

Cosmology:

A Modern Copernican Revolution?

Peter Timbie

Department of Physics

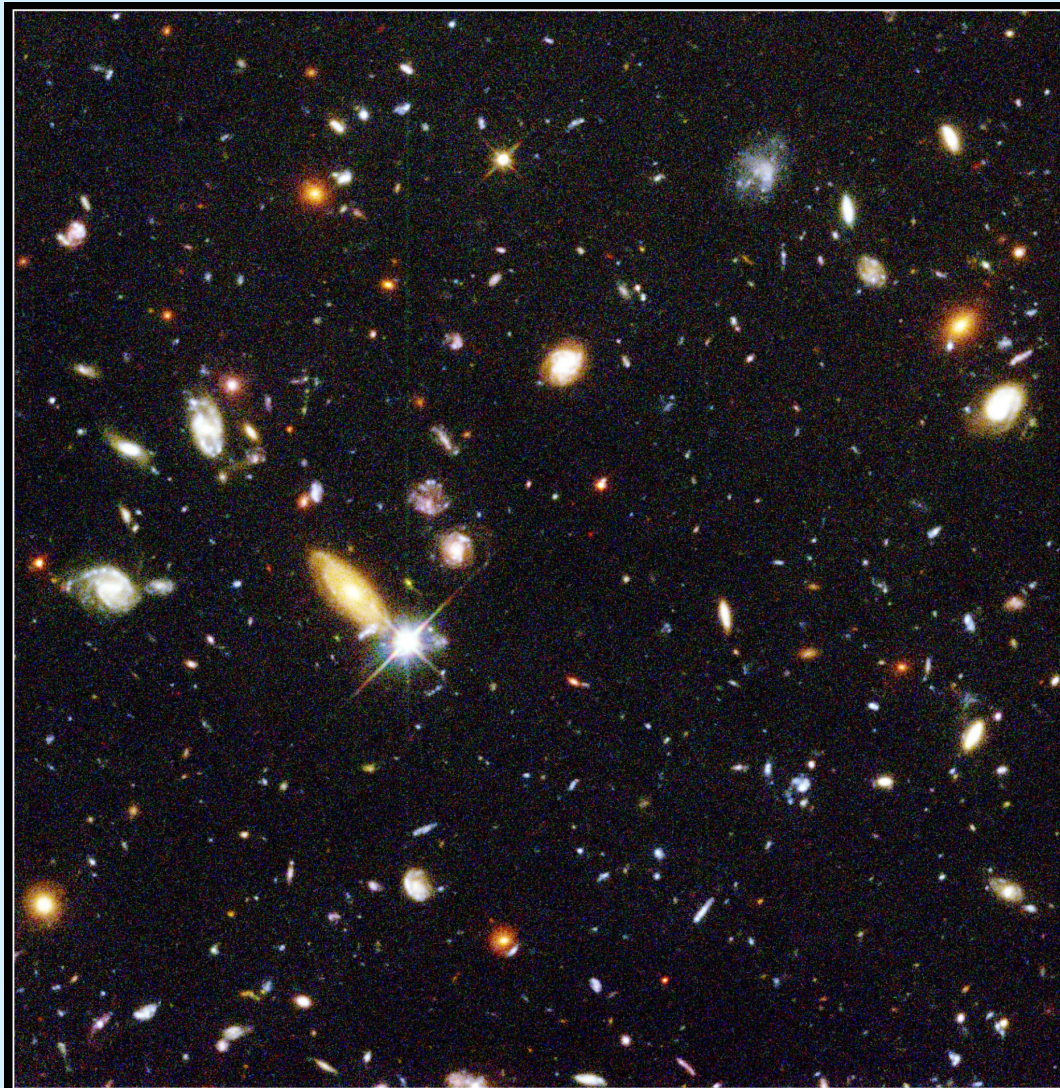


NASA/IDEAS Workshop

“Teaching Astronomy/
Astrophysics at the High School
Level”

June 18, 2002

Hubble Deep Field



Hubble Deep Field
Hubble Space Telescope • WFPC2

Please visit our website!

<http://cmb.physics.wisc.edu/>

and look at the **Cosmology Tutorial . . .**

Whirlpool Galaxy • M51

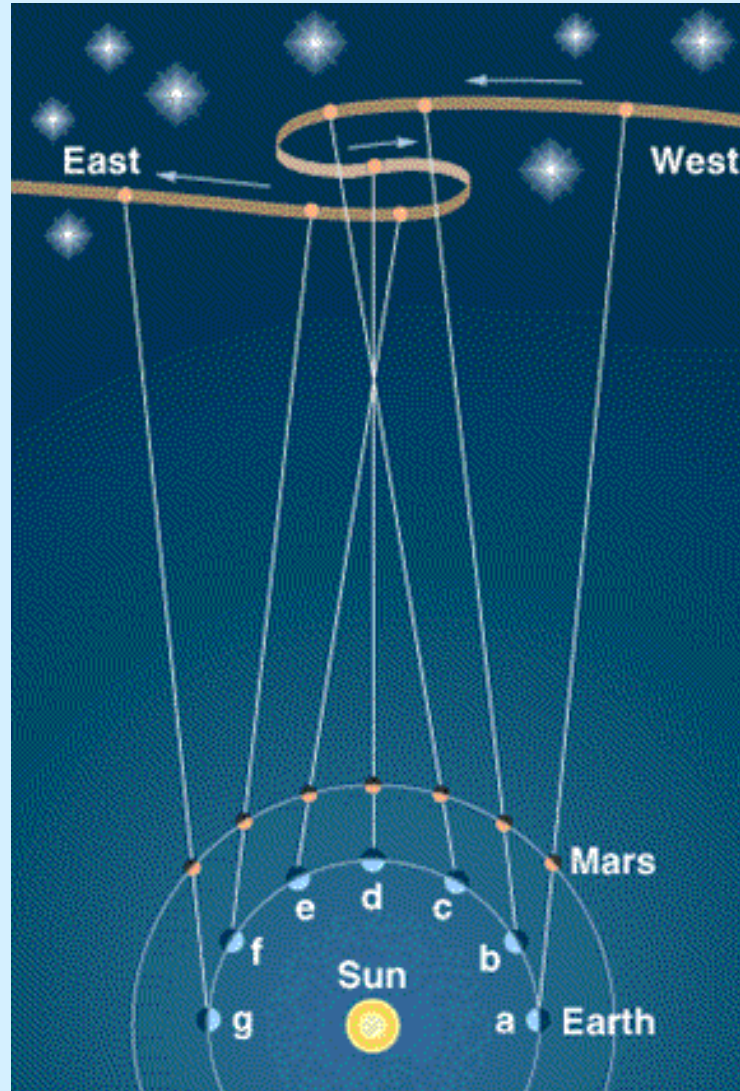


Hubble
Heritage

NASA and The Hubble Heritage Team (STScI/AURA)
Hubble Space Telescope WFPC2 • STScI-PRC01-07

What is the Ultimate Fate of the Universe?

Go to the Cosmology Tutorial Online
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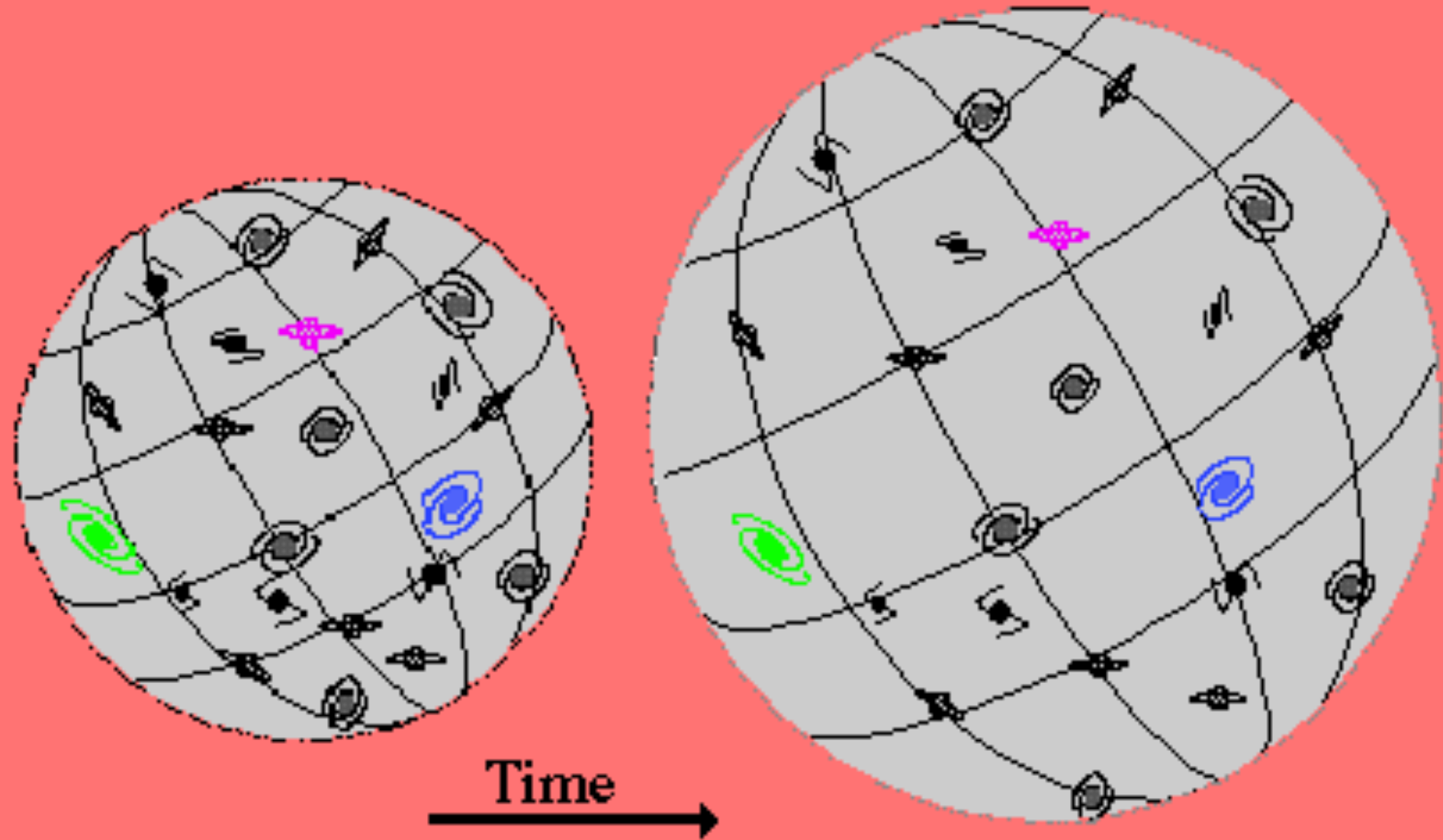
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Olbers' Paradox



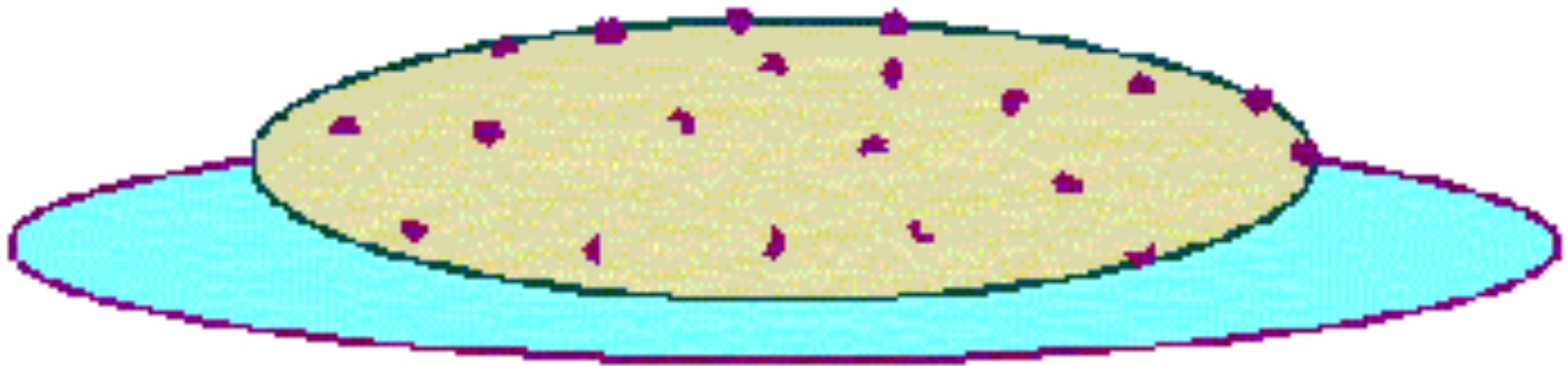
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Hubble Expansion



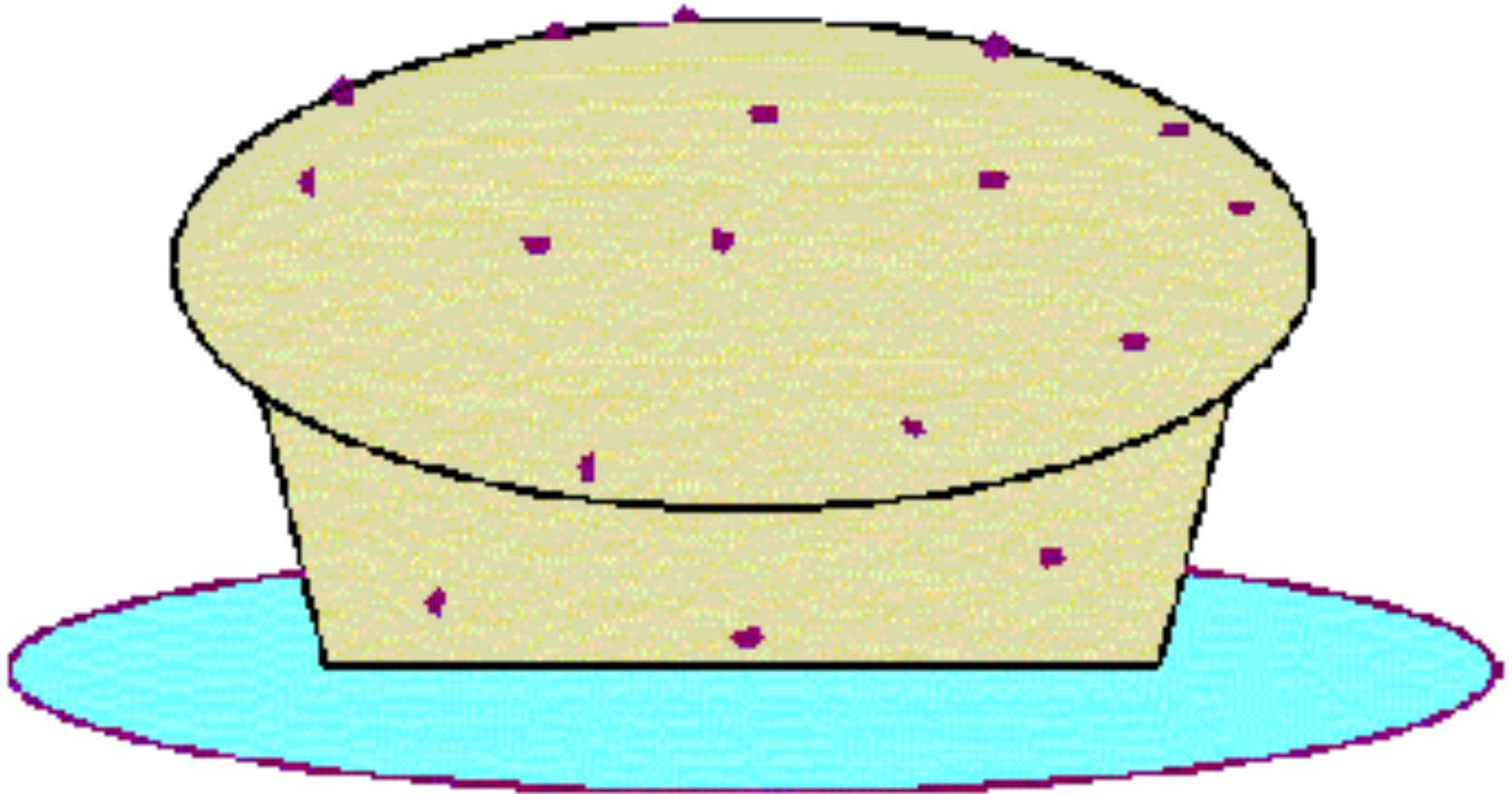
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Raisinbread Example – Hubble Expansion



Before...

Raisinbread Example – Hubble Expansion



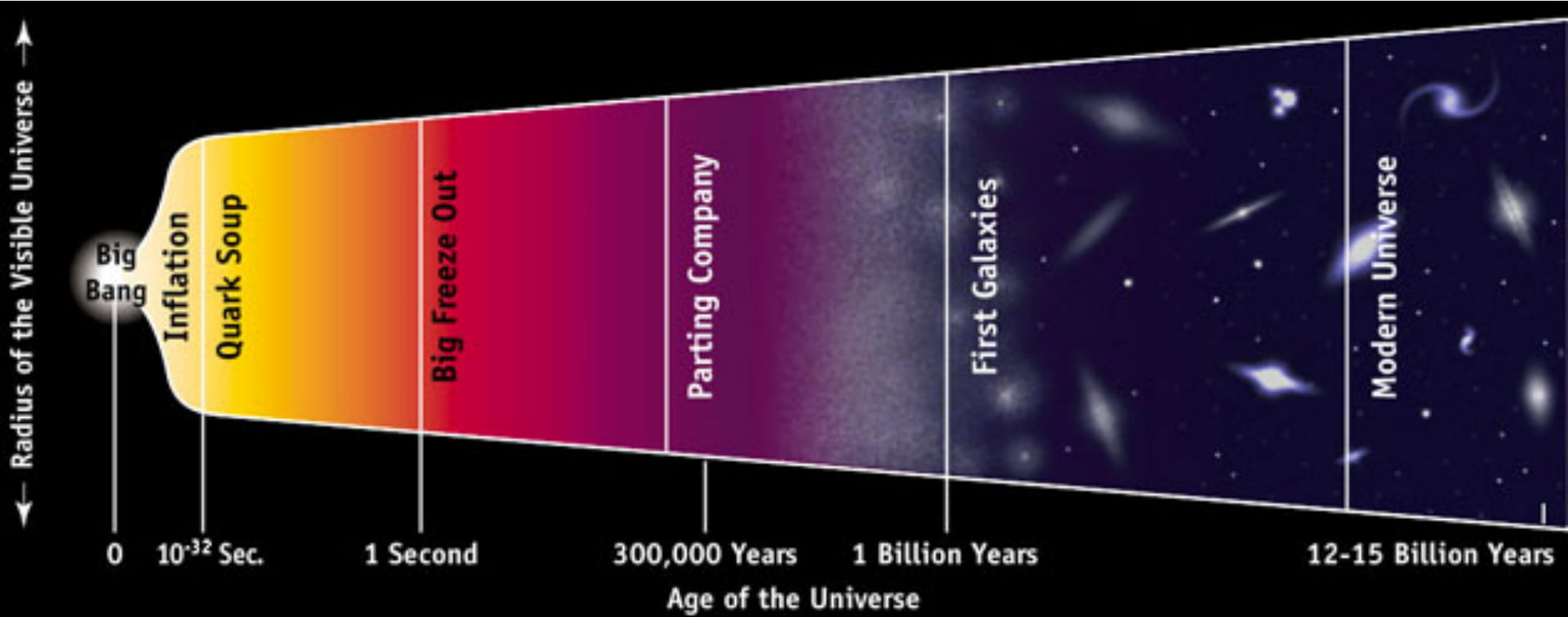
After !

Hubble Expansion Classroom Activity

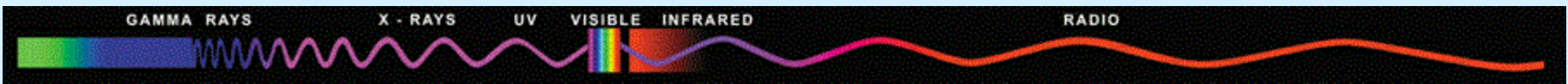


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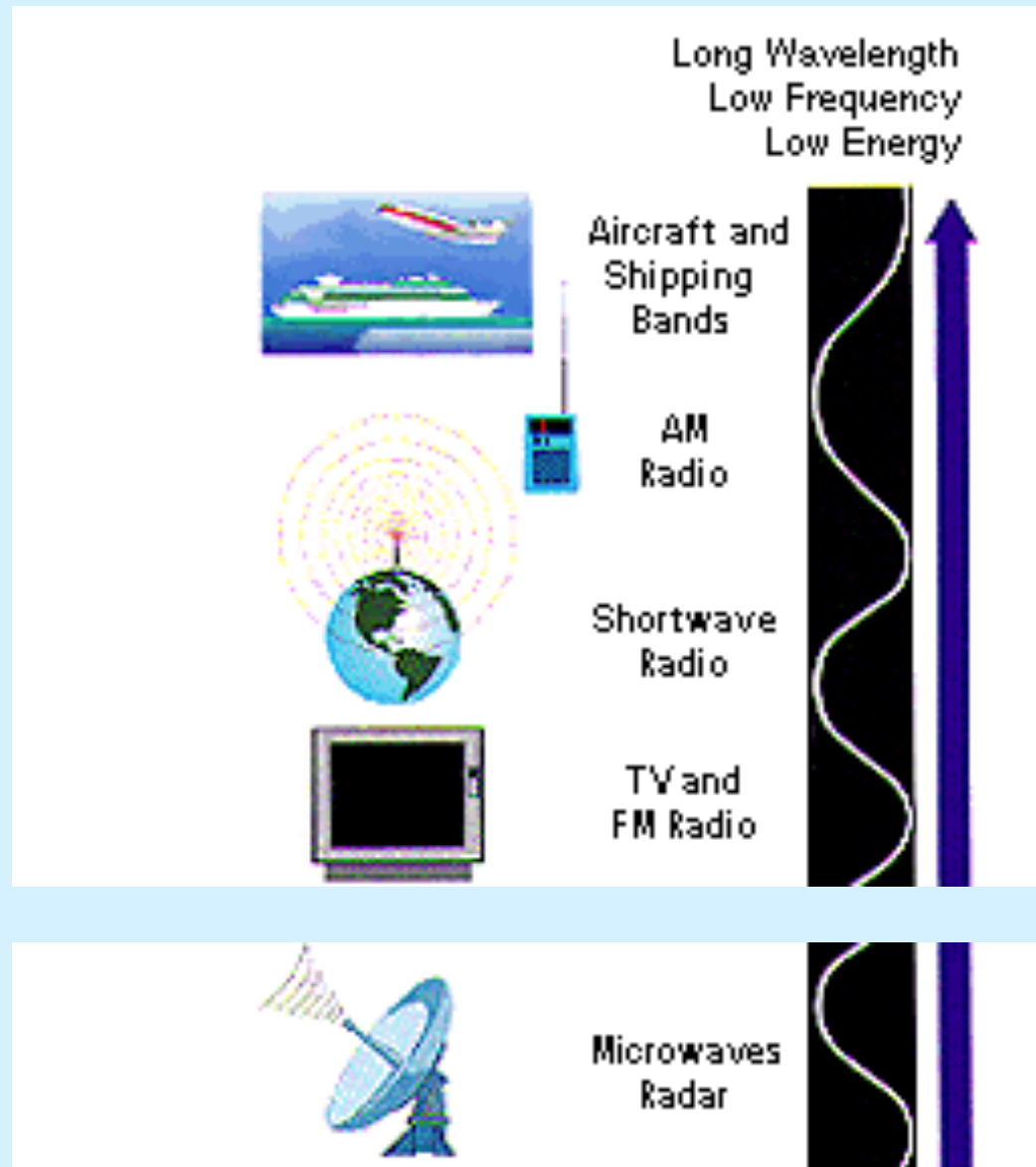
Timeline of the Big Bang



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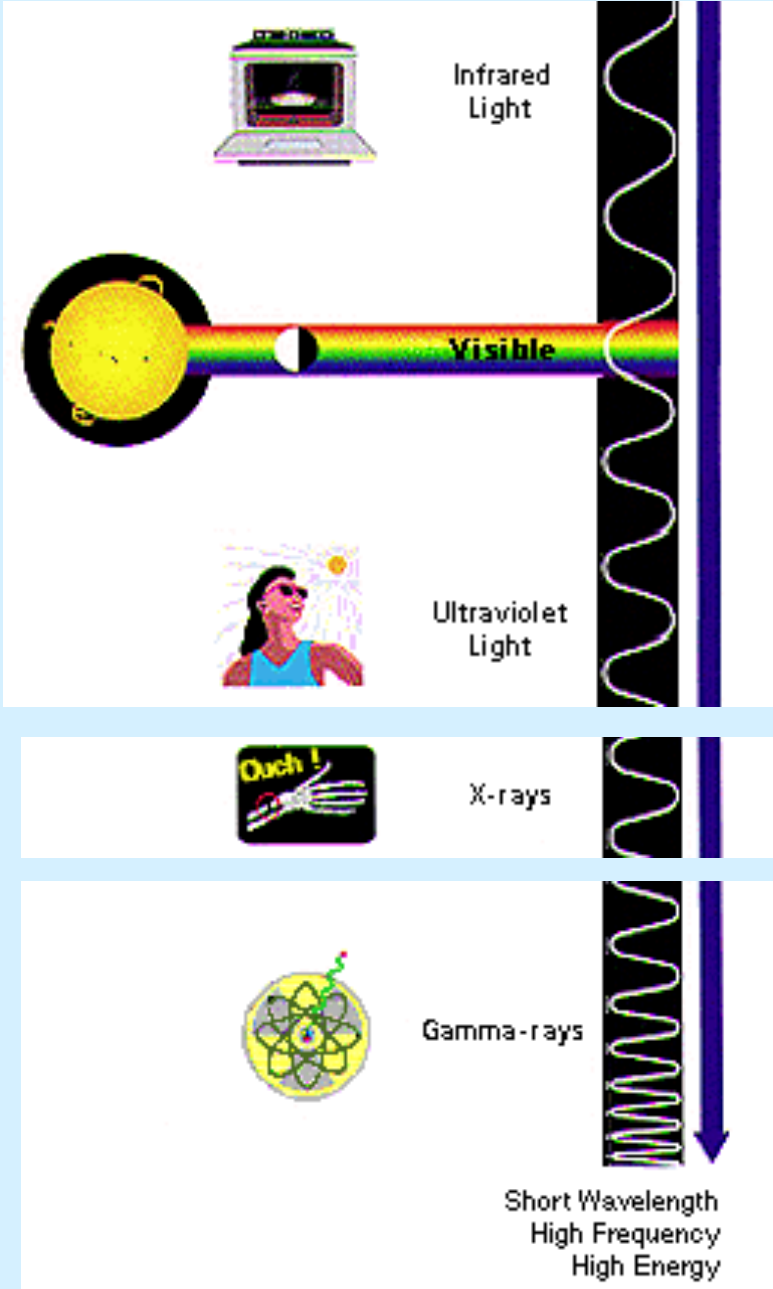


Types of Light Waves

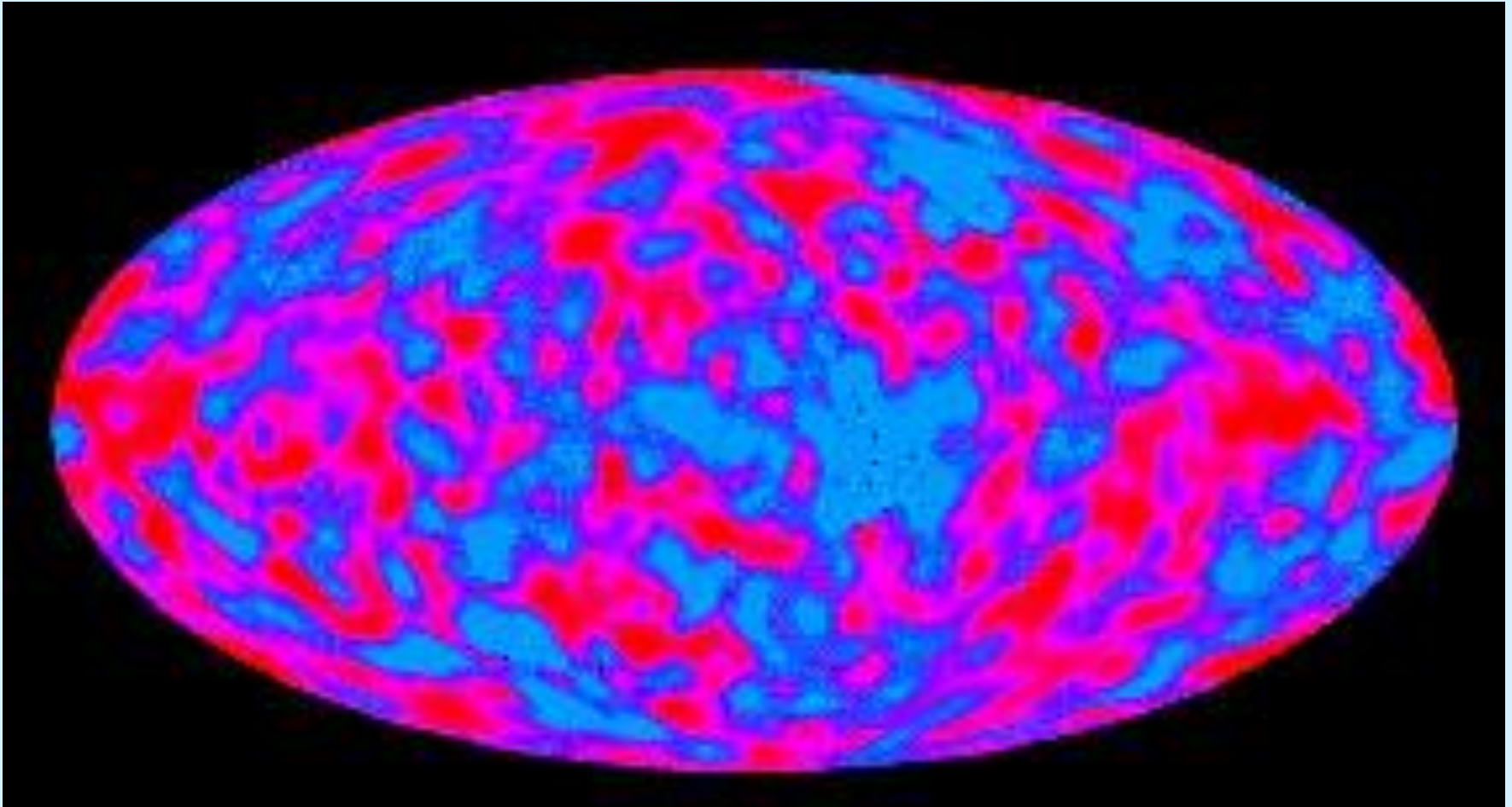




Types of Light Waves

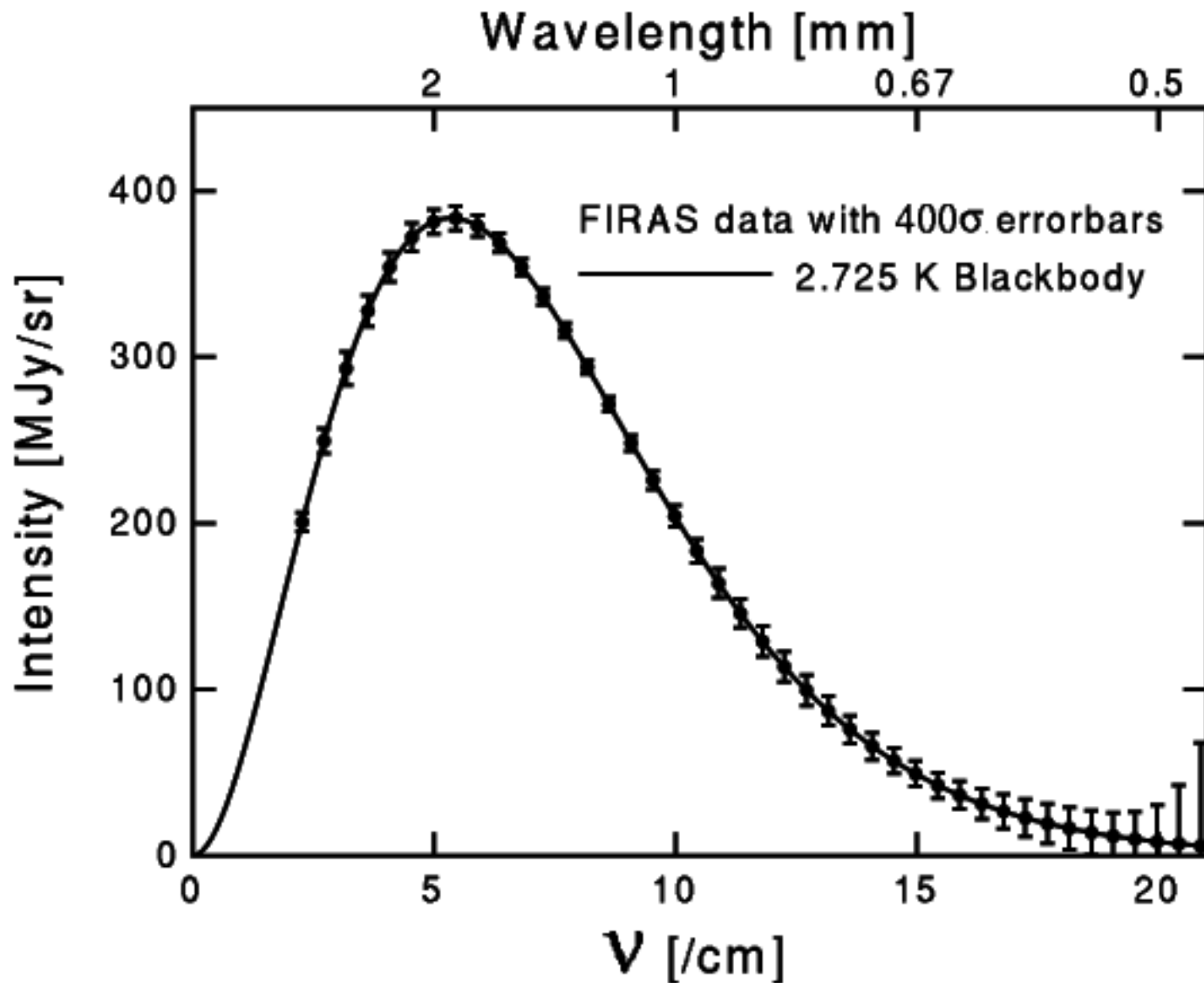


COBE Map with Galaxy Removed

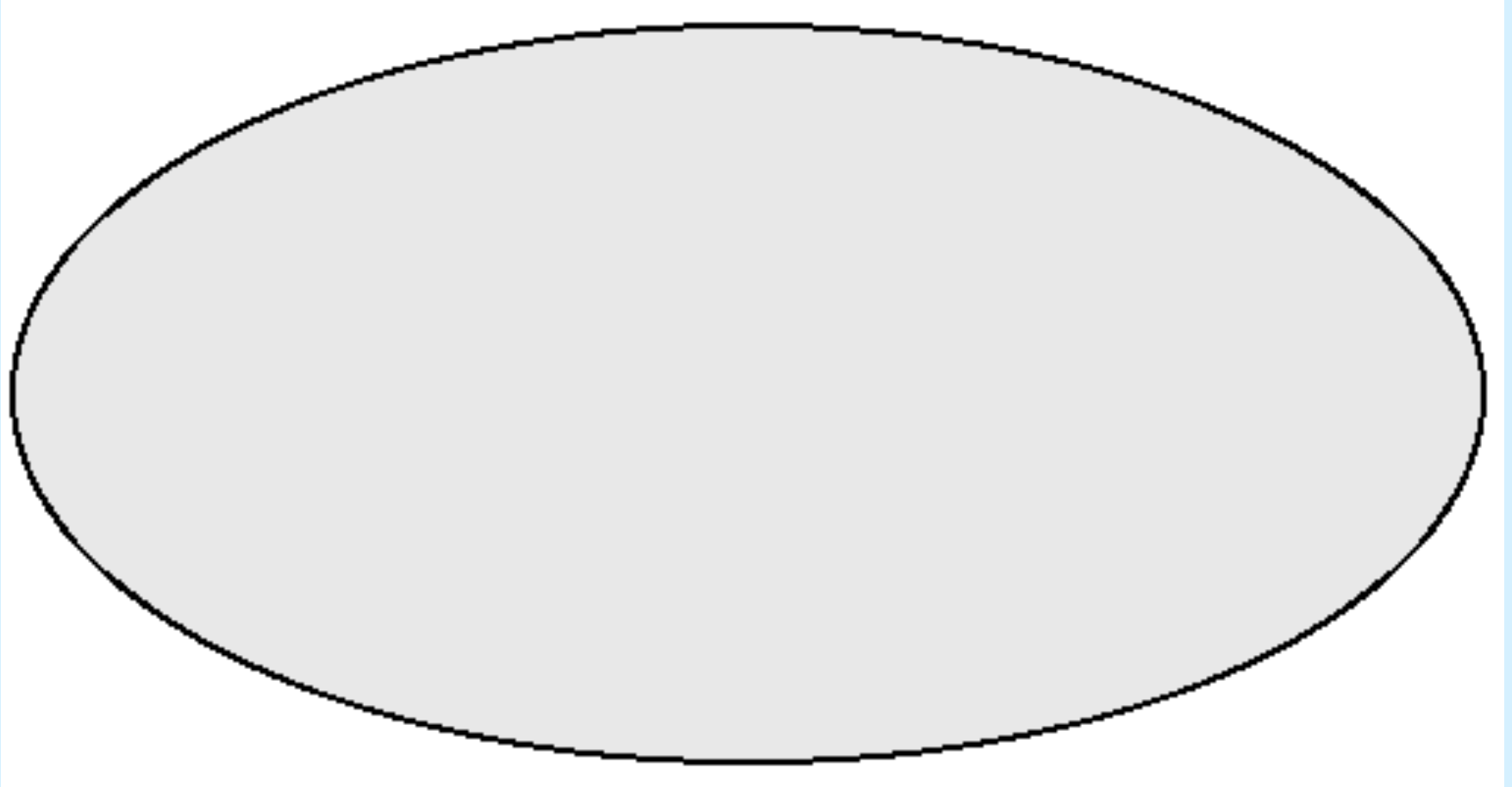


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Cosmic Microwave Background is a perfect *blackbody*



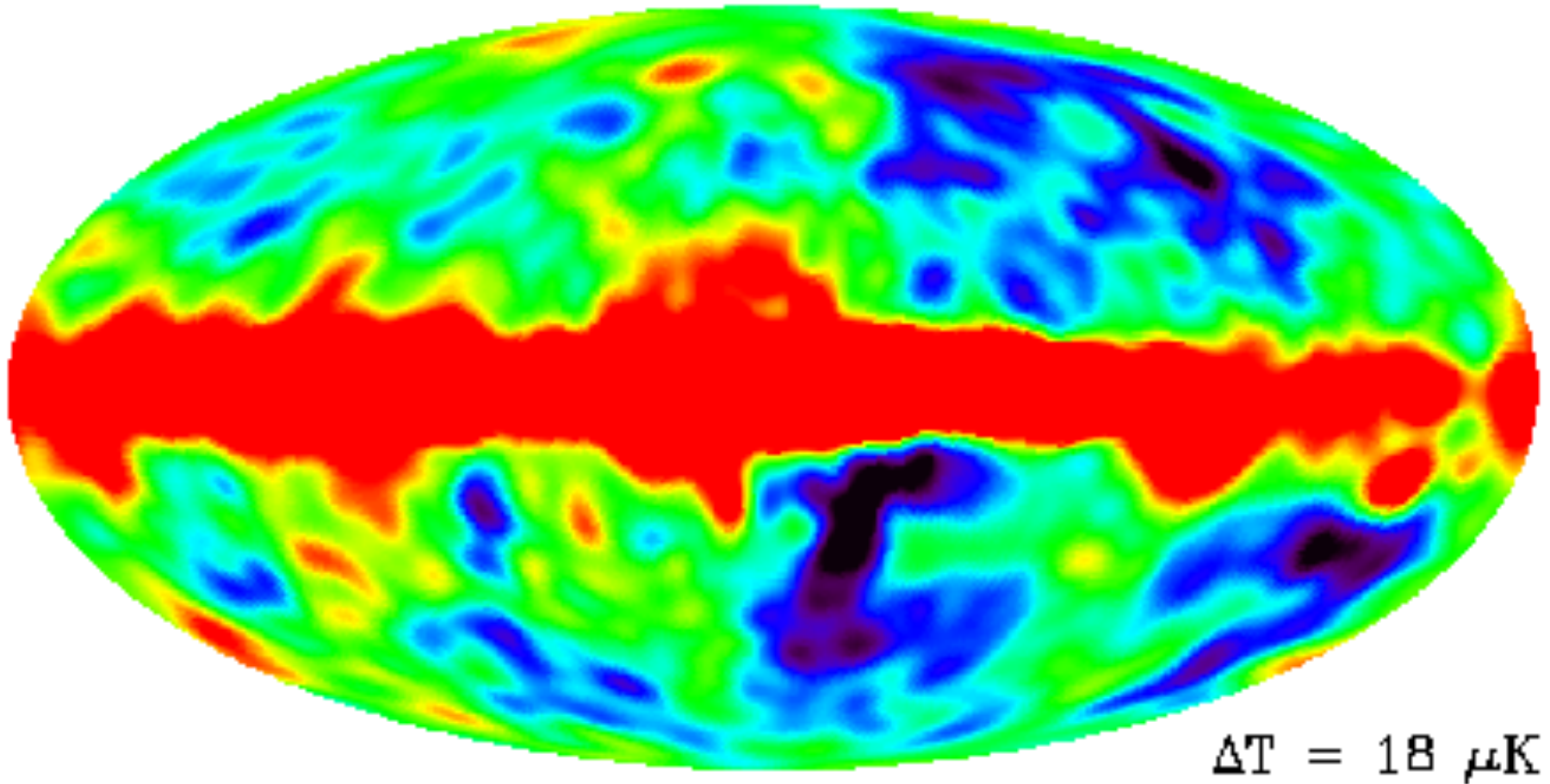
The Cosmic Microwave Background is *almost perfectly uniform*



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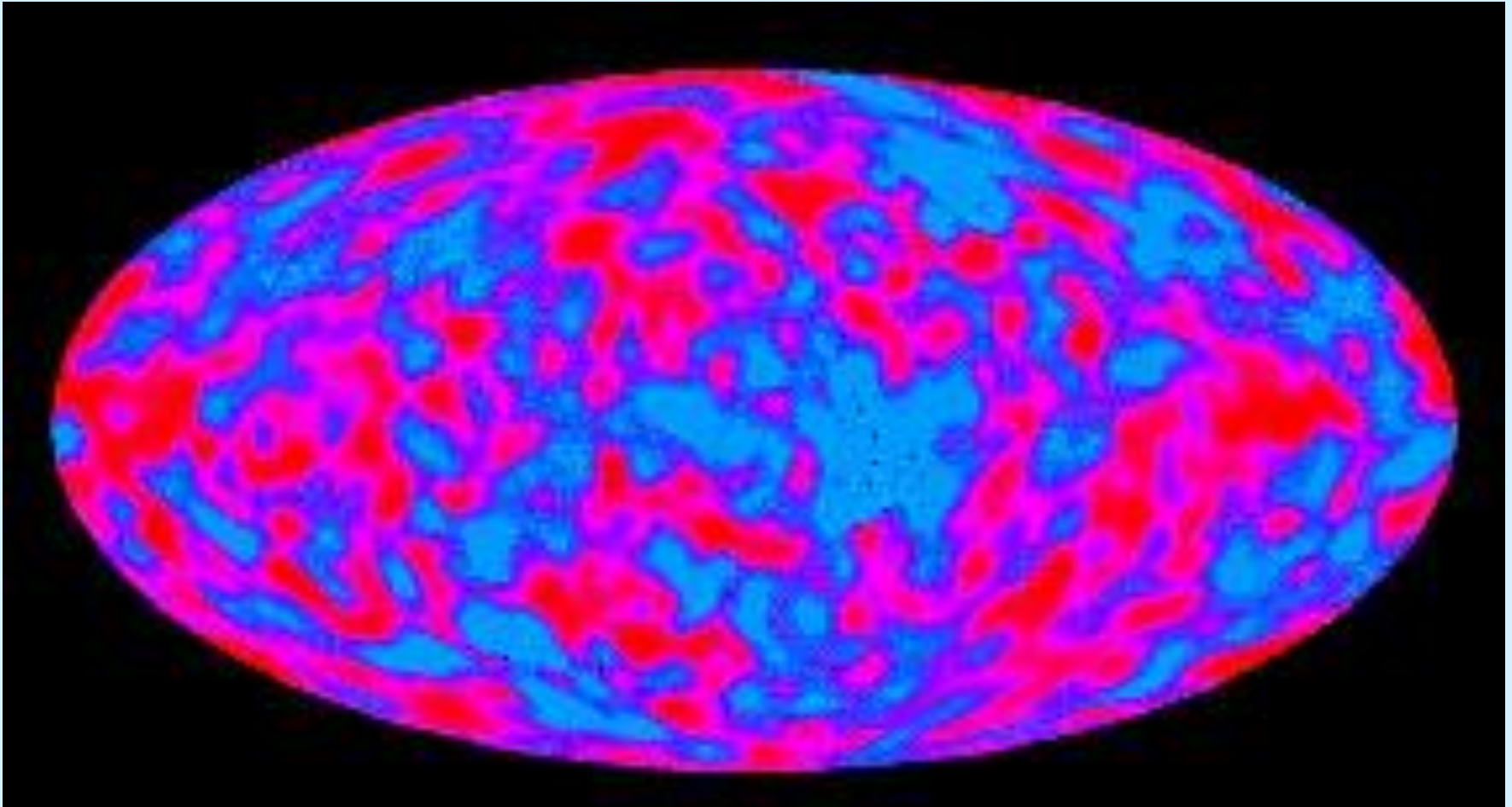
COBE Map of the CMB

Cosmic Microwave Background (CMB)



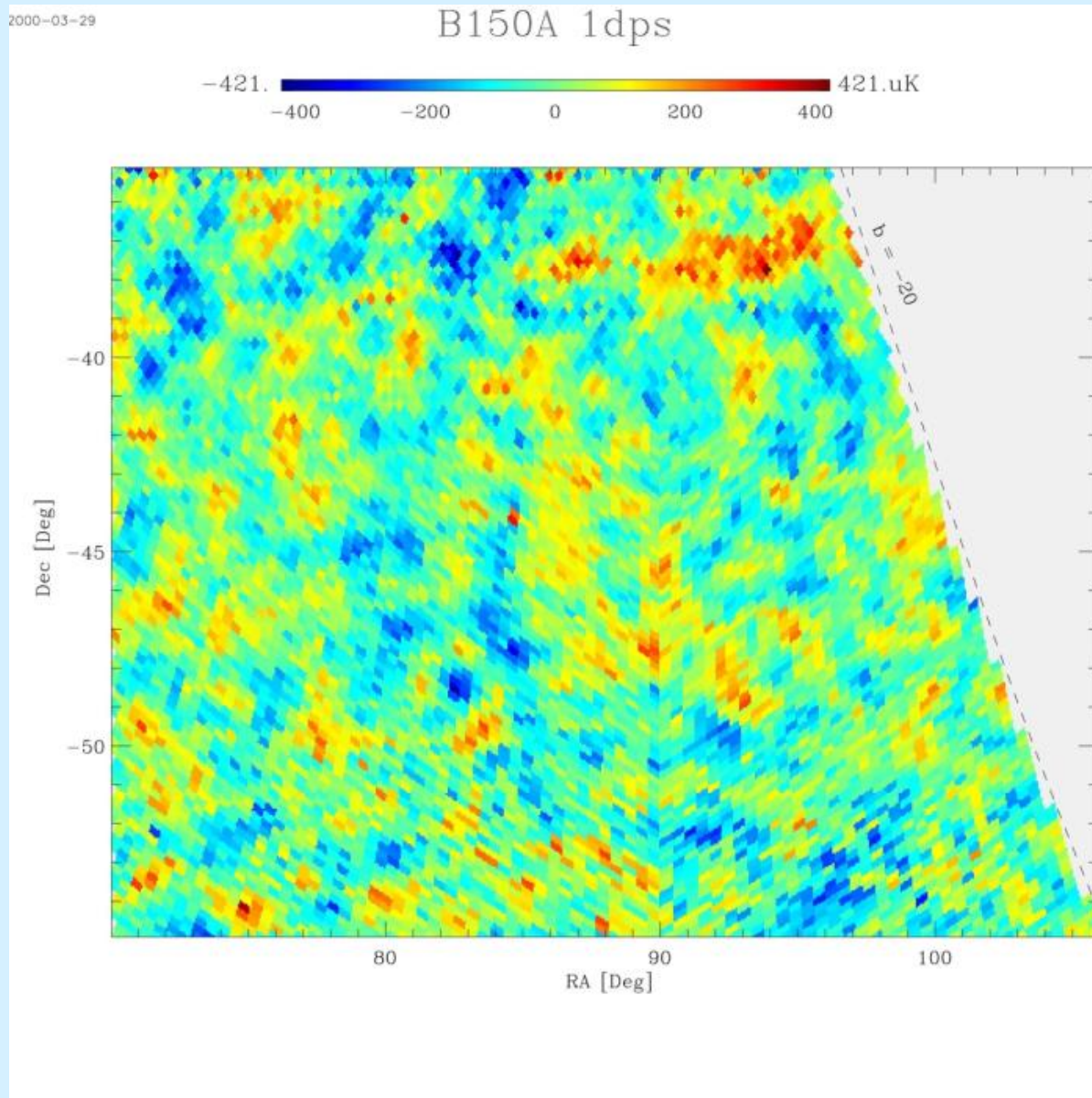
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COBE Map with Galaxy Removed



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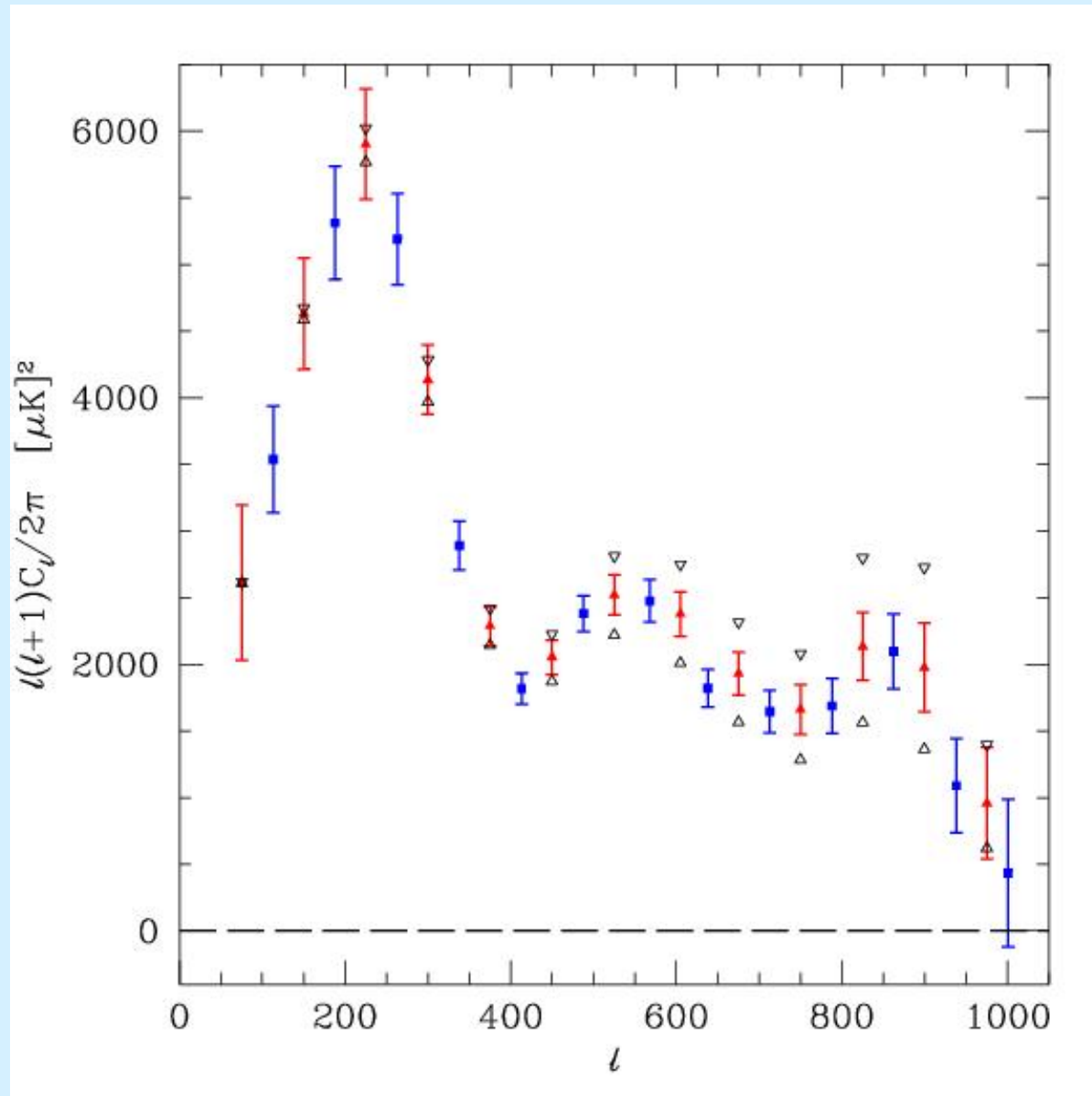
BOOMERANG Map



COSMOLOGICAL PARAMETERS

Ω_0	total energy density
$\Omega_b h^2$	baryon density
Ω_m	total matter density
Λ	cosmological constant
h	Hubble parameter
Q	CMB power spectrum normalization (quadrupole)
n_s	CMB scalar power spectrum index
r	scalar/tensor ratio
n_t	CMB tensor power spectrum index
f_ν	neutrino energy fraction
Z_{ri}	redshift of reionization

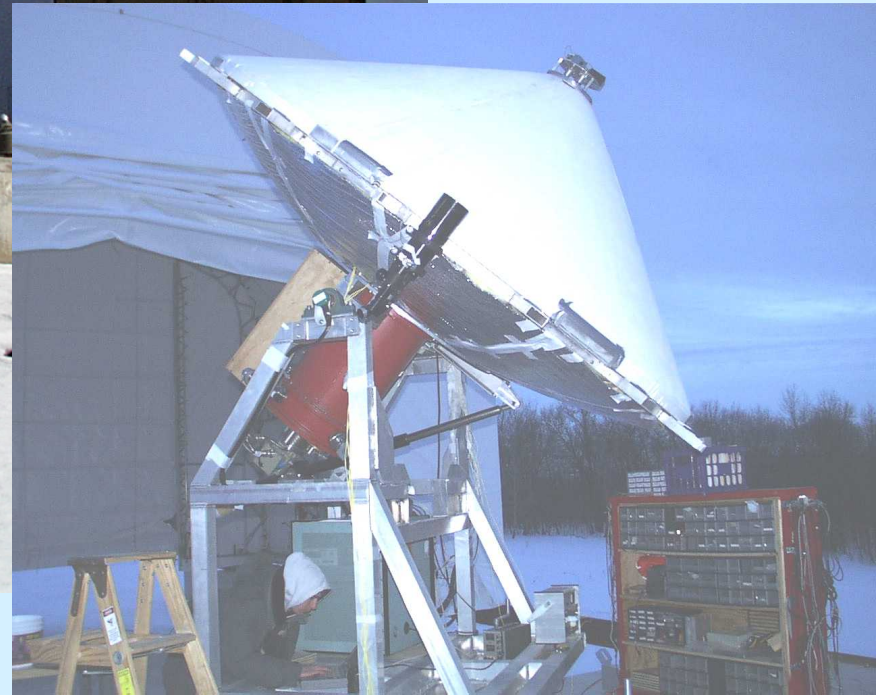
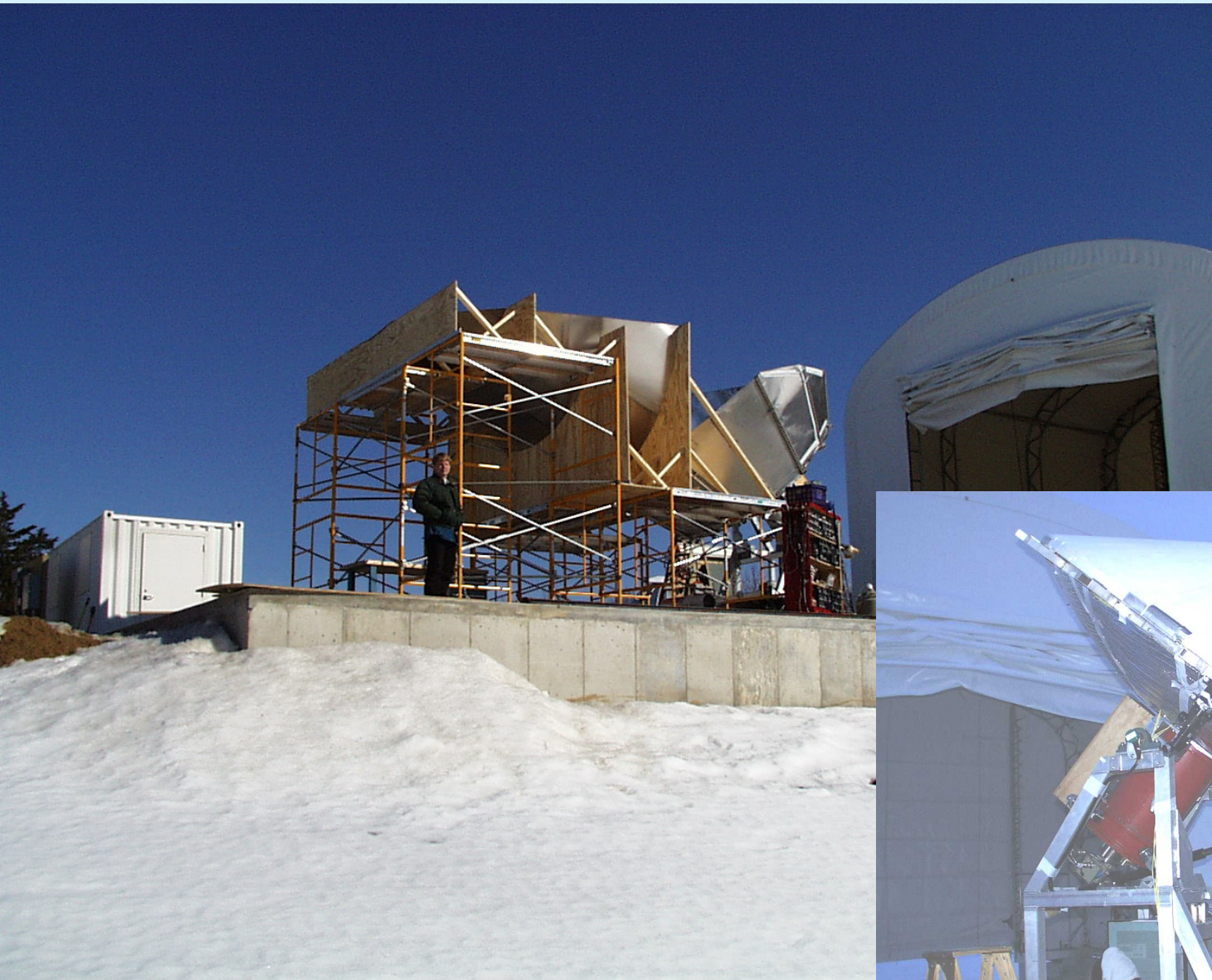
CMB Power Spectrum



Density of the Universe....

A modern Copernican Revolution!

COMPASS at Pine Bluff, WI



Observational Cosmology at UW

- **TopHat**
- **POLAR**
- **COMPASS**
- **COMPASS Array**
- **Millimeter-wave Bolometric Interferometer (MBI)**
- **Explorer of Diffuse Hi-Z Galaxy Emission (EDGE)**
- **Superconducting Transition-Edge Sensors (TES)**

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