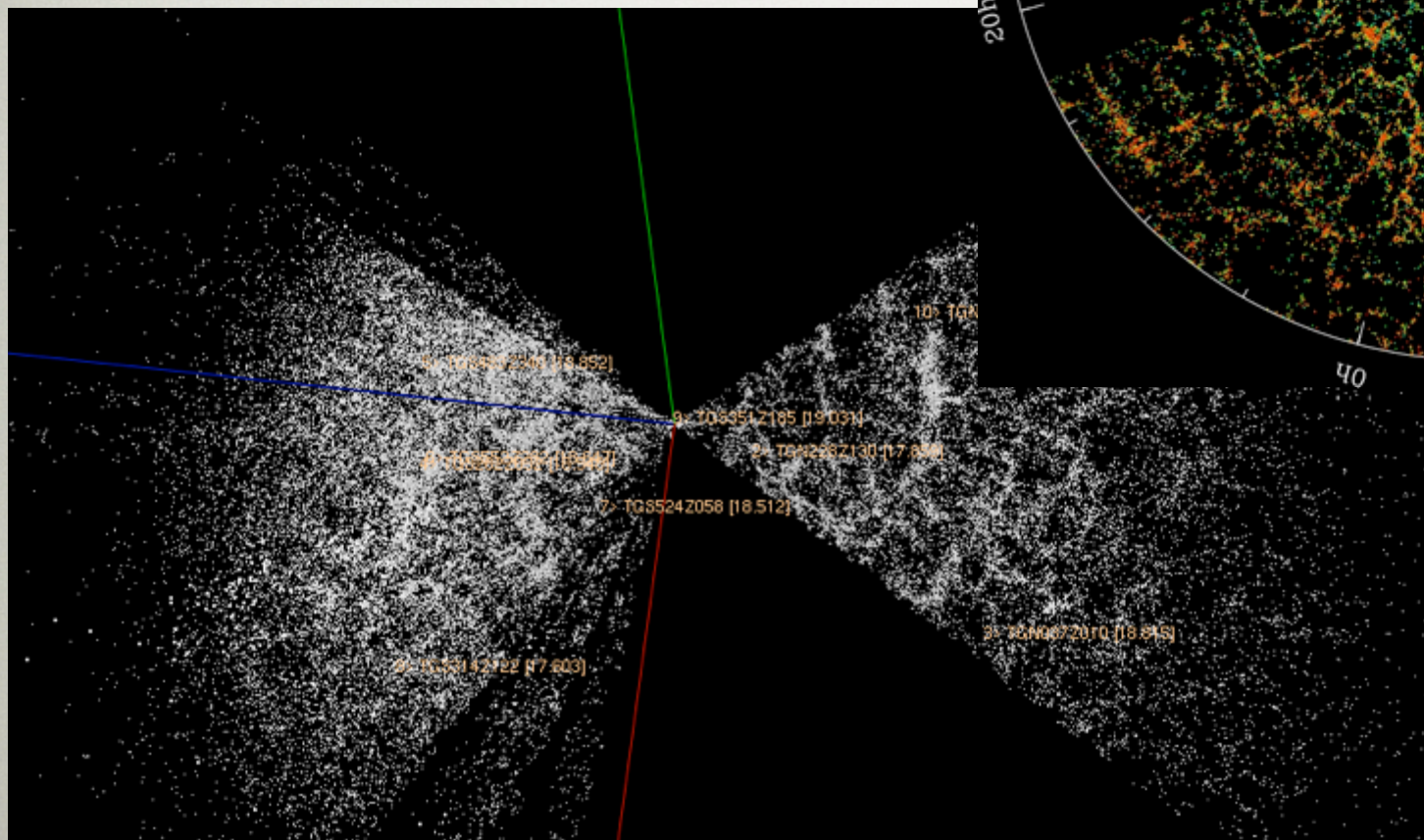
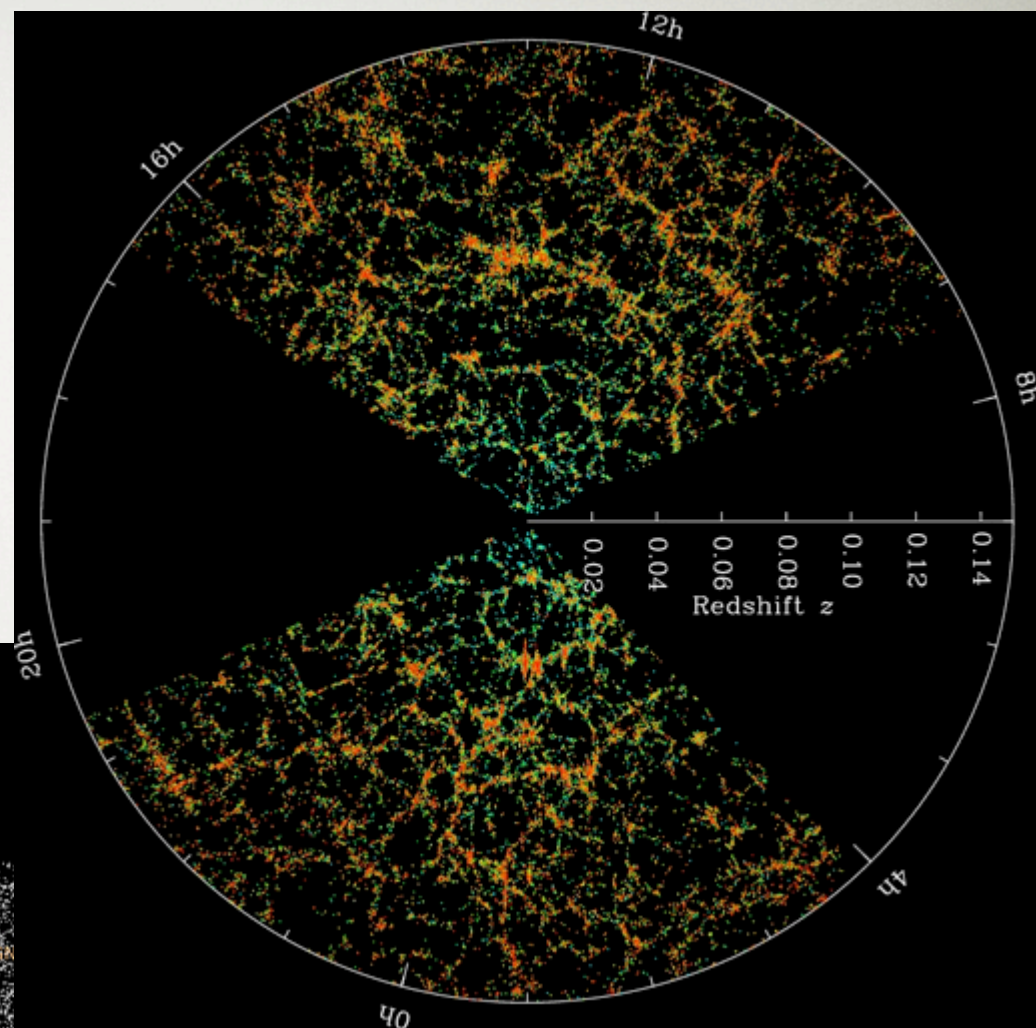
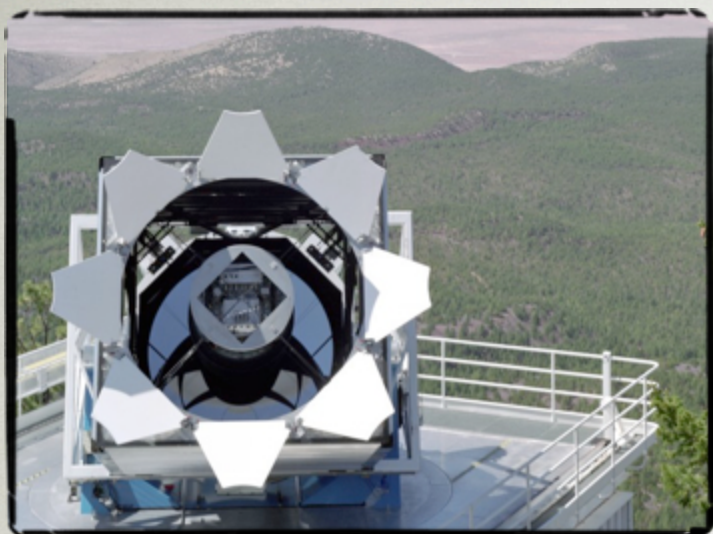
UV LIGHT IONIZES THE UNIVERSE

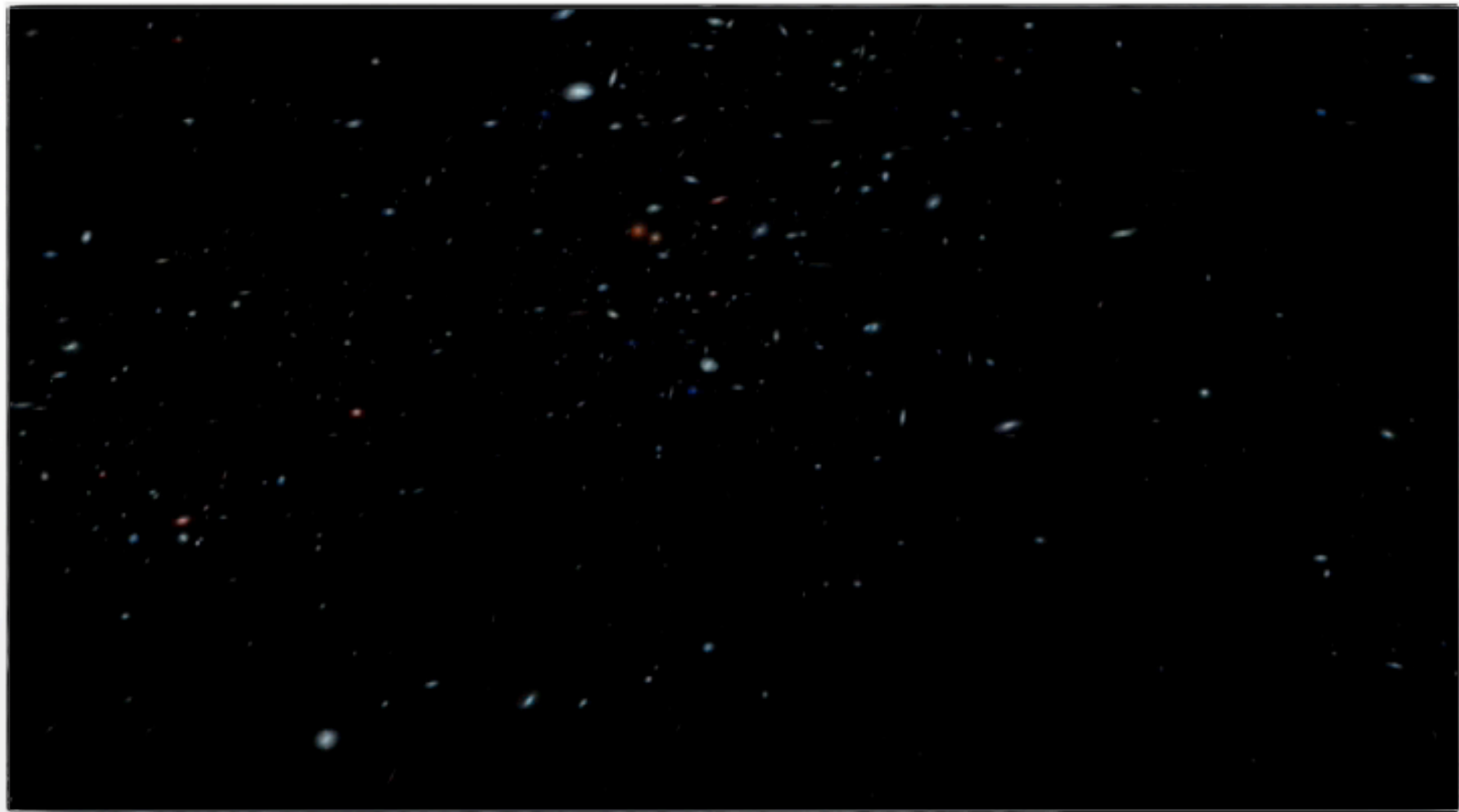


DARK MATTER HALOS HOST REGULAR MATTER

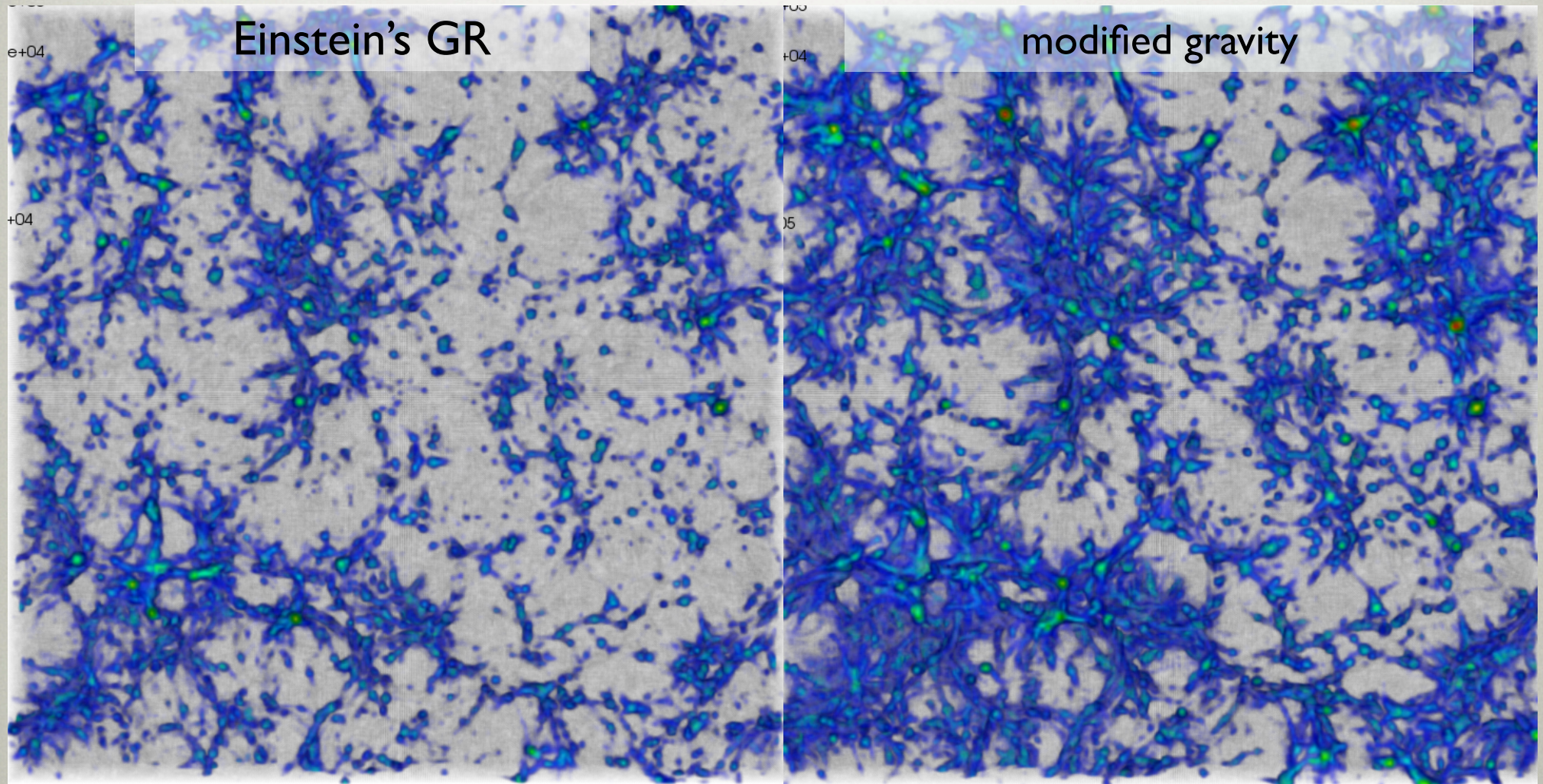


OBSERVATIONS



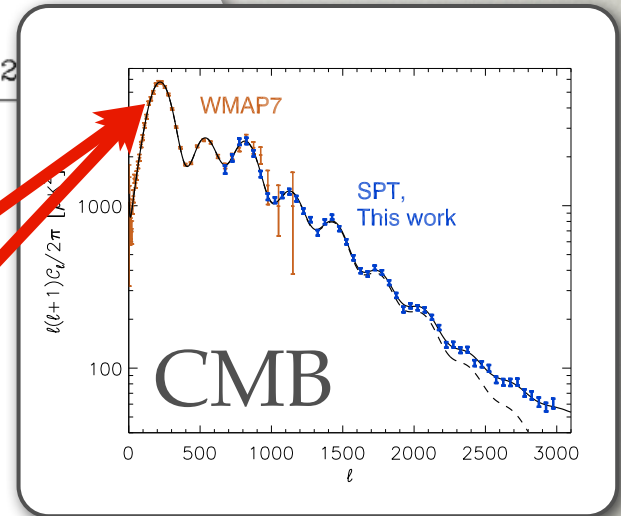
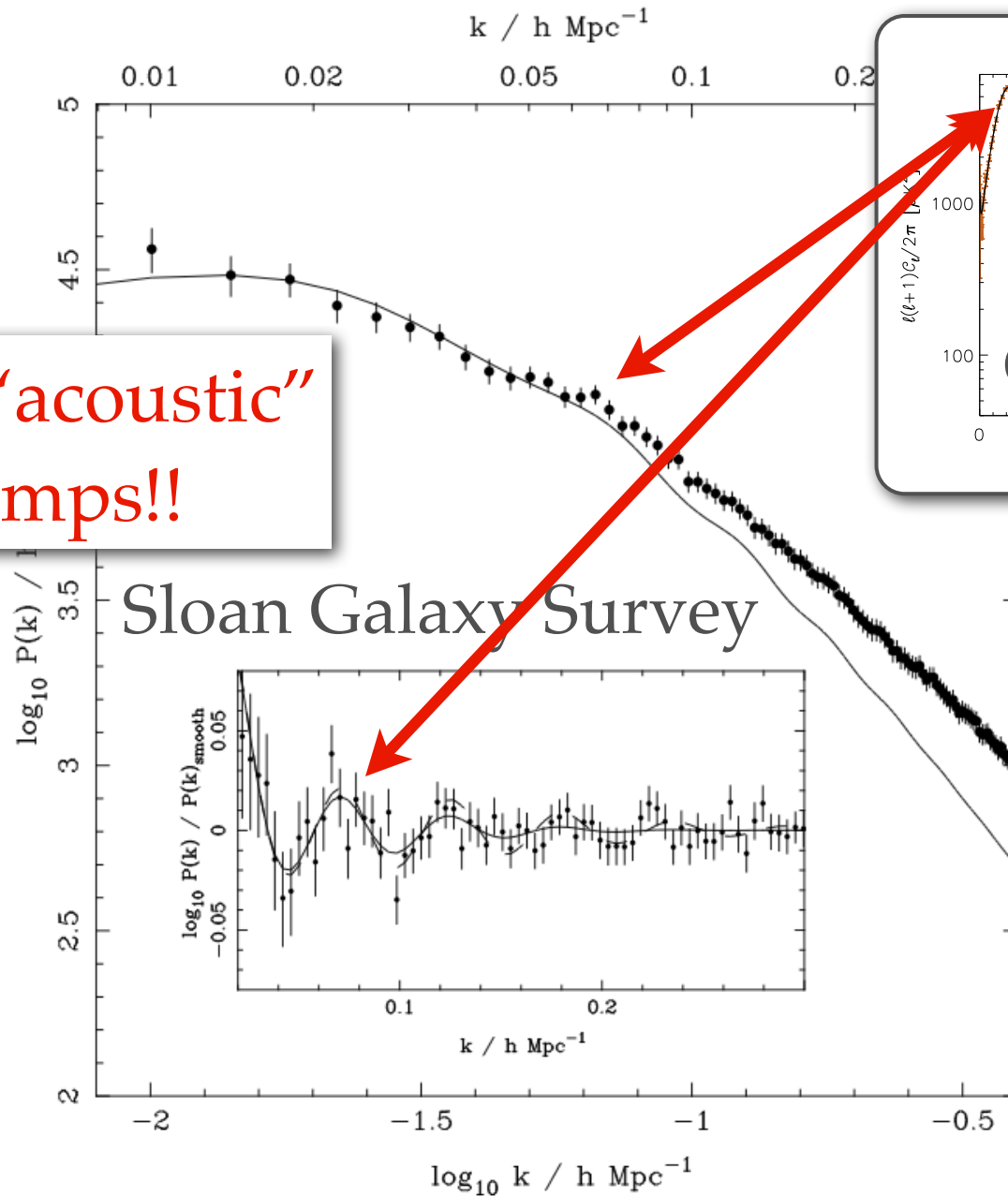


I USE THESE OBSERVATIONS TO TEST THEORIES OF GRAVITY

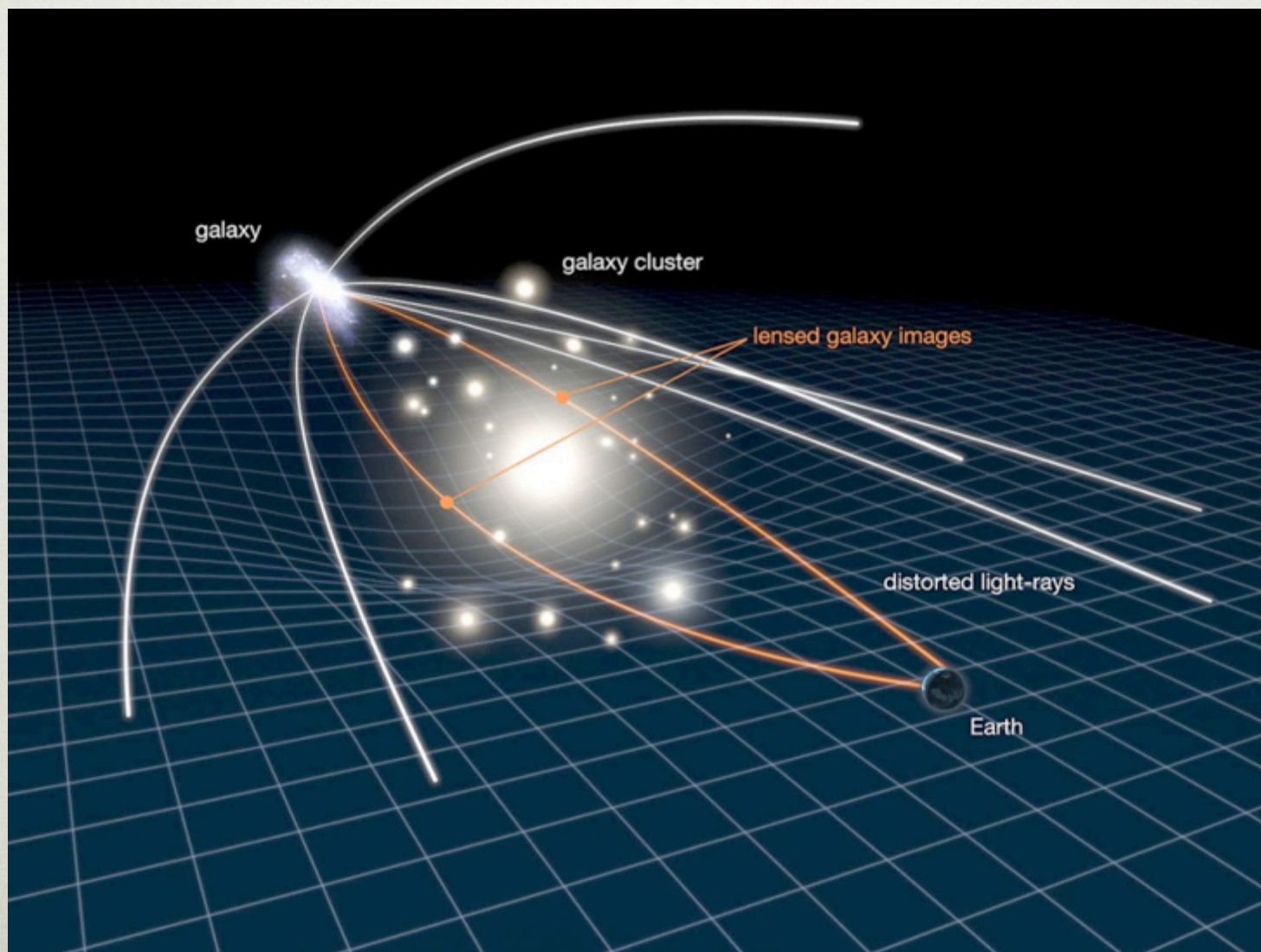


GALAXIES, ANALYZED LIKE THE CMB

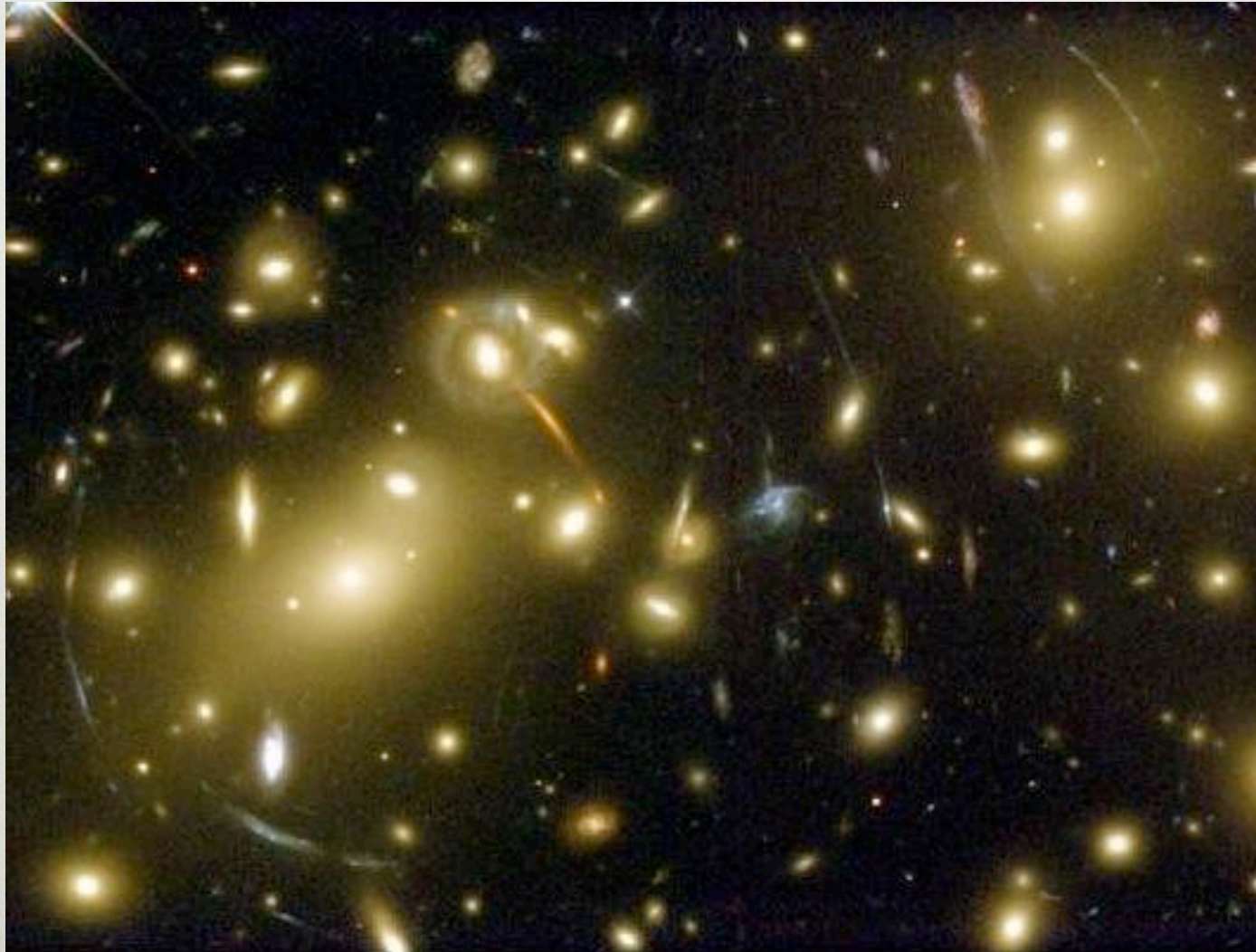
Same “acoustic”
bumps!!



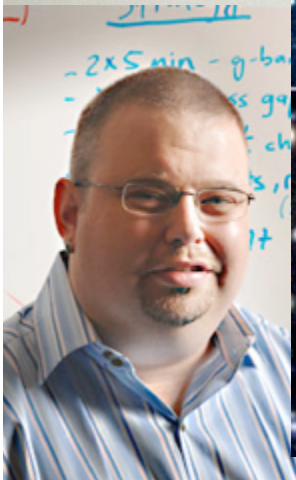
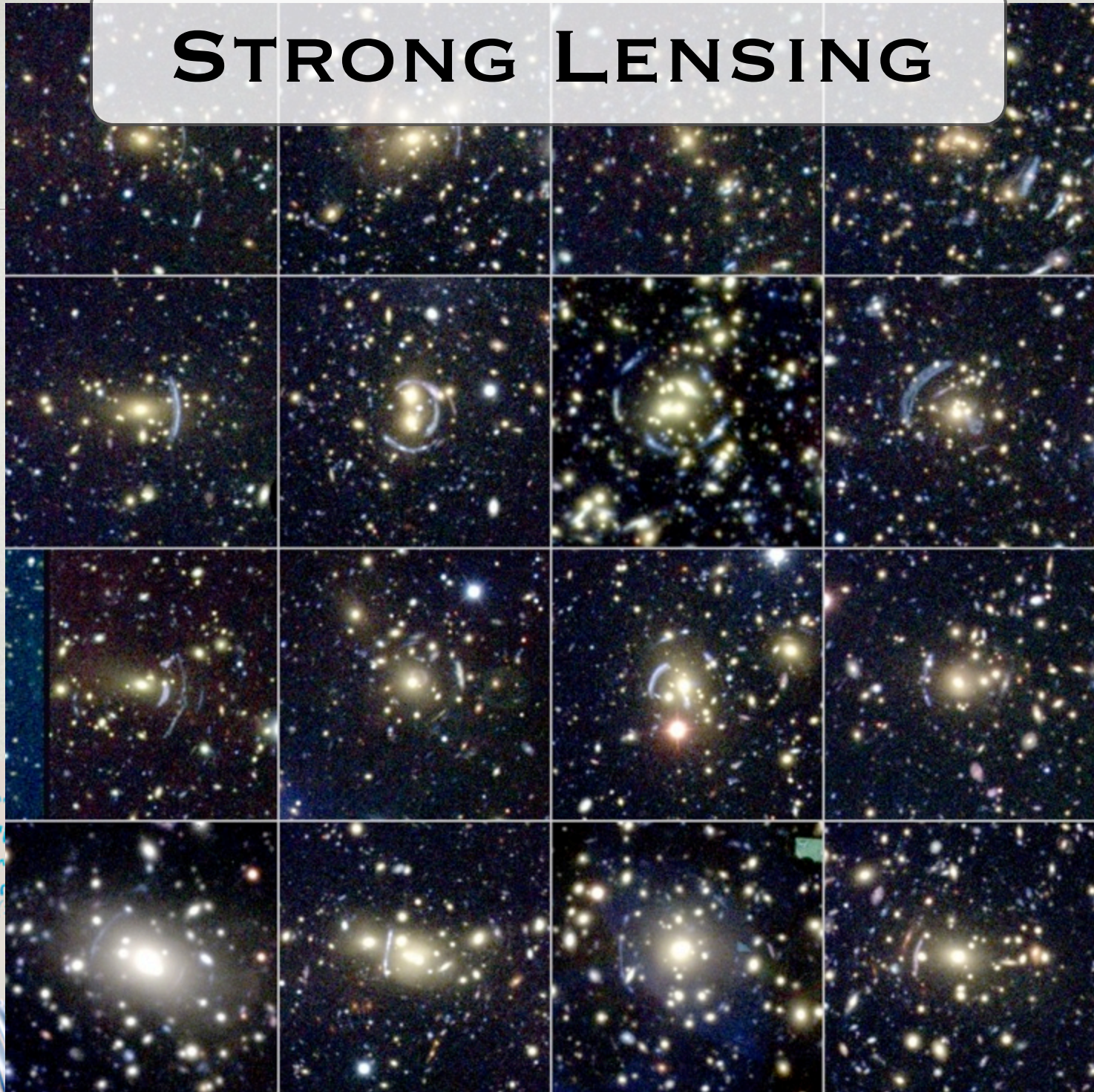
GRAVITATIONAL LENSING



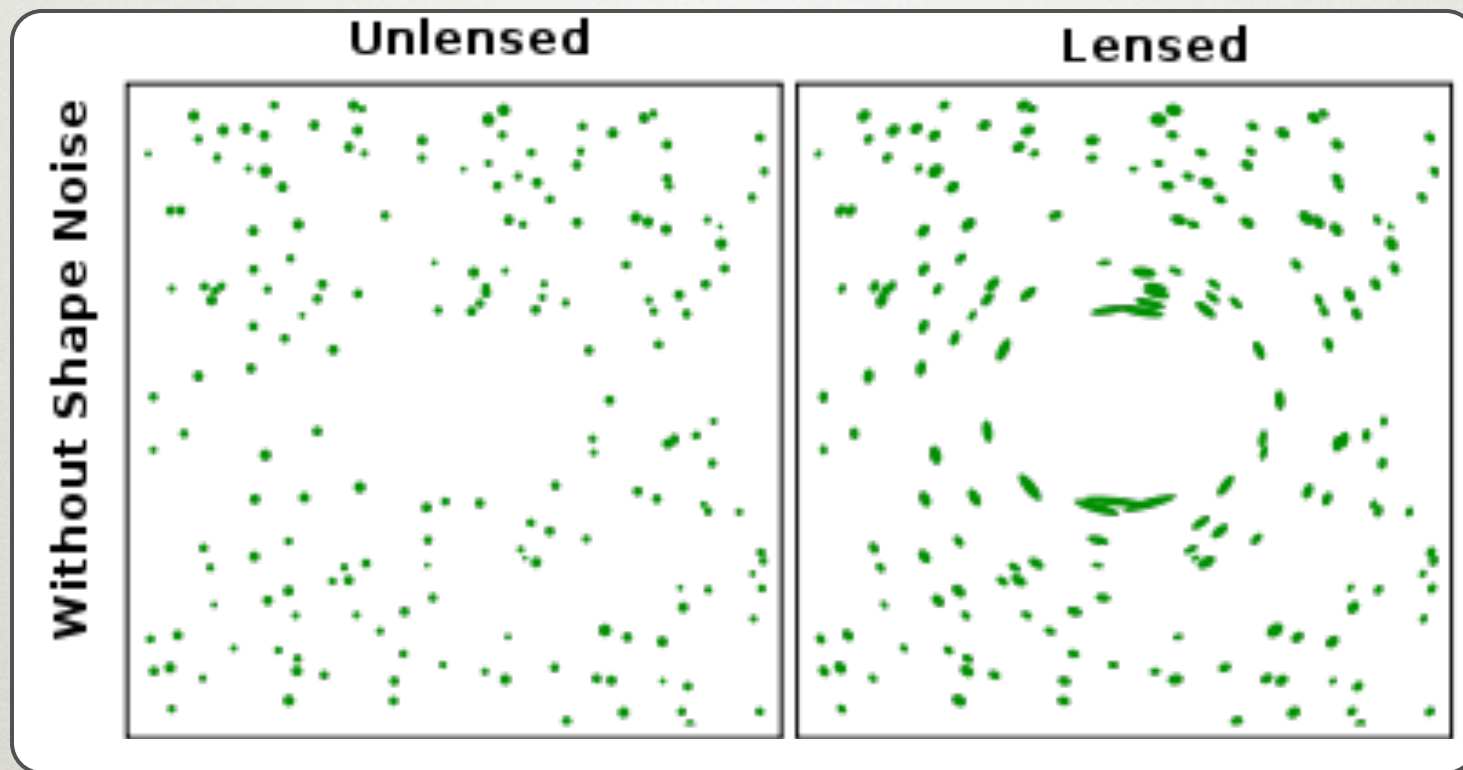
GRAVITATIONAL LENSING



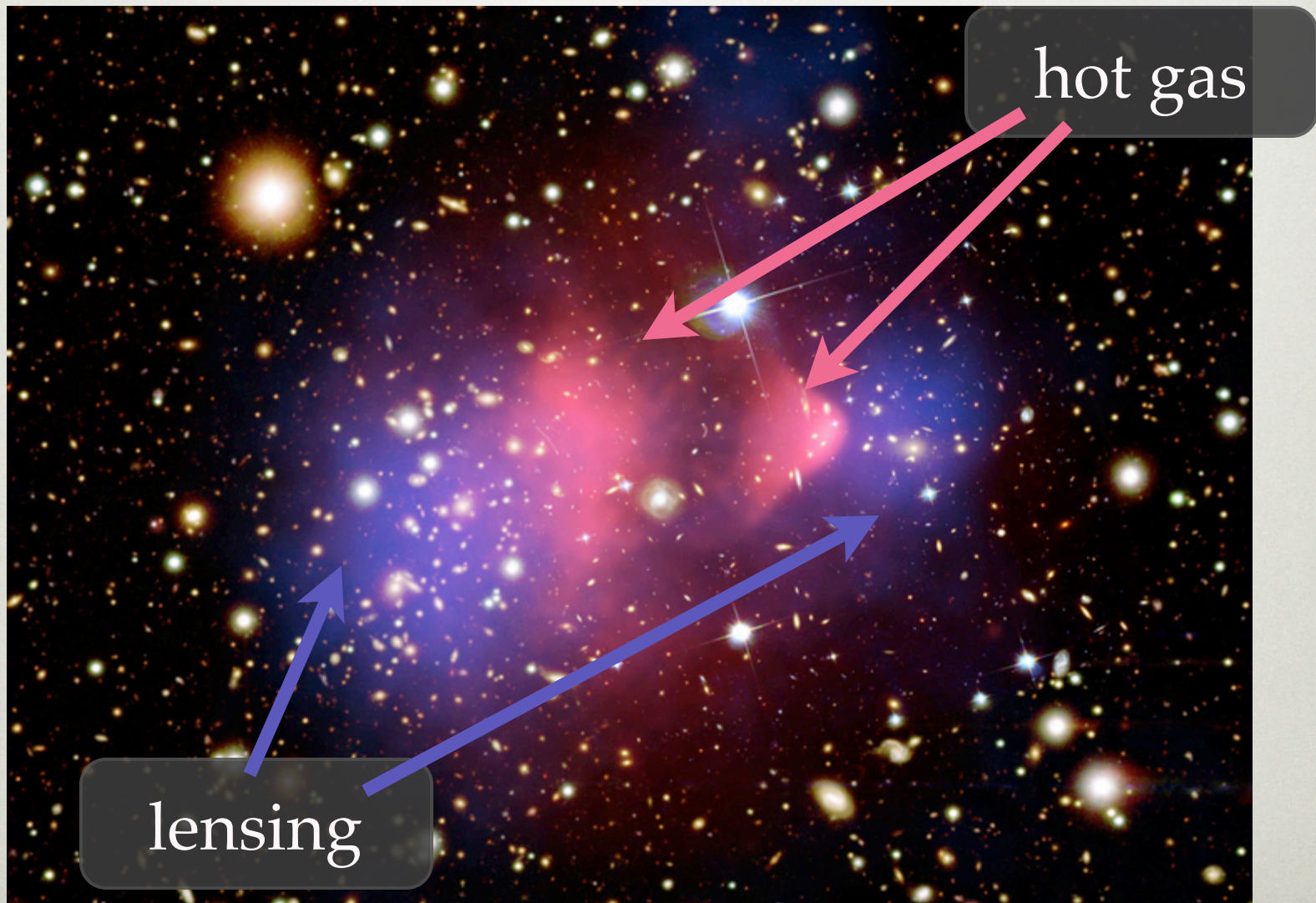
STRONG LENSING



WEAK LENSING



THE BULLET CLUSTER

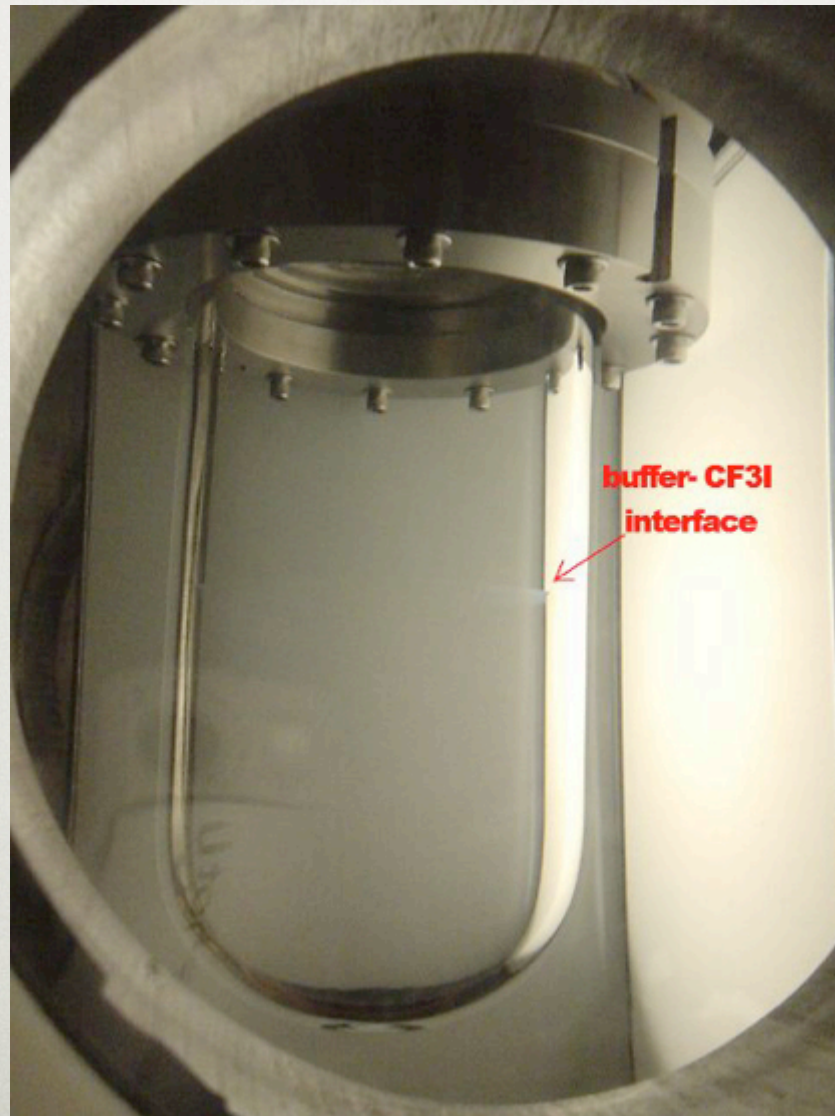


SO, REALLY.
WHAT IS DARK
MATTER?

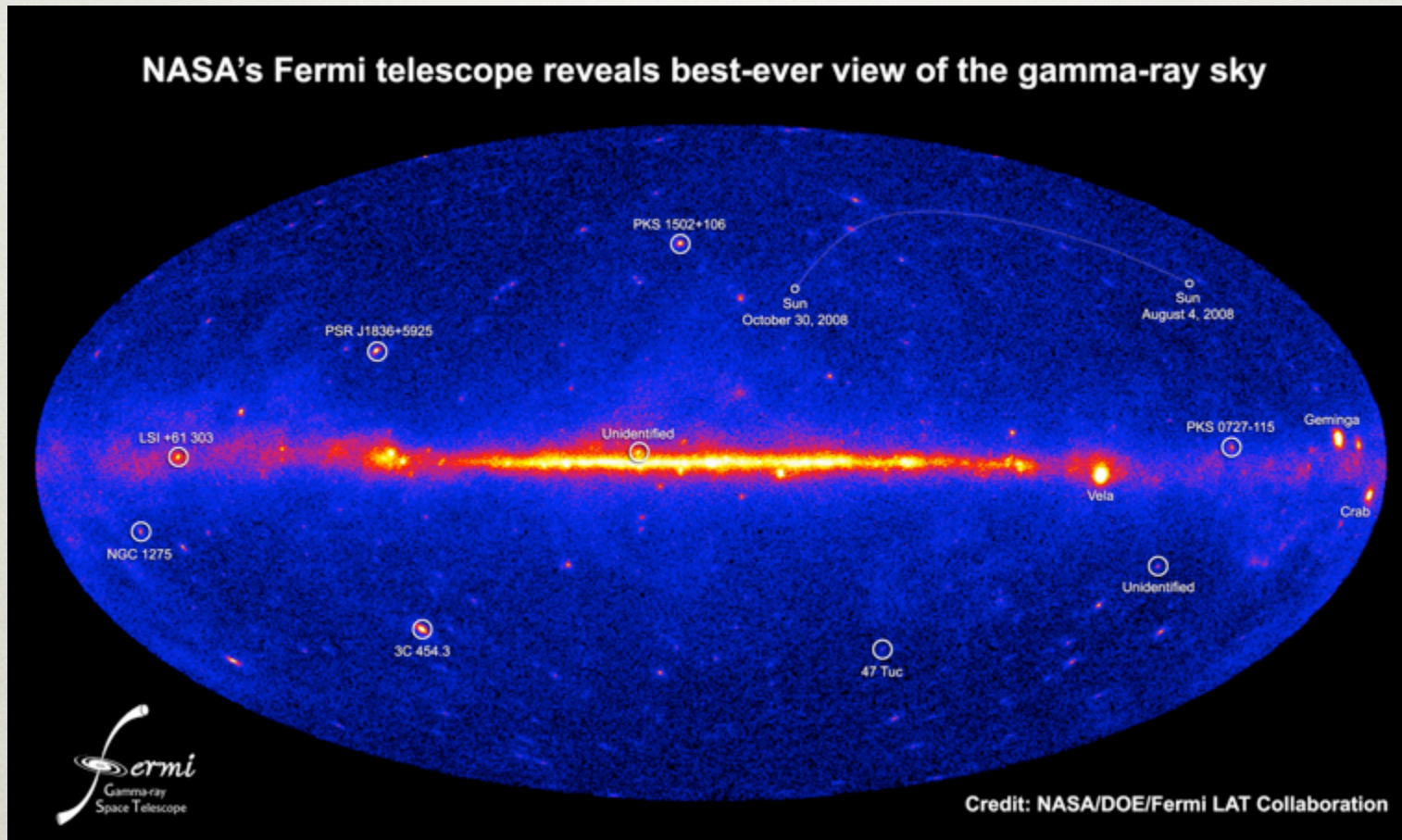
WE'RE LOOKING FOR IT!!

WAITING FOR IT TO HIT US

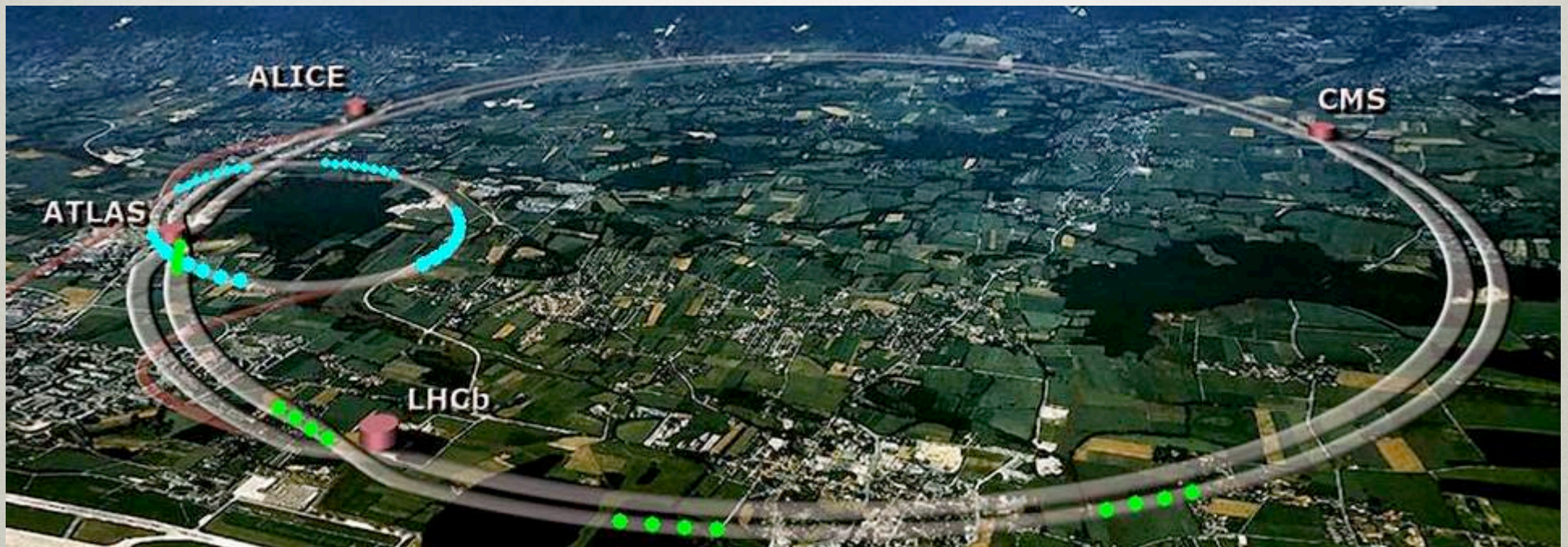
Chicagoland Observatory for Underground Particle Physics



LOOKING OUT IN SPACE



TRYING TO MAKE IT AT HOME



QUESTIONS?

