

# Sloan Great Wall

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# What is the Sloan Great Wall?

- The Sloan Great Wall is group of superclusters connected by filaments of galaxies in deep space 1.4 billion light years long
- The wall is the third largest object in our universe
- The wall stretches for about 5% of the observable universe
- Composed of:
  - Superclusters
  - Filaments
  - Voids

# What is a Supercluster?

- A supercluster is a group of about 3-10 clusters
- It can range up to 100 light years wide

## Clusters

- Clusters are bunches of galaxies
- They are anywhere from 50 to 2000 galaxies big
- They can range from  $6.17 \times 10^{19}$  km to  $3 \times 10^{20}$  km

# Filaments

- Thread like structures that connect clusters together
- They contain single galaxies and groups



# Voids

- Cloud of dust and gas that absorbs all light from background stars
- Likely place for new stars to form
- Possible to see through it with infrared
- Space with nothing in it



# Dark Matter in the wall

- Thought to have been born from dark matter
- The Sloan Great Wall could be a resting place for dark matter
- Dark matter is matter in space that we can't see
- Thought to be composed of WIMPS (weak interacting massive particles)
- When lots of them are together their mass creates lots of gravity
- Dark matter attracts normal matter
- All the galaxies were then attached to it

Picture of Dark  
Matter 

# Force of Gravity

$m_1$  = Mass of the WIMPS

$m_2$  = Mass of a visible mass

$r$  = distance between  $m_1$  and  $m_2$

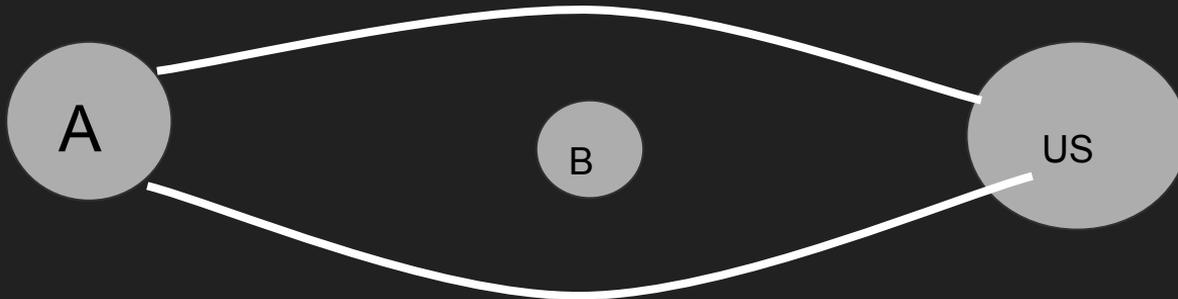
$F_g$  = Force of gravity

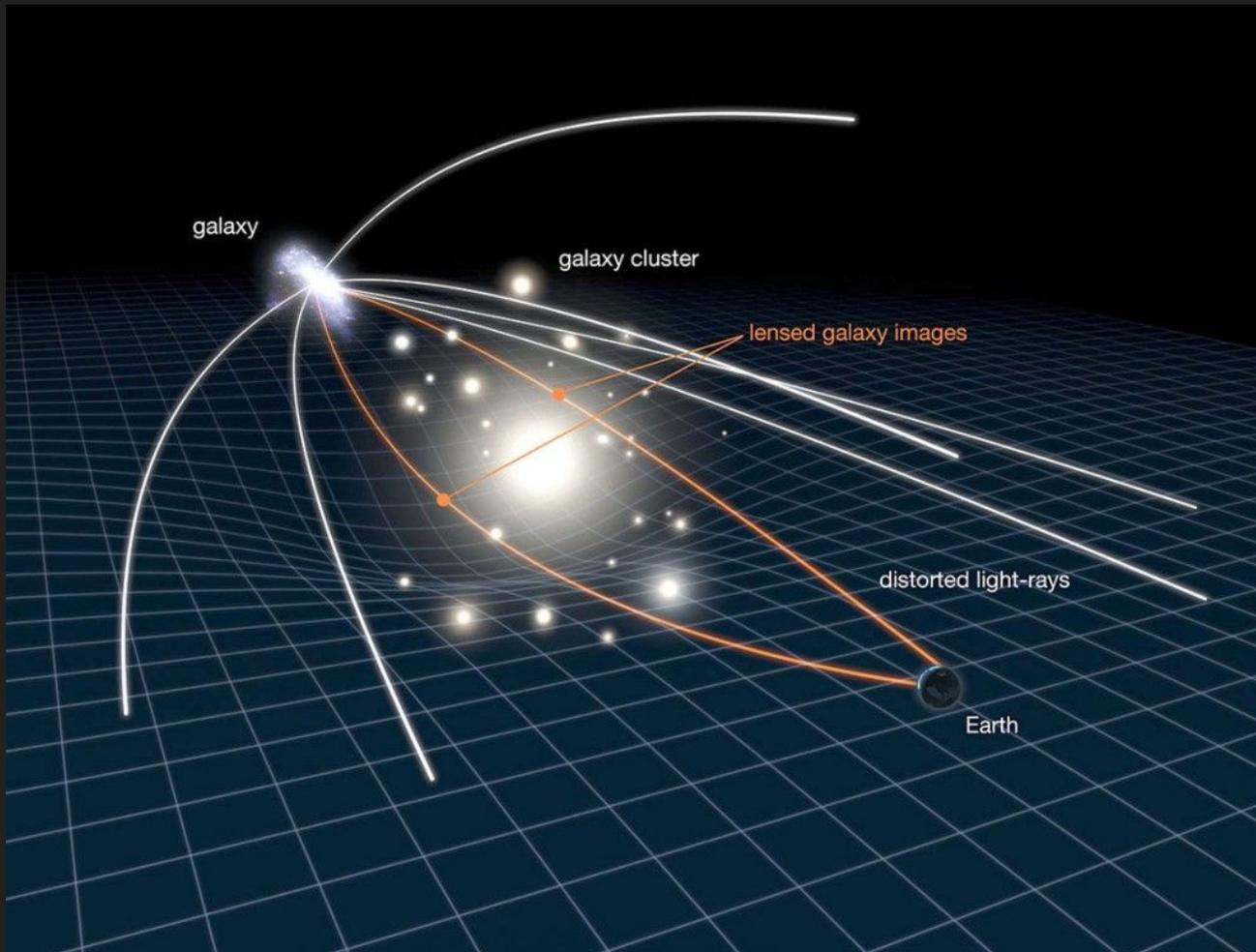
$G$  = gravitational constant

$$F_g = \frac{Gm_1m_2}{r^2}$$

# How do we know this?

- A process called gravitational lensing is able to prove the existence of dark matter
- process is used to measure the mass of a galaxy or galaxy cluster
- separation of the angles of the multiple images gives us mass of galaxy B
- If the mass derived is greater than visible mass then dark matter is present
- 5:1 ratio of dark matter to visible matter
- Matter in nearby galaxy stretches spacetime around it



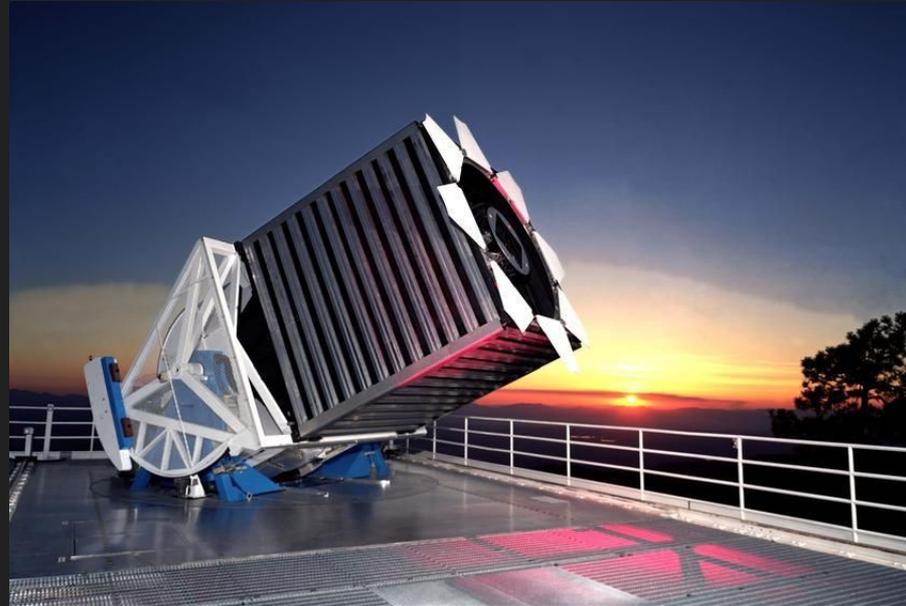


# How long did it take?

- Scientists have considered how long it would have taken to grow to this size assuming dark matter is the reason behind it
- The wall would have taken 80 to 150 billion years to reach its current size
- The problem with that is that it then challenges the Big Bang Theory
- Big Bang says that the Universe is only 13.7 billion years old

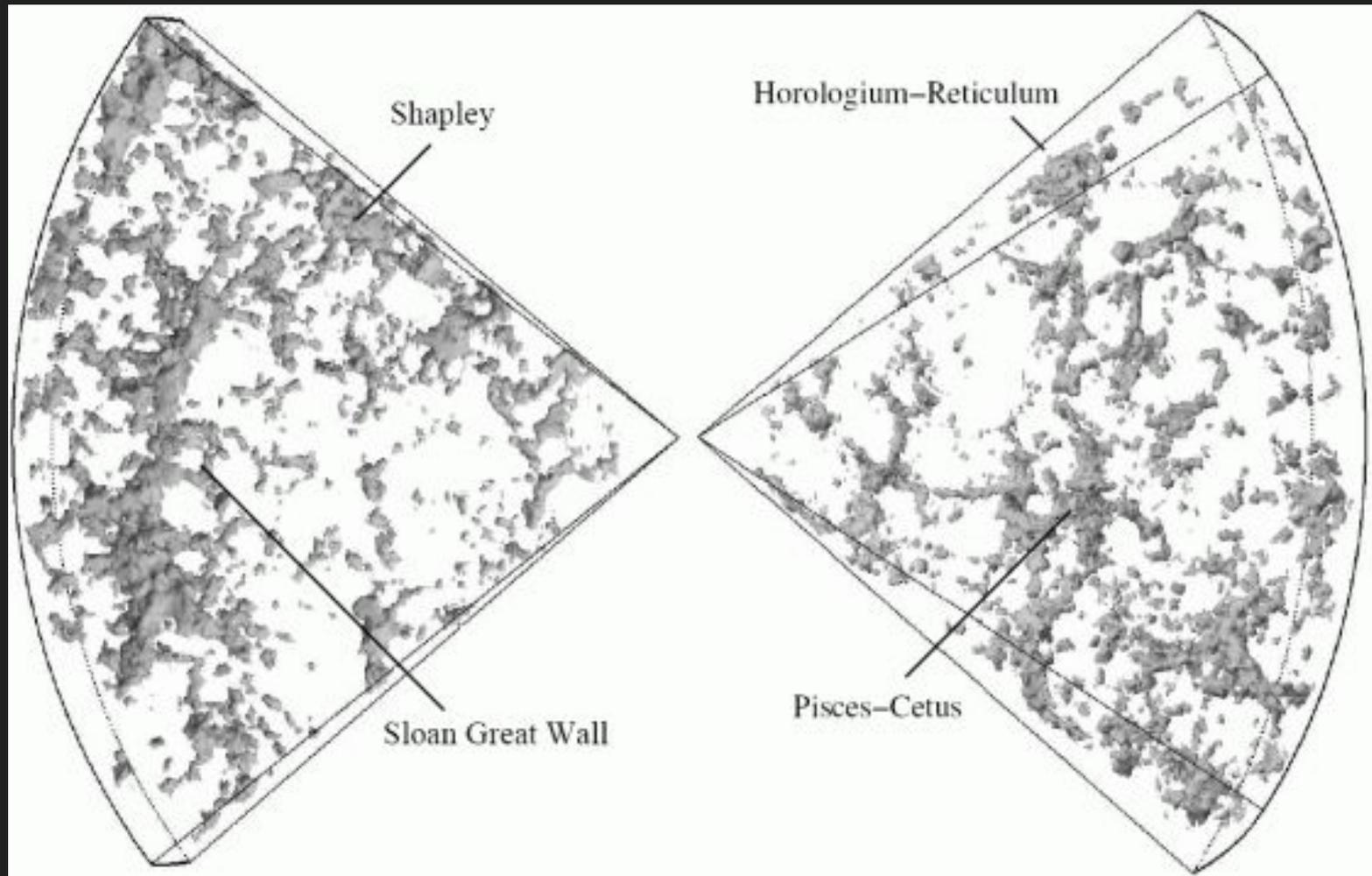
# How was it found?

- Discovered in 2003 by Sloan Digital Sky Survey
- The survey was meant to make a map of the observable universe
- When they discovered the large mass



# How did they prove it was there?

- Astronomers looked for Gamma Ray Bursts
- The bigger the burst the bigger the star
- A big star will have more matter around it
- Astronomers discovered lots of bursts coming from the area of the wall
- Proves that there is a large amount of matter in that area



Kahoot!