Observing the Birth of the Universe with the Cosmic Microwave Background

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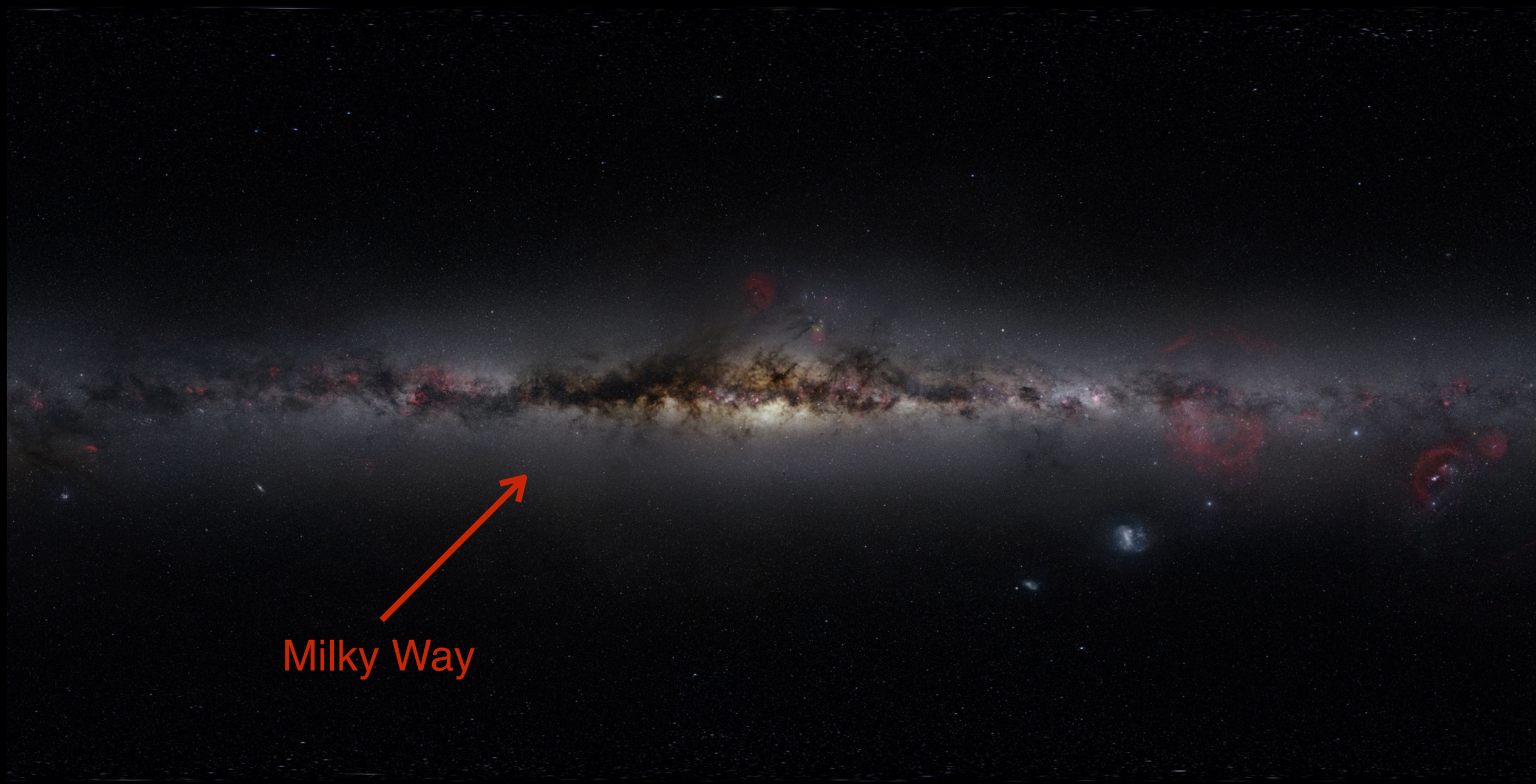
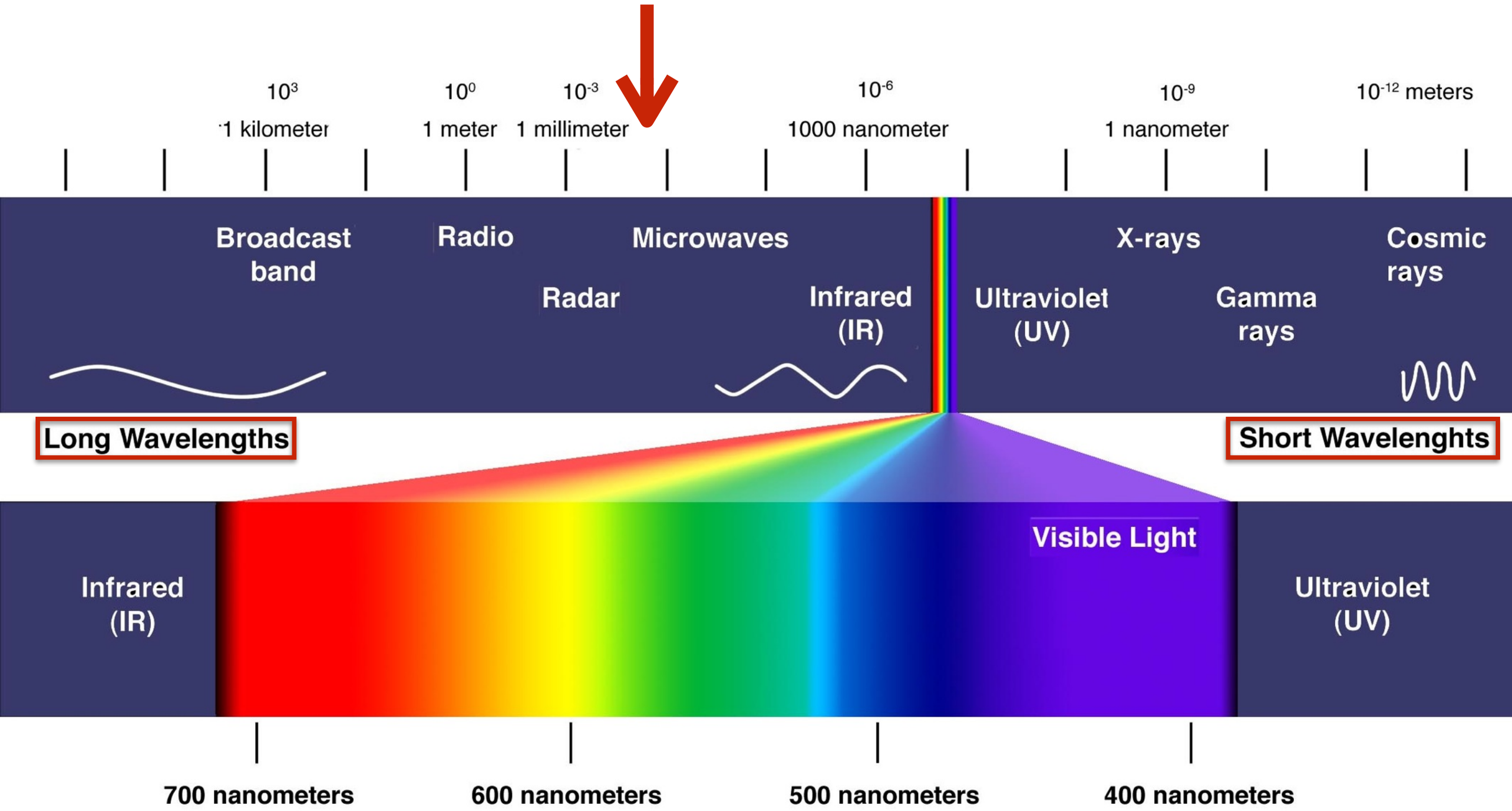
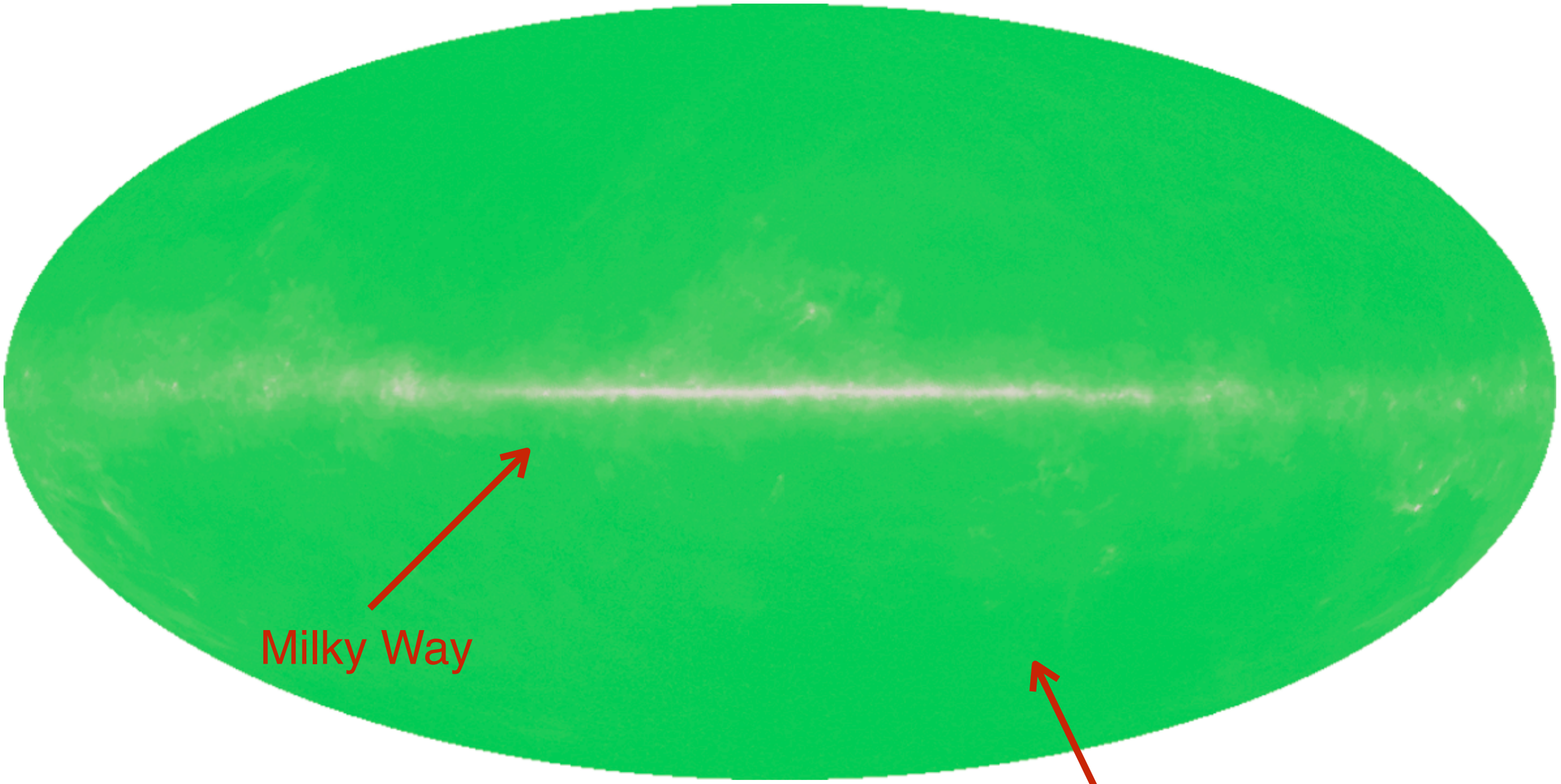
Staring at the Night Sky



The Light Spectrum



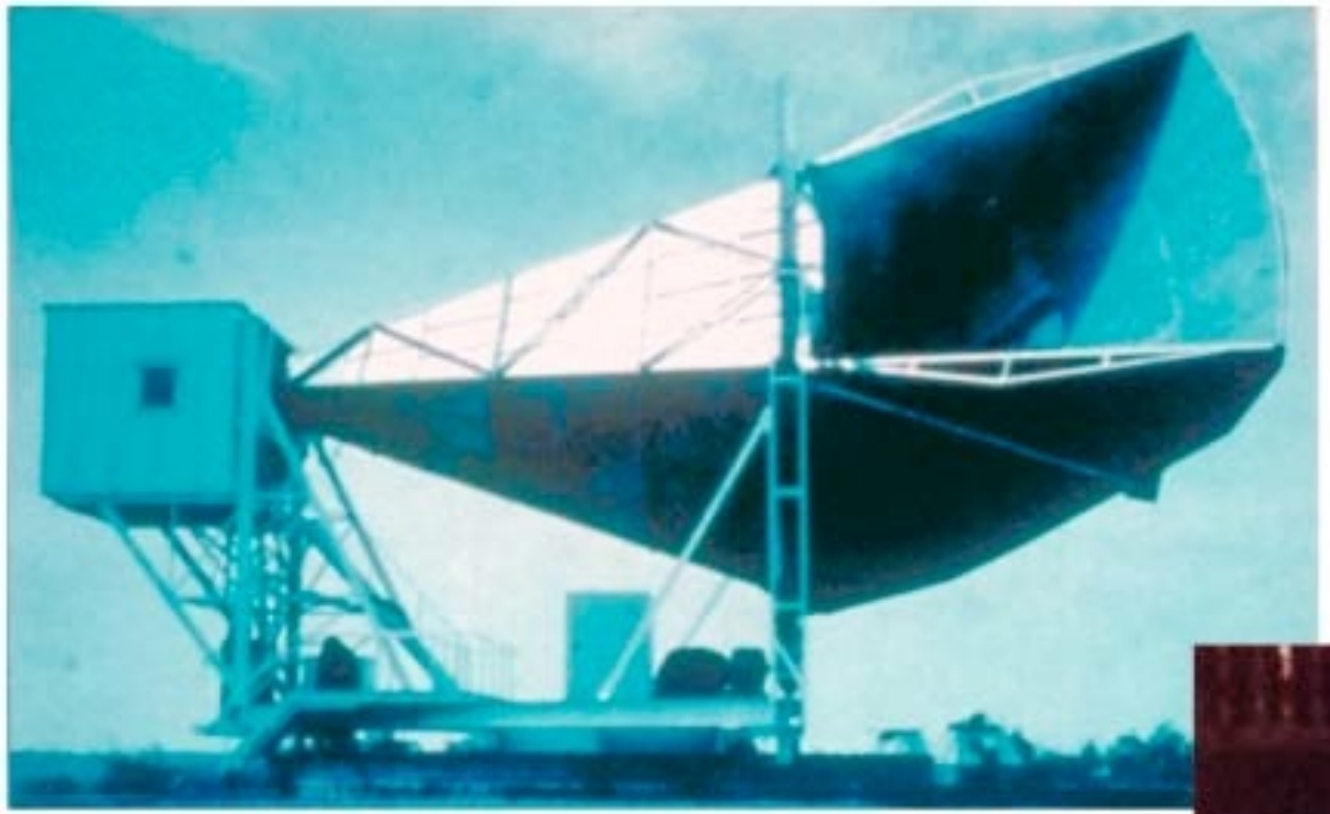
The Sky at Microwave Frequencies



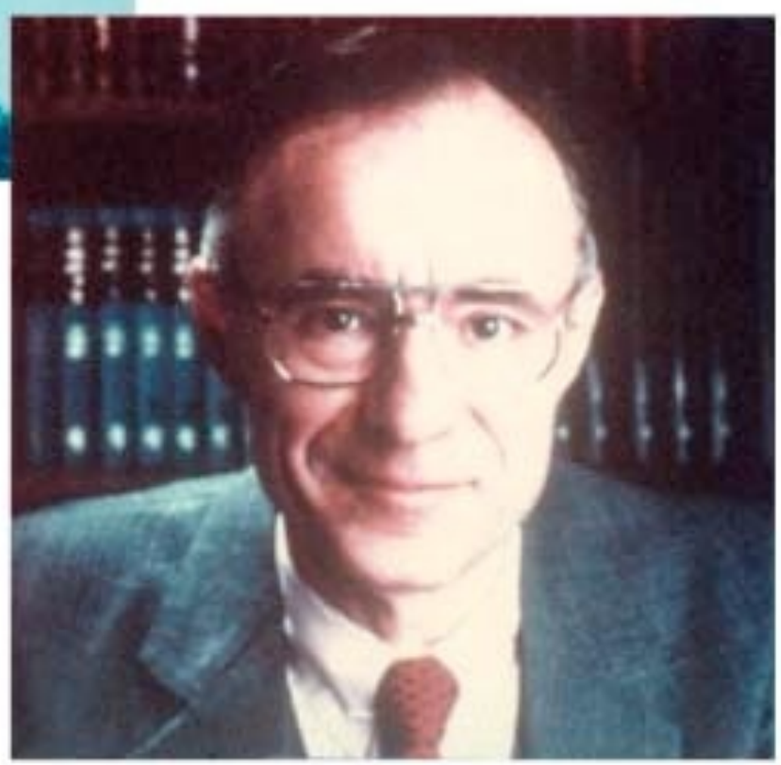
Discovery of the Cosmic Microwave Background in 1965

50 yrs birthday of the discovery

Nobel Prize in 1978



Microwave Receiver

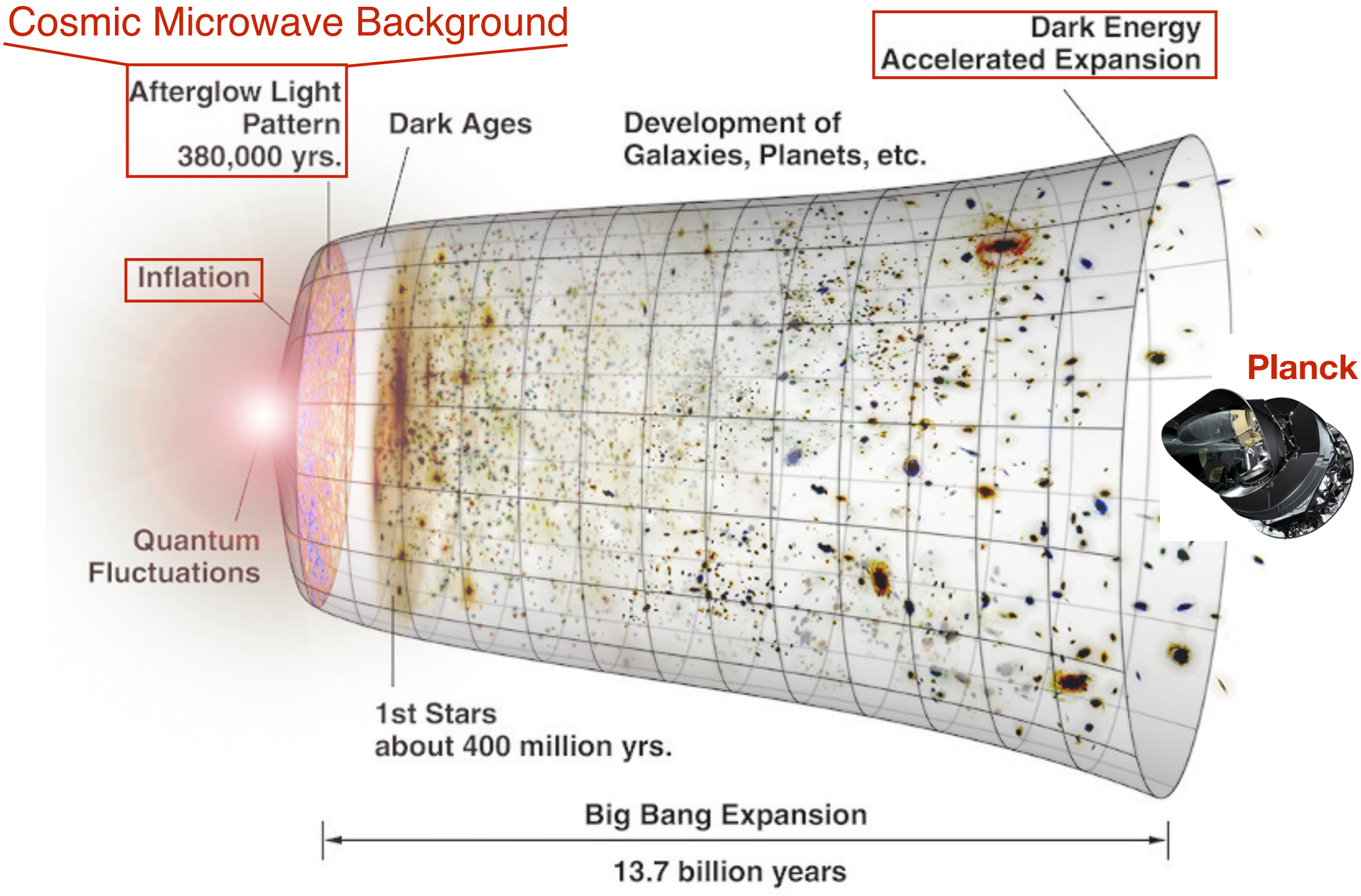


Arno Penzias

Robert Wilson

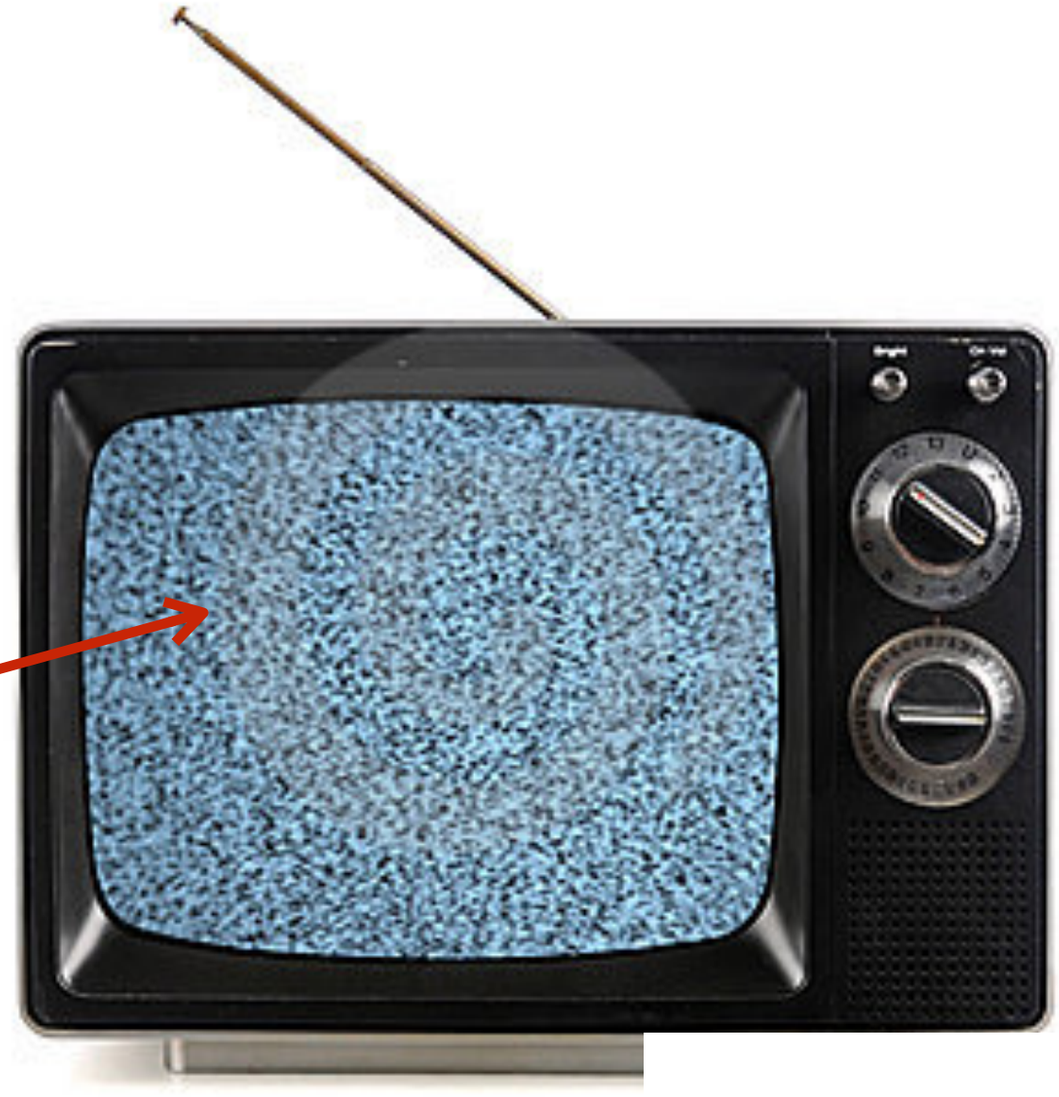
MAP990045

A Cosmic Timeline



Cosmic Microwave Background Fun Facts

- 400 photons (particle of light) per cubic cm today, anywhere.



1% of the snow-like noise actually comes from the CMB

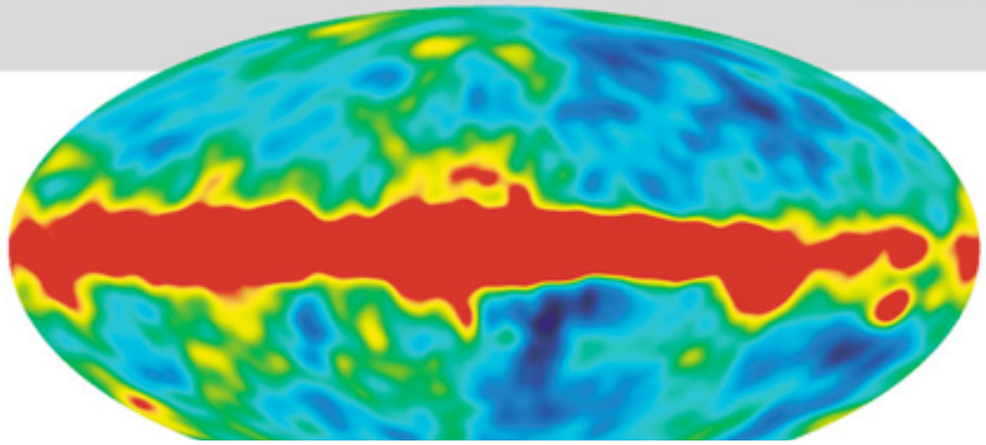
1965

Penzias and Wilson

Nobel Prize in 1978 to A. Penzias and R. Wilson

1992

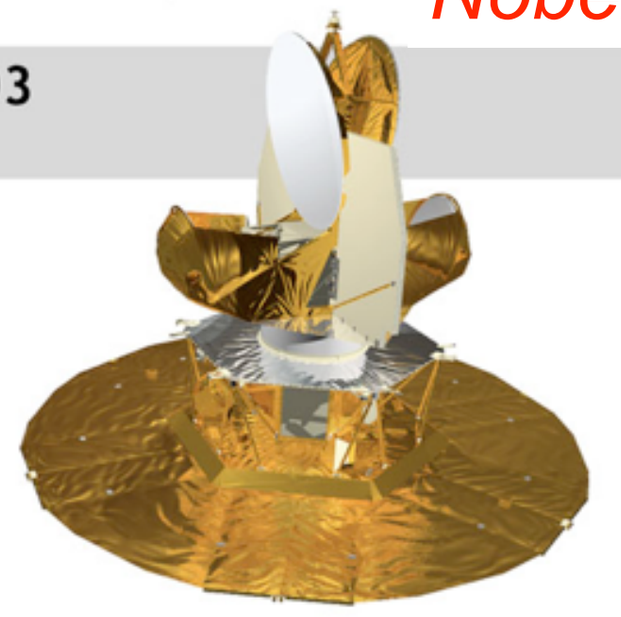
COBE

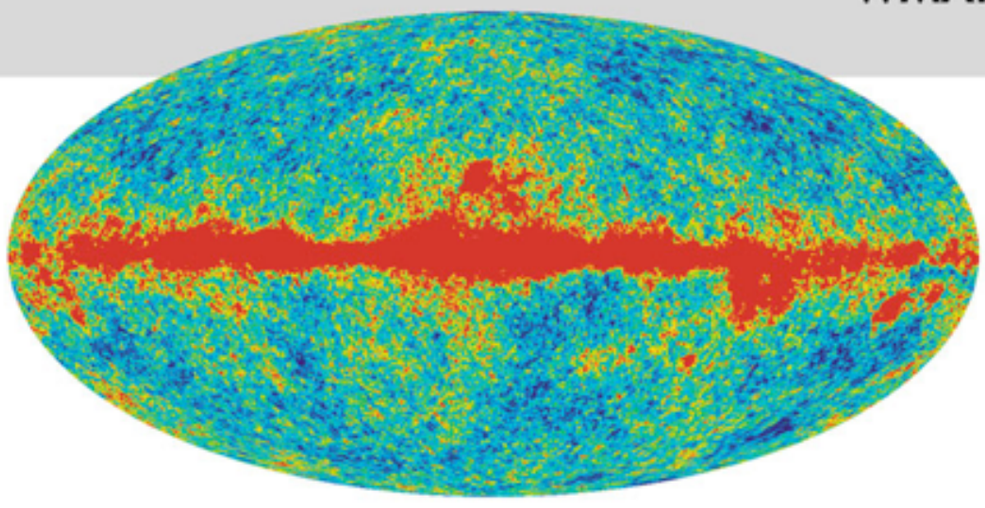


Nobel Prize in 2006 to G. Smoot and J. Mather

2003

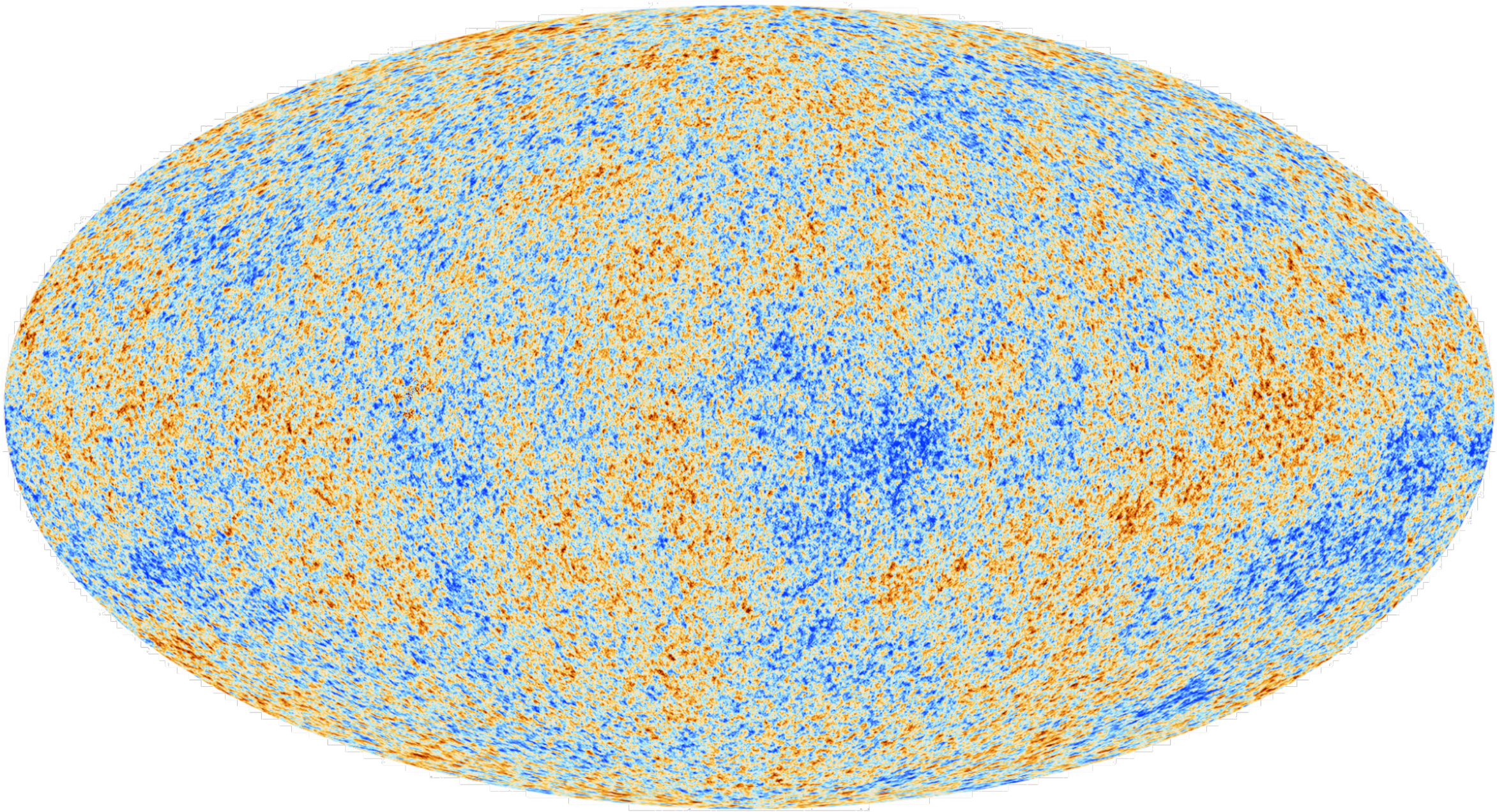
WMAP





Cosmology after Planck

- Cosmology:
  - ➡ *The study of the evolution of the Universe and its nature on very large scales (≳3M light-years)*.



Planck Collaboration 2015

Cosmic Microwave Background and Cosmolgy

- Cosmic Microwave Background has been a formidable observational tool for cosmology over the last 50 years.
  - ➡We can see a snapshot of the Universe when it was very young.

- Cosmology:
  - ➡The study of the evolution of the Universe and its nature on very large scales (≳3M light-years).

- What is precision in cosmology?
  - ➡As an example, the age of the Universe is measured to be 13.719 Gyr ± 0.5% using Planck (!!)
  - ➡Other global properties such as the matter content of the Universe are measured at percent level.

- Thanks to the Cosmic Microwave Background and other tools, we are constantly improving our understanding of the evolution of the Universe.
  - ➡Cosmology is an important and vibrant scientific endeavor.

FIN

Mollweide Projection