



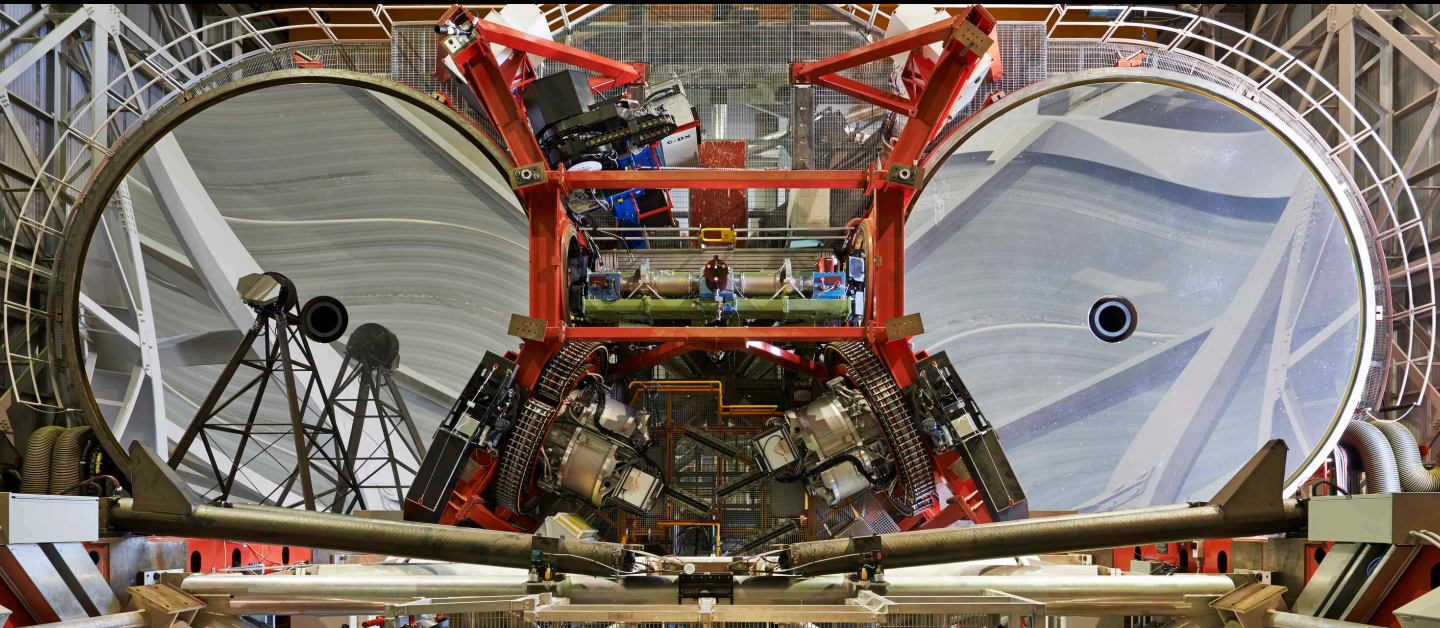
# Our Place in the Universe

From Earth to the Stars

Dr. Jonathan Crass















# Our Place in the Universe

- So just where are we in the Universe?
  - Distances in astronomy
- The changing and evolving Universe
- What makes up the Universe?





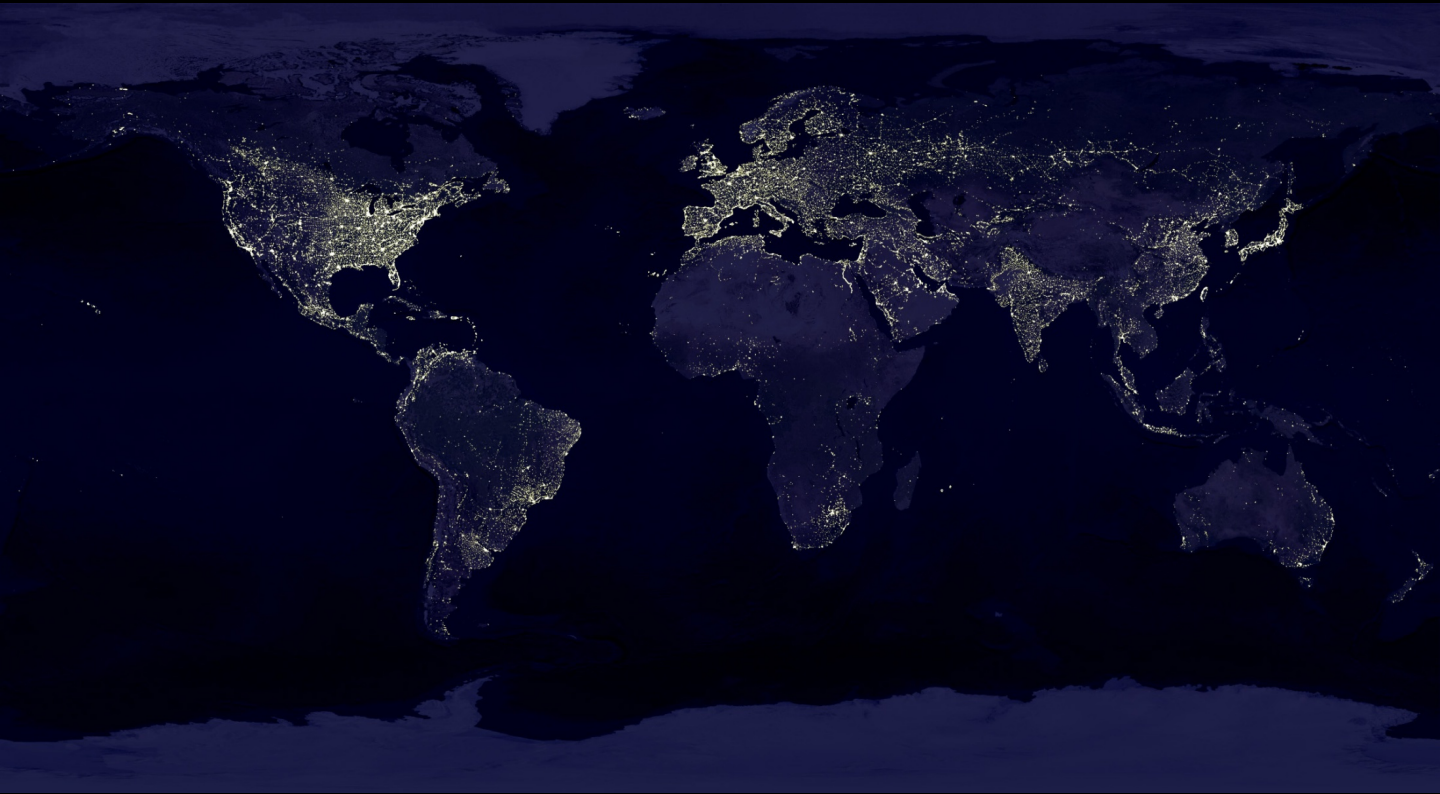


The United Kingdom



Europe

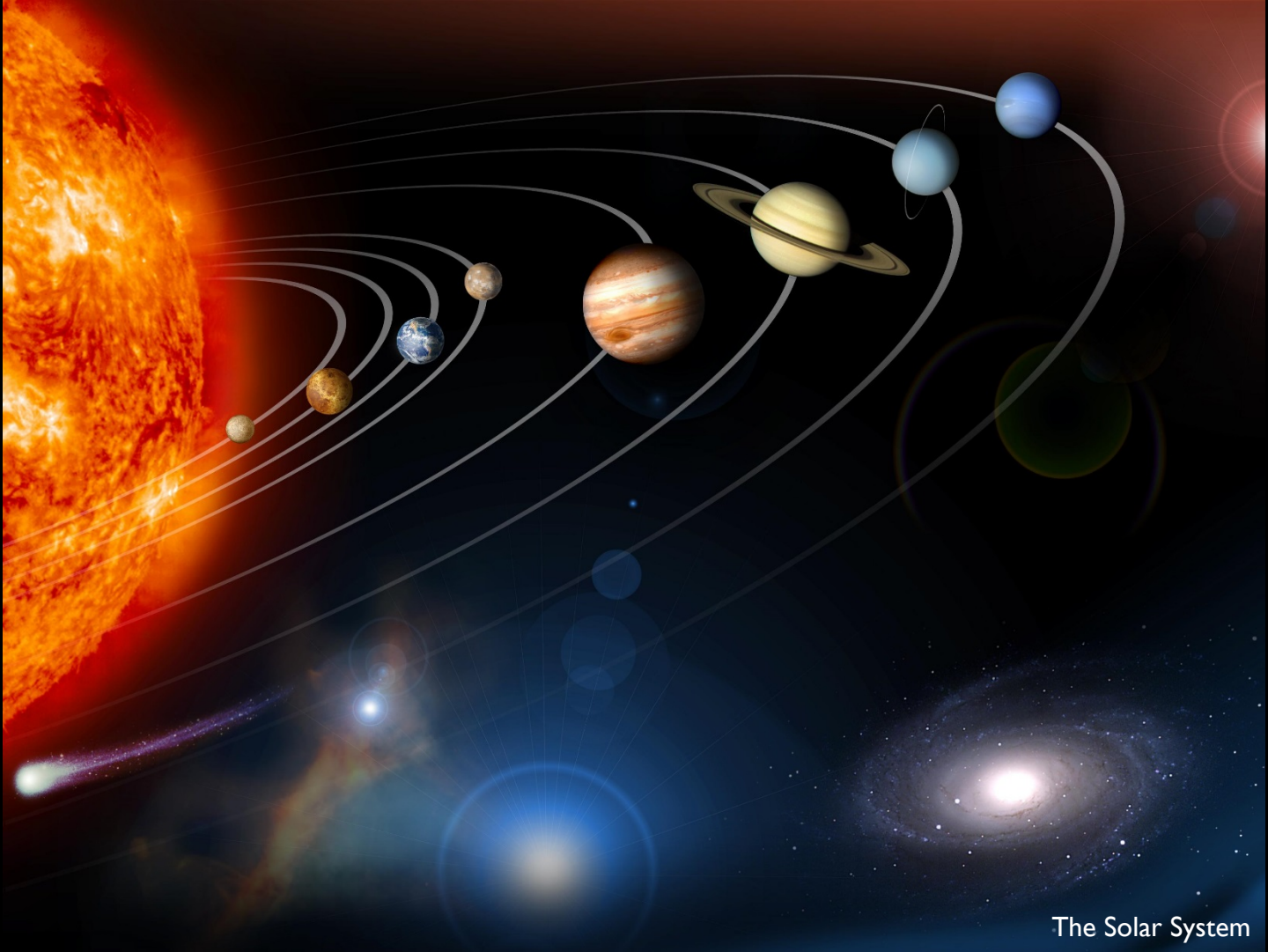




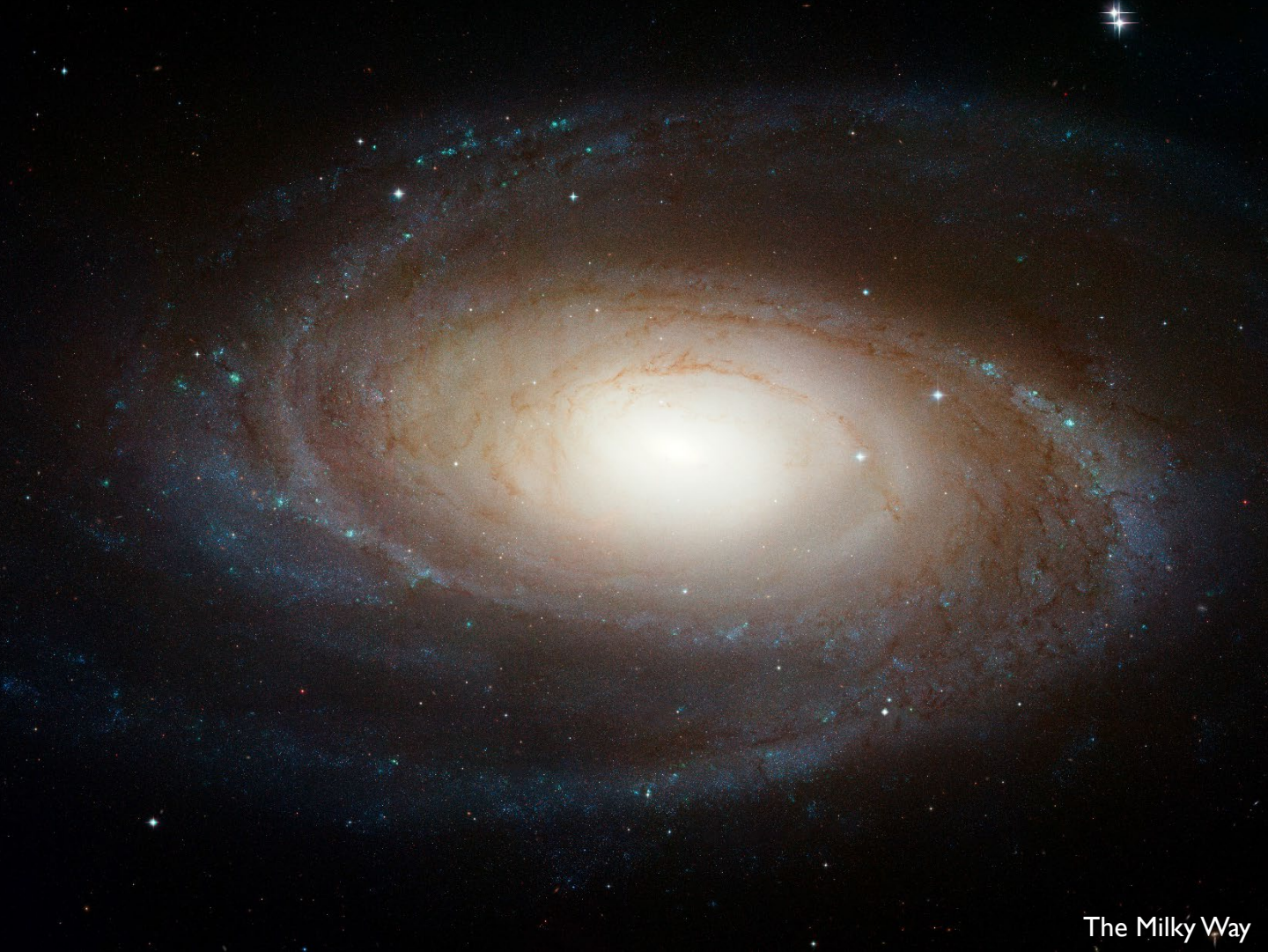


The Earth



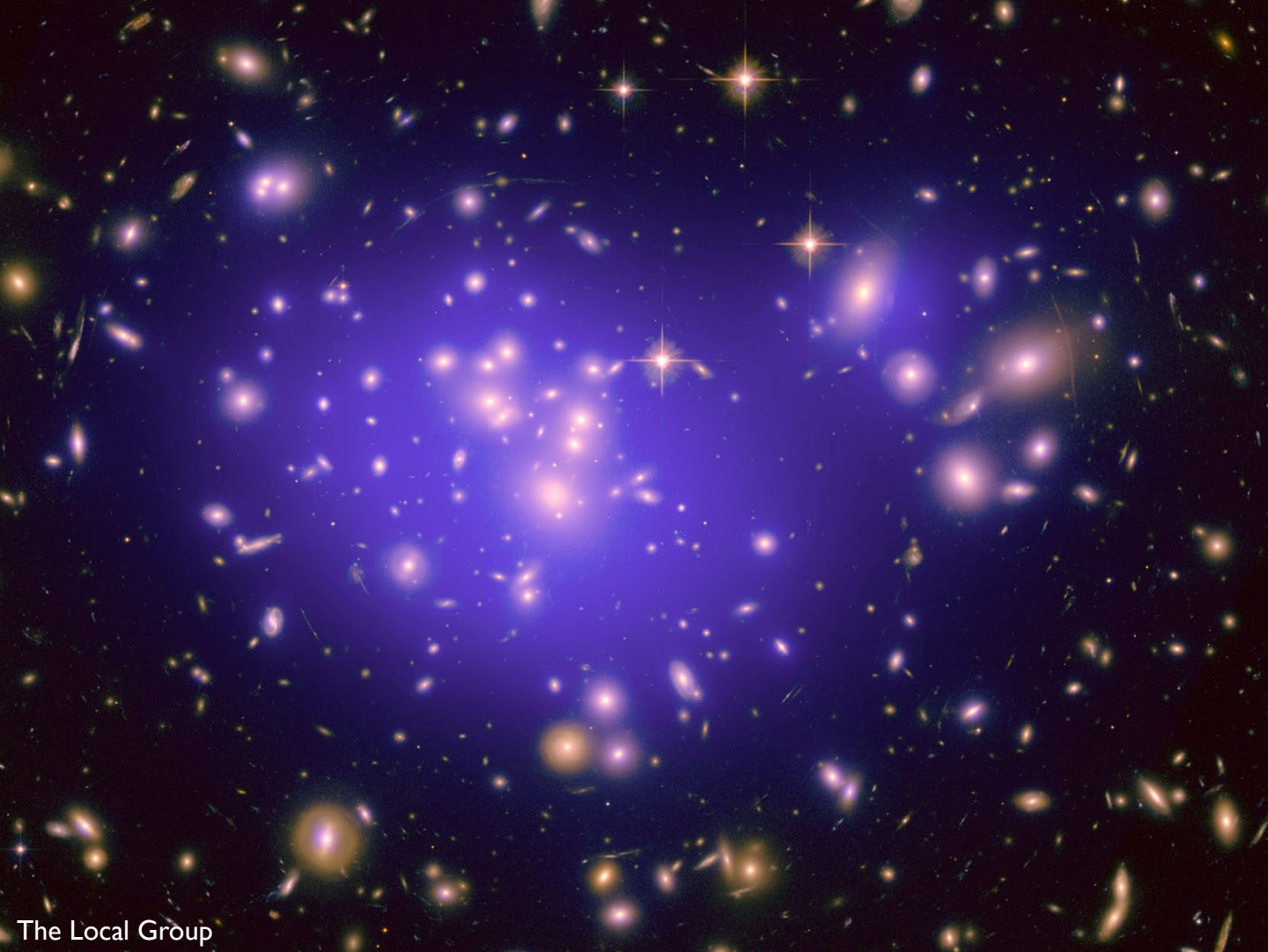


The Solar System

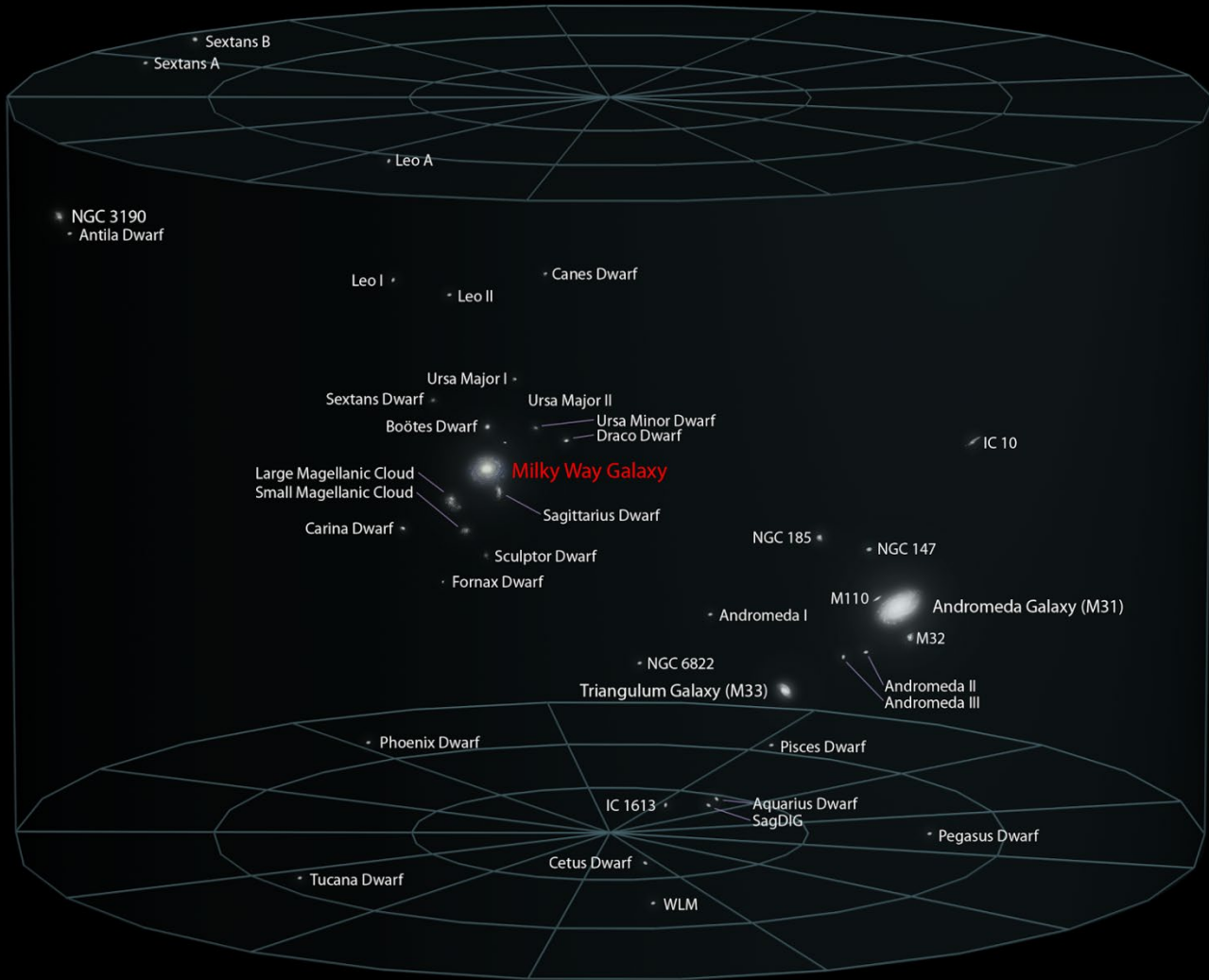


The Milky Way

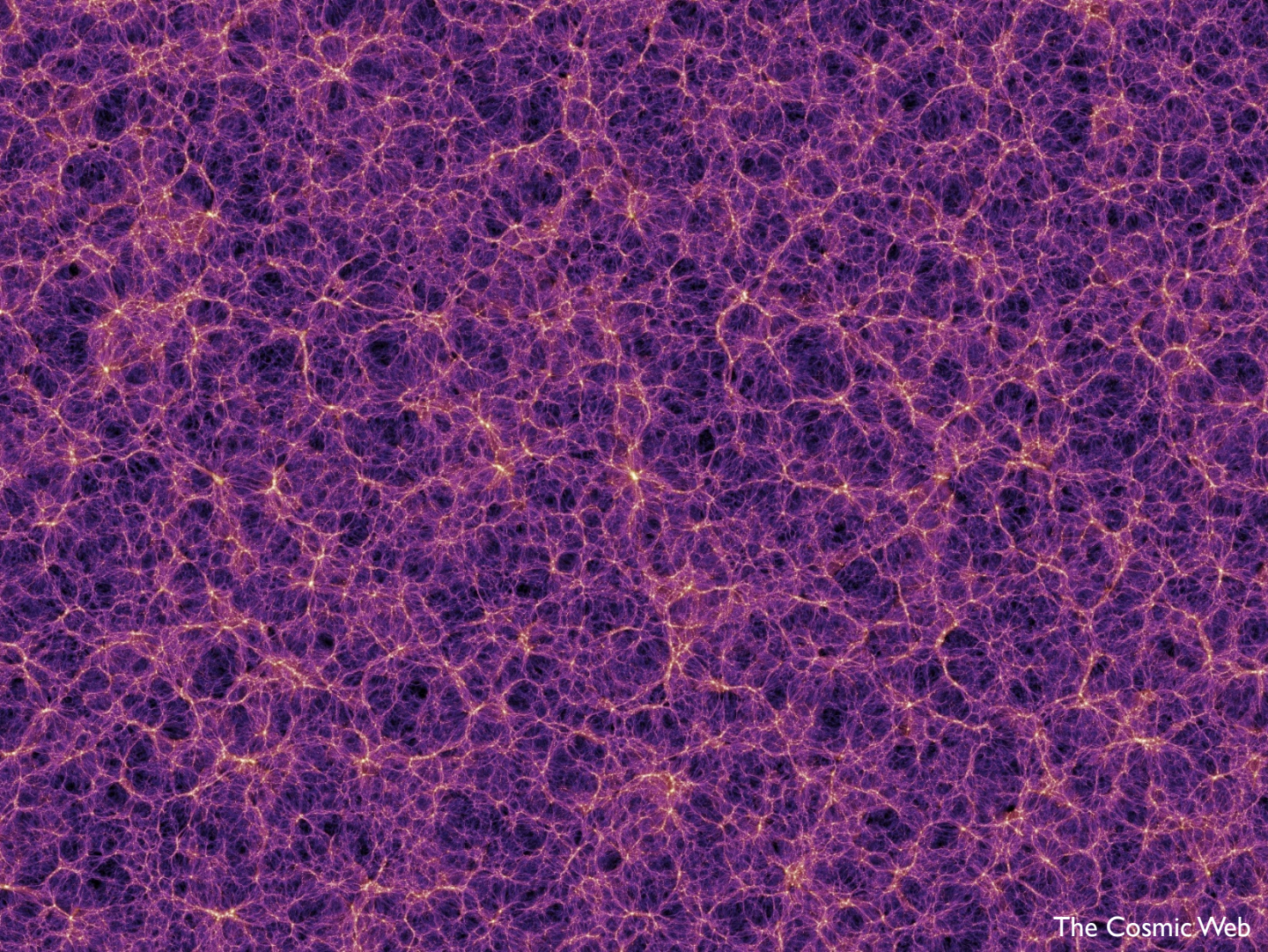




The Local Group

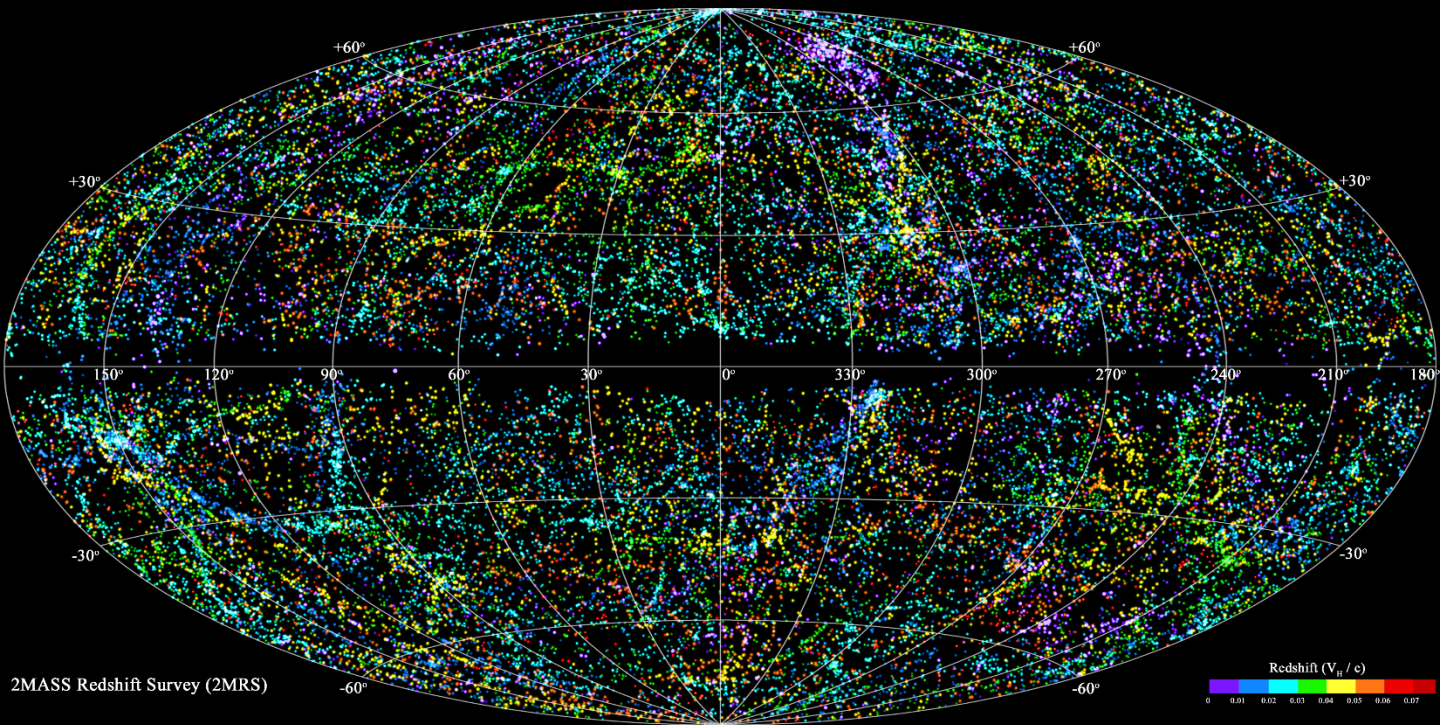






The Cosmic Web

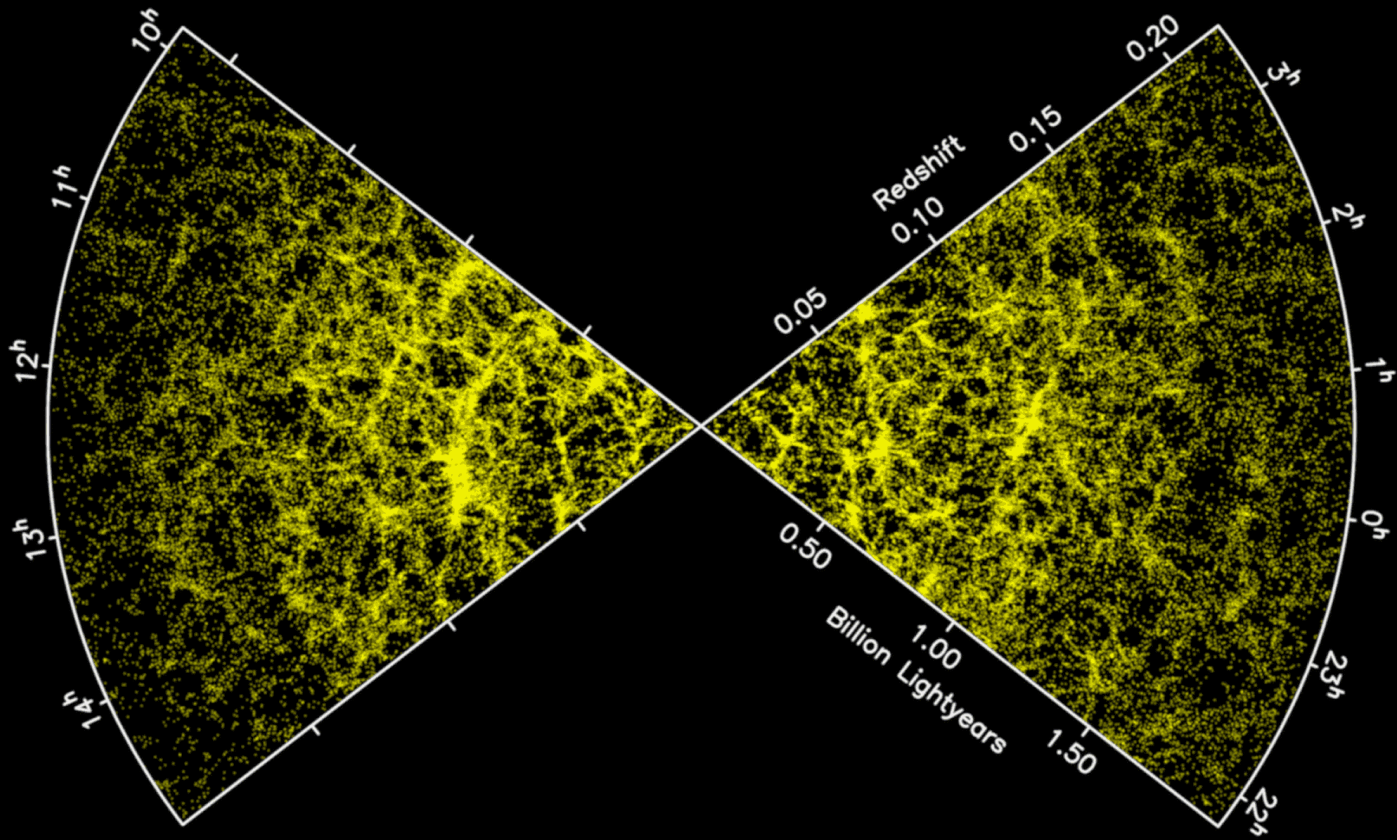


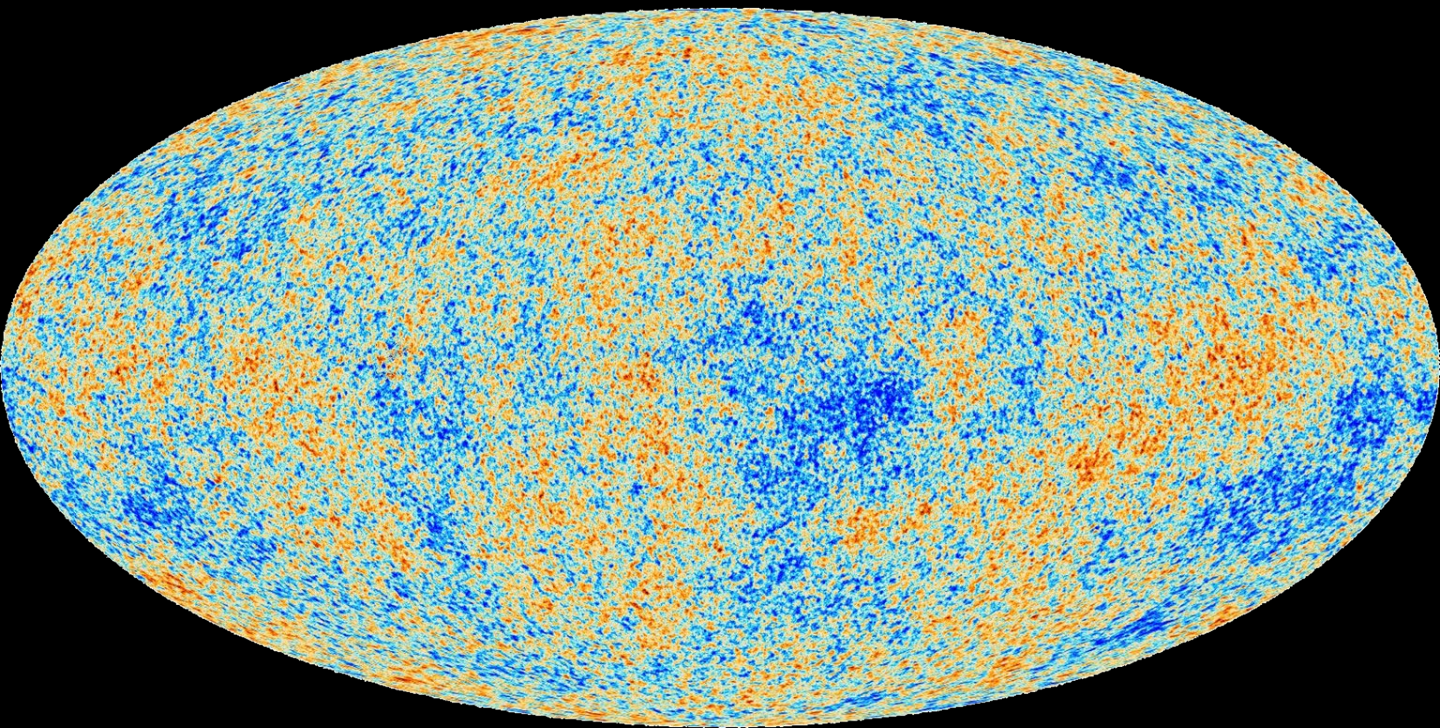


2MASS Redshift Survey (2MRS)









The Cosmic Microwave Background



# So where are we?

## Our Earth Address

Cunard Line,  
Southampton,  
Hampshire,  
United Kingdom,  
Europe,  
The Earth

## Our Universal Address

Cunard Line,  
The Earth,  
The Solar System,  
The Milky Way,  
The Local Group,  
The Universe

# Cosmic Distances



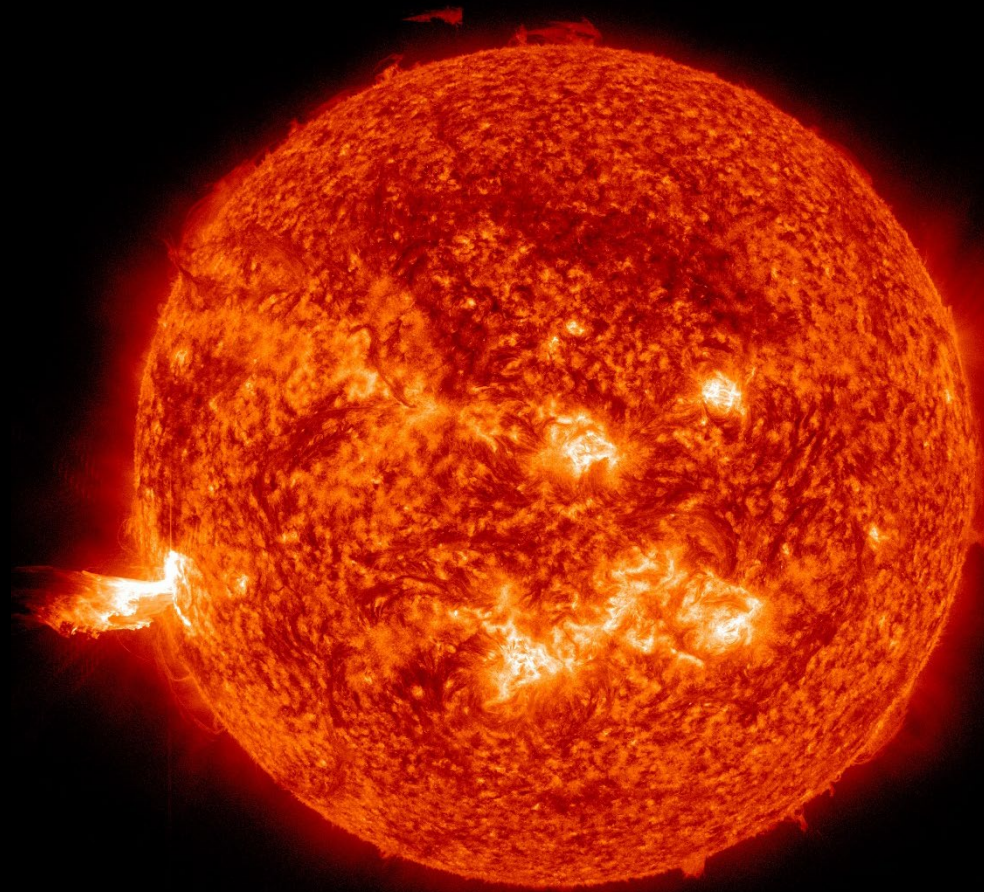


Southampton to New York: 3,420 miles / 5,500km

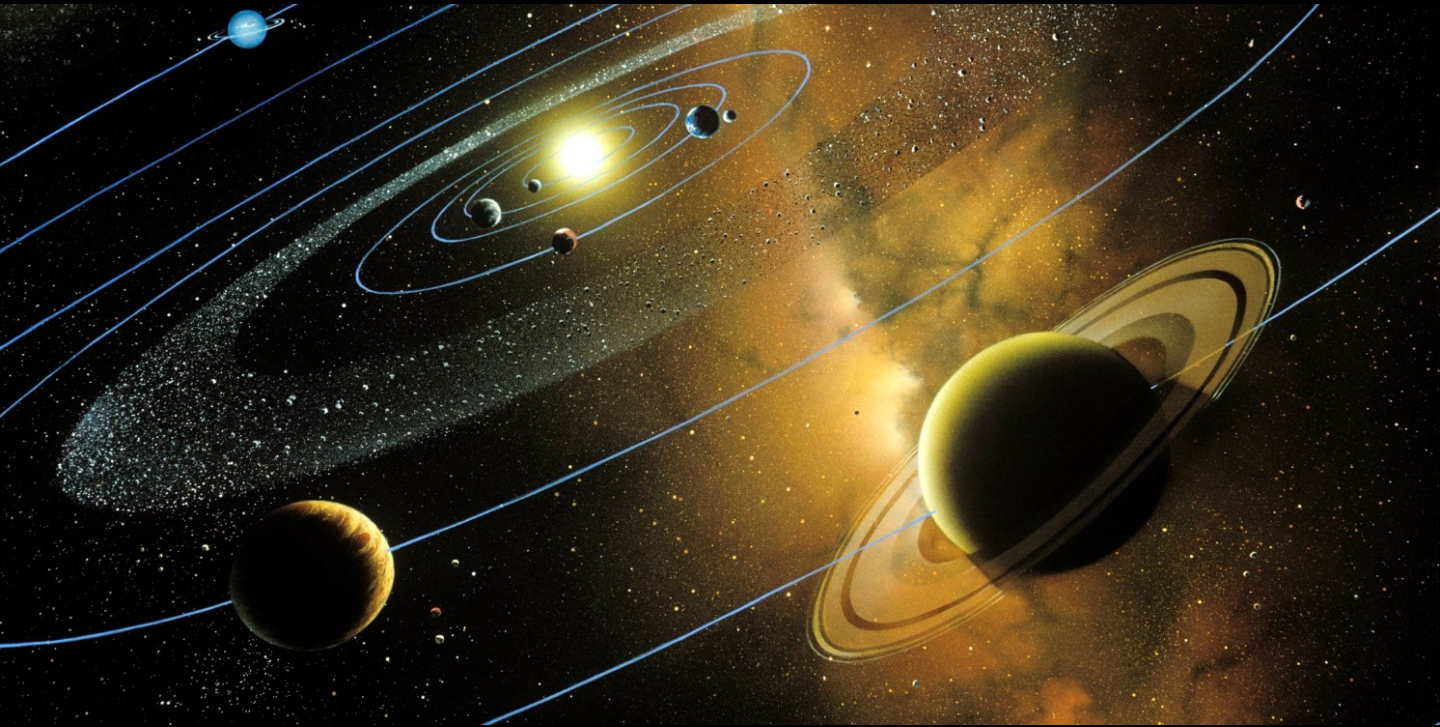


Earth to the Moon: 238,900 miles / 384,400 km



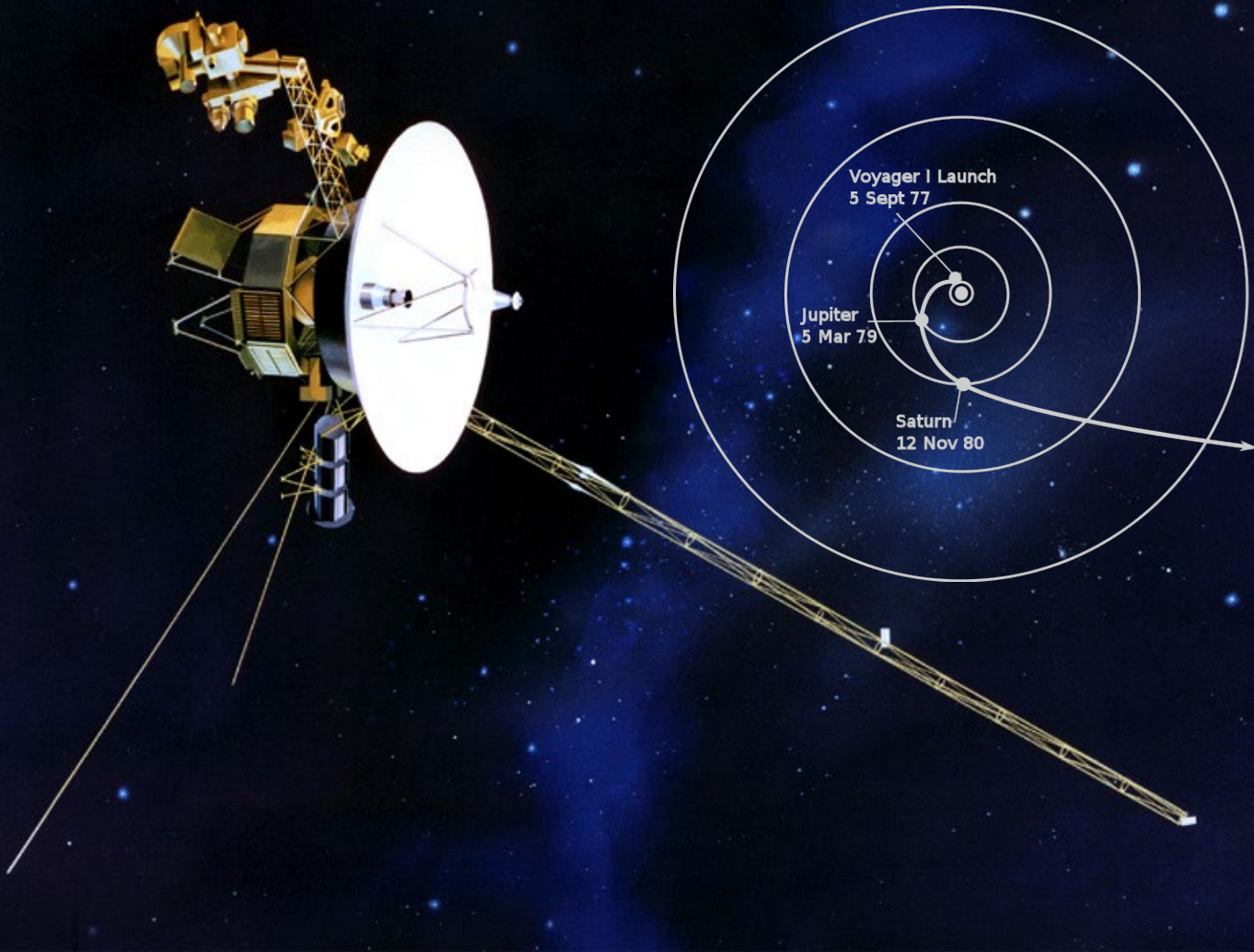


Earth to the Sun: 92,960,000 miles / 149,600,000 km



The edge of the Solar System: 9,000,000,000 miles / 14,484,096,000 km





Voyager 1 Launch  
5 Sept 77

Jupiter  
5 Mar 79

Saturn  
12 Nov 80





Queen Mary 2

Q

# Distances in Astronomy

- At the maximum speed of Queen Mary 2 (35mph)
  - Southampton to New York:  
4 days
  - Earth to the Moon:  
284 days
  - Earth to the Sun:  
302 years
  - To the edge of the Solar System:  
29,334 years





# Distances in Astronomy

- At the speed of light
  - Southampton to New York:  
0.0183 seconds
  - Earth to the Moon:  
1.28 seconds
  - Earth to the Sun:  
8.3 minutes
  - To the edge of the Solar System:  
13.4 hours

# Units of Distance

- 1 Astronomical Unit (AU)
  - The average distance between the Sun and the Earth
  - 149,597,871 km
- 1 Light Year (ly)
  - The distance light would travel in 1 year
  - 9,460,528,410,000 km









To the centre of the Galaxy: 25,900 light years





To the Andromeda Galaxy: 2,538,000 light years





To the most distant Galaxy known: 13,000,000,000 light years

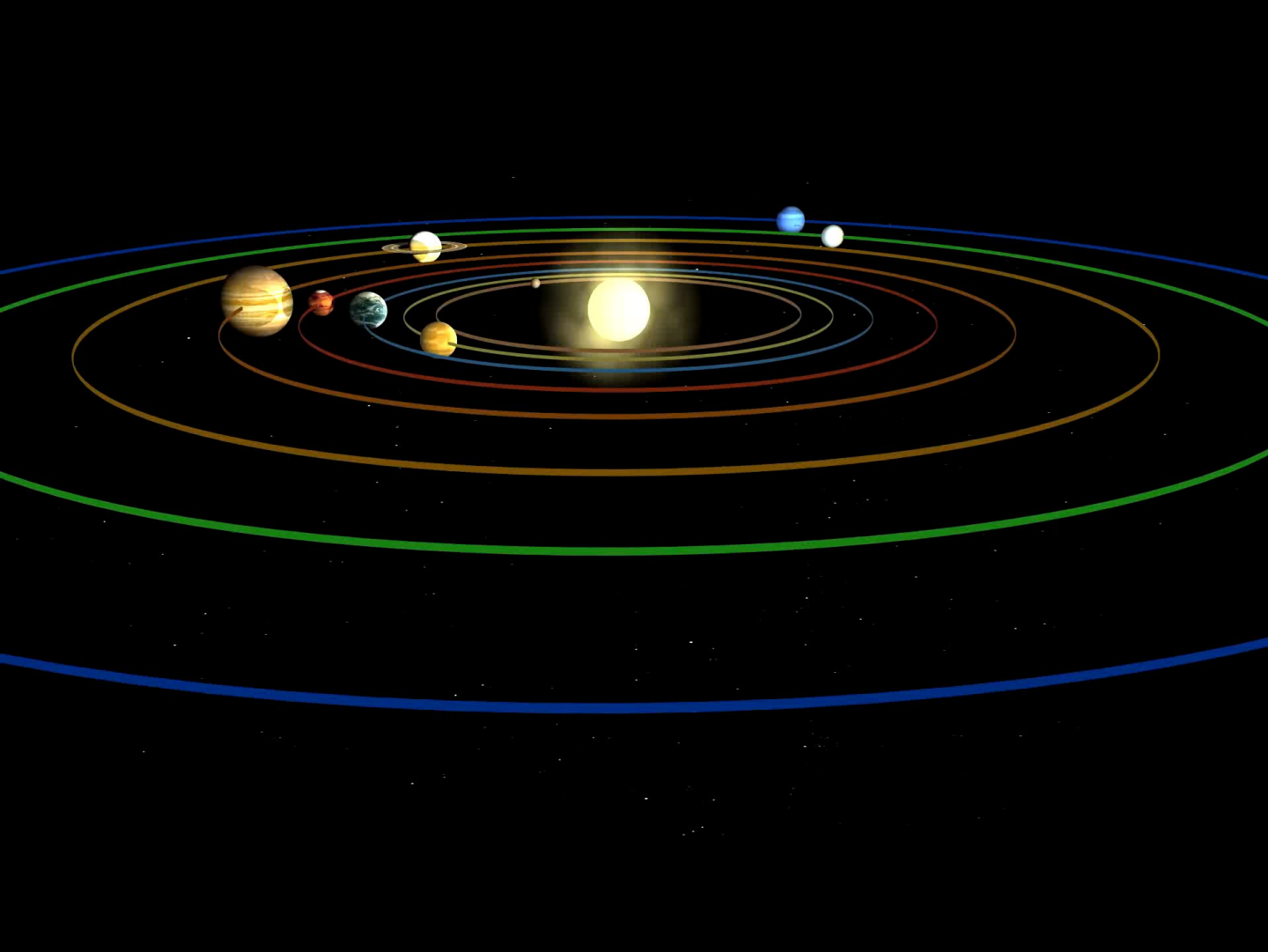
# Our Location – a Summary

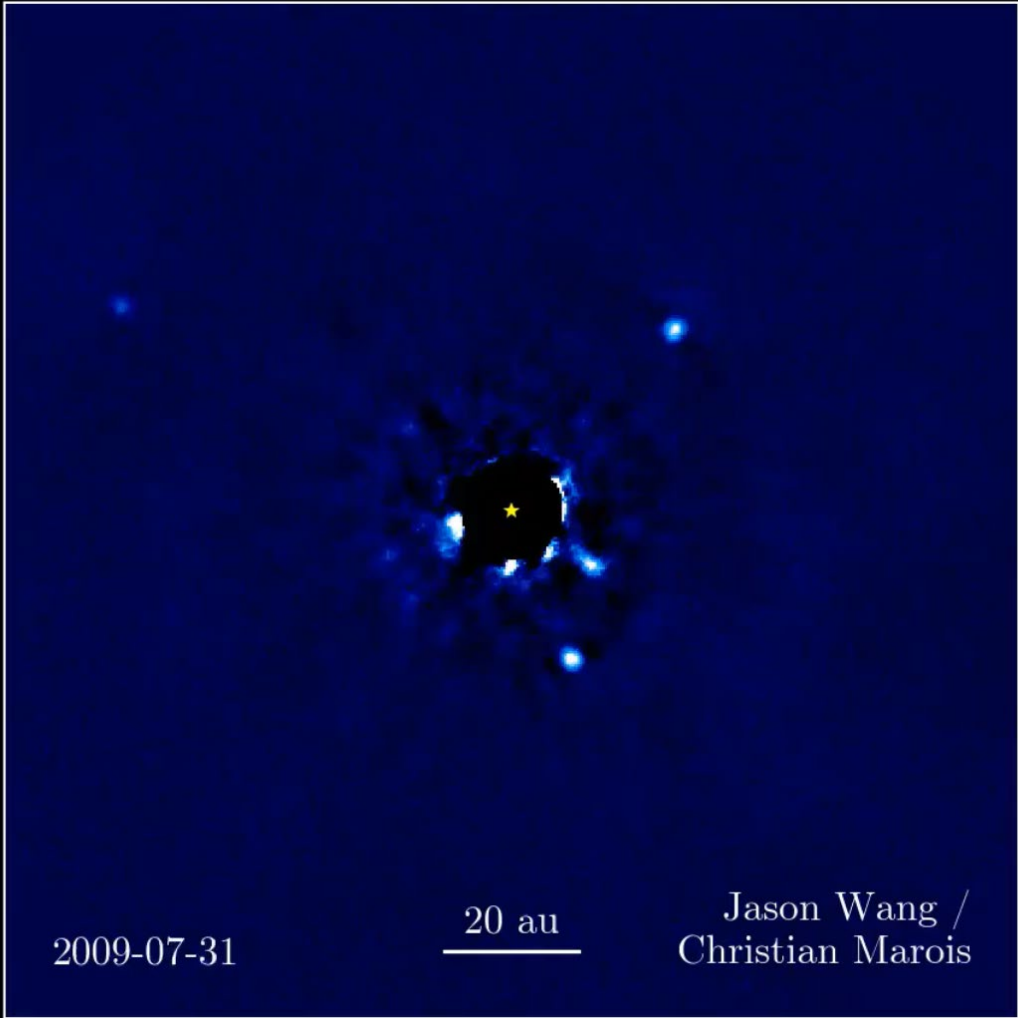
- We are:

On Earth	km/miles
Which is in the Solar System	50-100 AU
Which is in the Milky Way	50 thousand ly
Which is in the Local Group	10 million ly
Which is in the Cosmic Web	Billion ly
Which is in the Universe	13.8 Billion ly

# **The changing and evolving Universe**







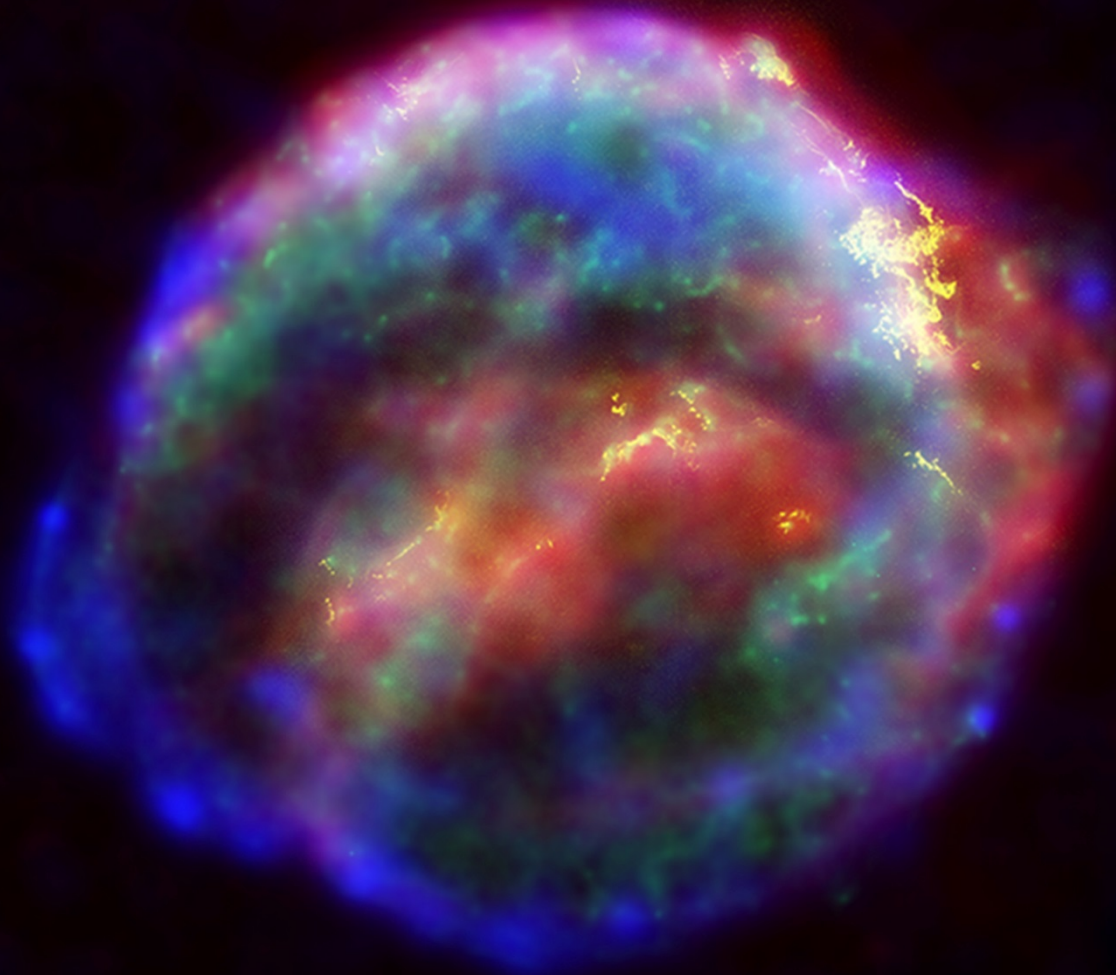
2009-07-31

20 au

Jason Wang /  
Christian Marois







alpha Persei



Pleiades



Orion











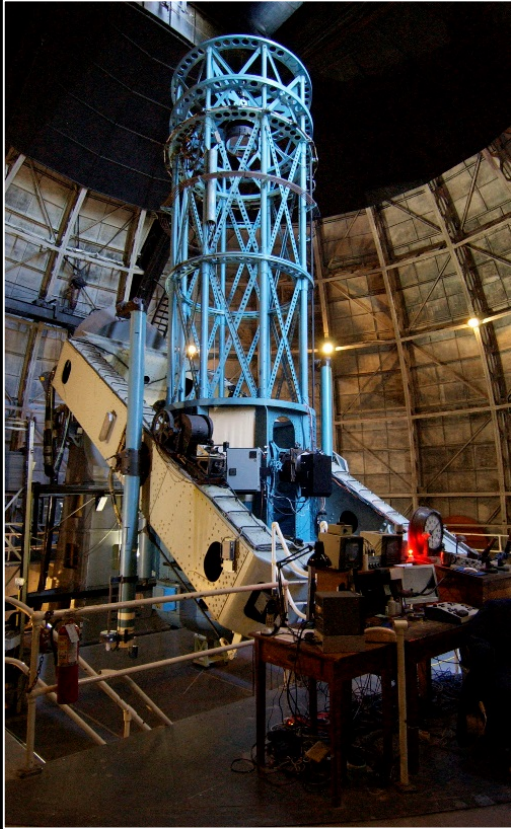






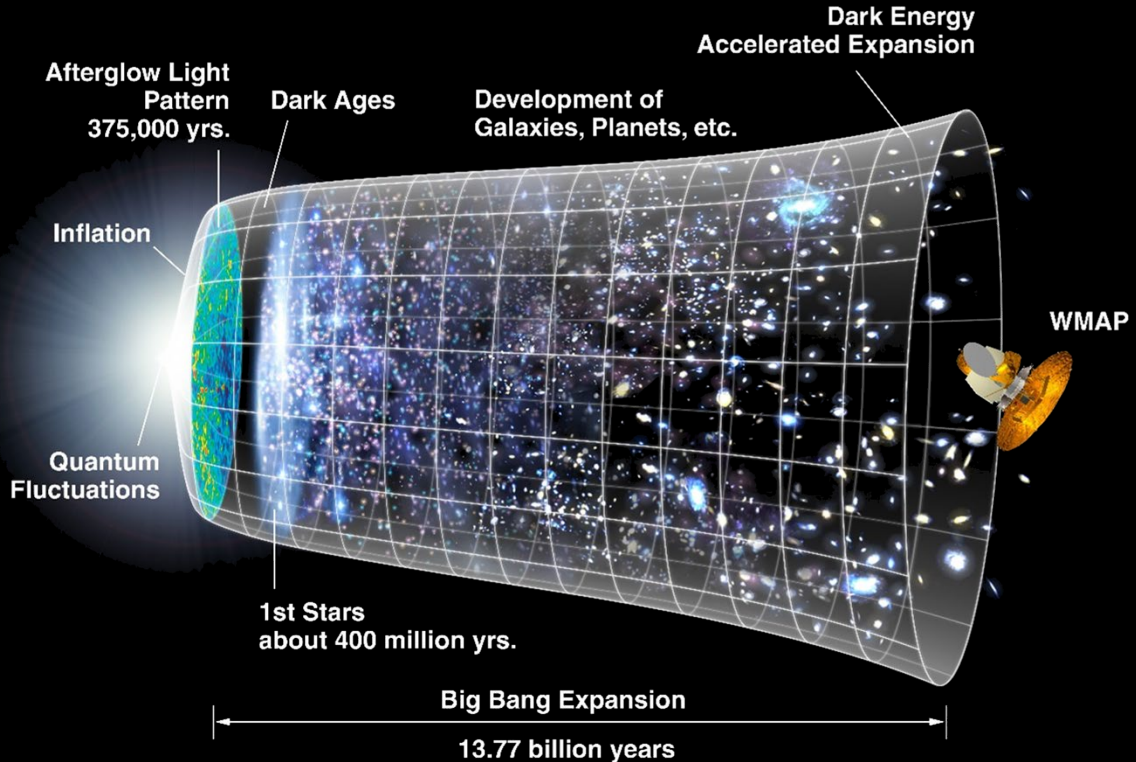


# Starting at the beginning





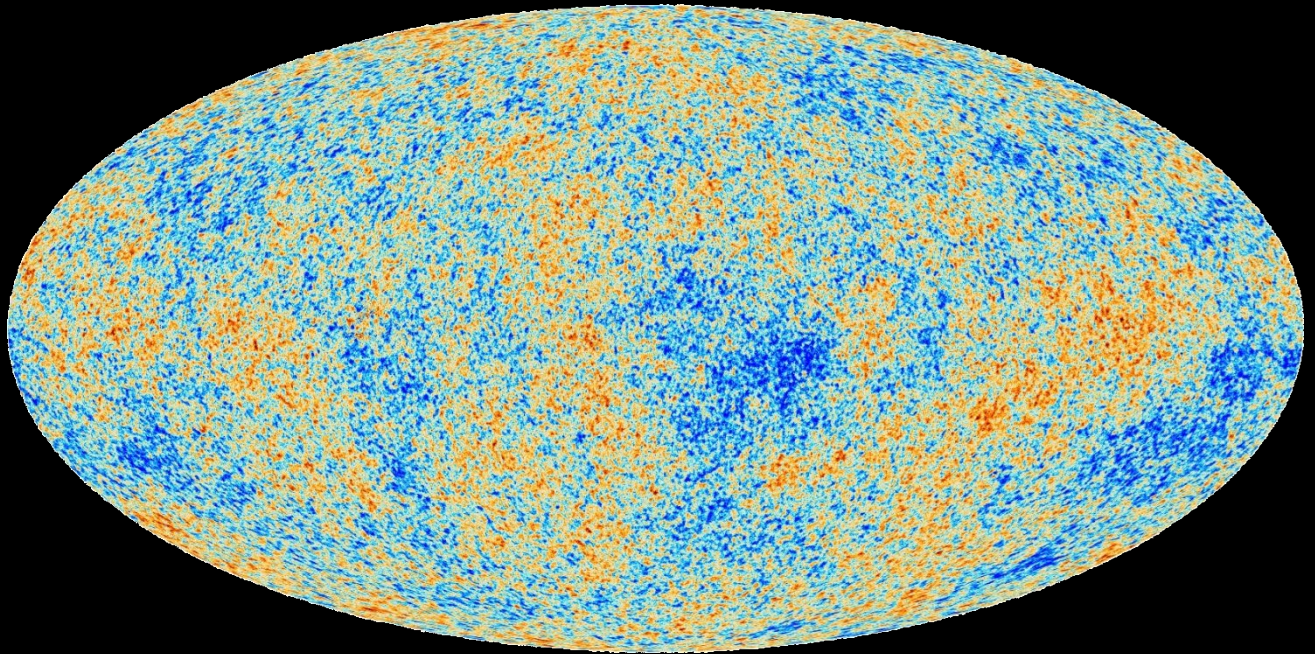
# The Big Bang



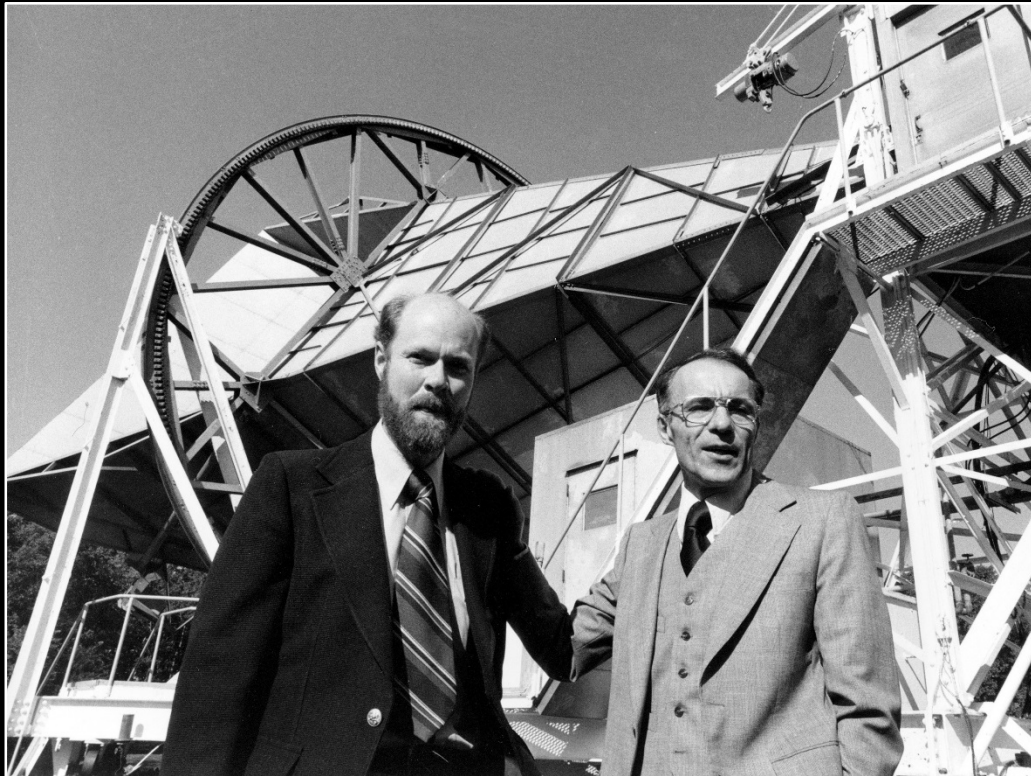
1,000,000,000,000,000,000,000,000,000,000,000°C



# The Cosmic Microwave Background



# The Cosmic Microwave Background







# The Universe of Today

