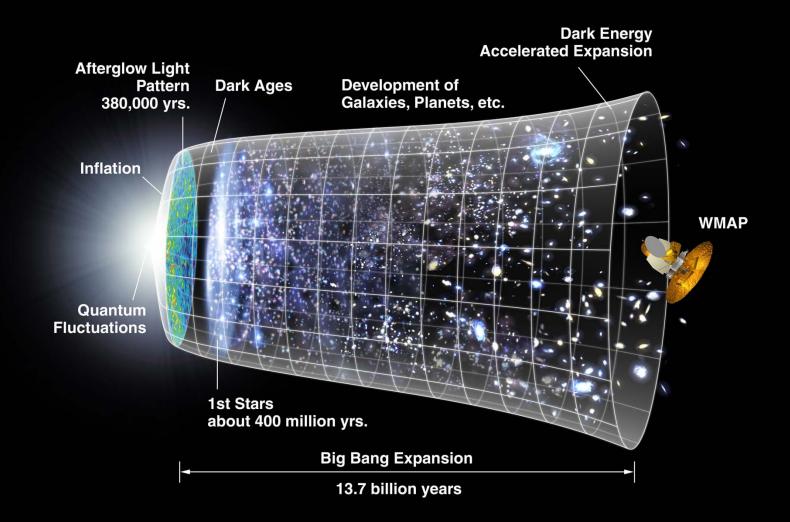
# Astronomy 6000 – The High Redshift Universe

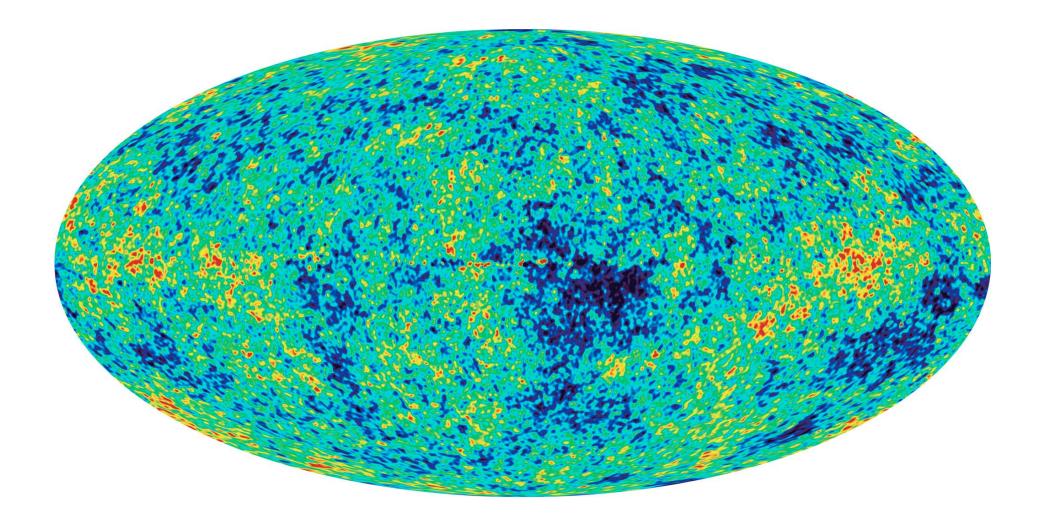
Nils Halveson

Jack Burns

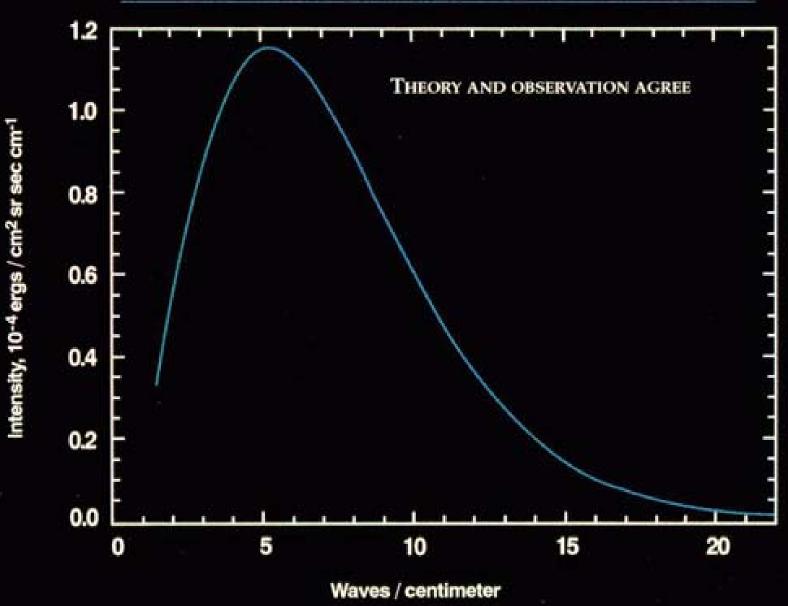
Geraint Harker

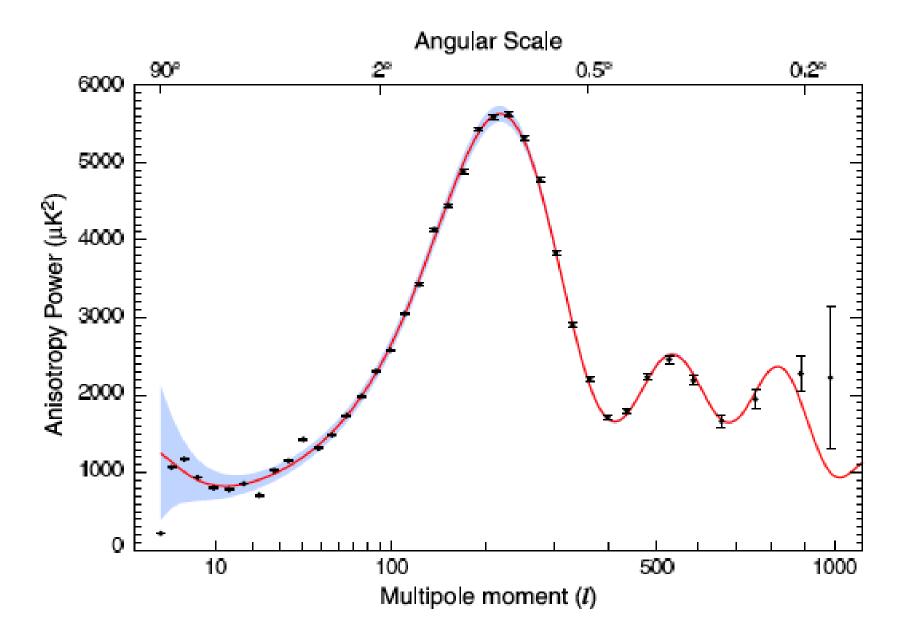
Class website: <a href="http://lunar.colorado.edu/~jaburns/astr6000/">http://lunar.colorado.edu/~jaburns/astr6000/</a>





#### COSMIC MICROWAVE BACKGROUND SPECTRUM FROM COBE





#### **The First Billion Years**

A Schematic Outline of the Cosmic History

Time since the Big Bang (years)

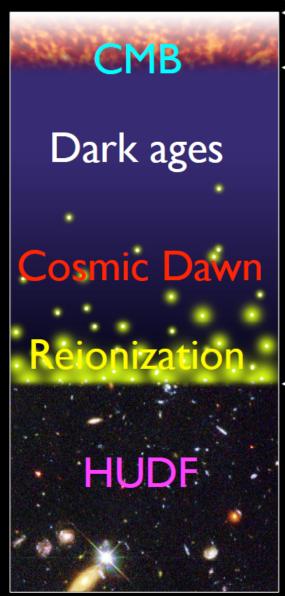
~ 300 thousand

~ 500 million

~ 1 billion

~ 9 billion

~ 13 billion



◆The Big Bang

The Universe filled with ionized gas

←The Universe becomes z=1100 neutral and opaque

The Dark Ages start

Galaxies and Quasars begin to form The Reionization starts

z~20-30

The Cosmic Renaissance The Dark Ages end

 Reionization complete, the Universe becomes transparent again z~6

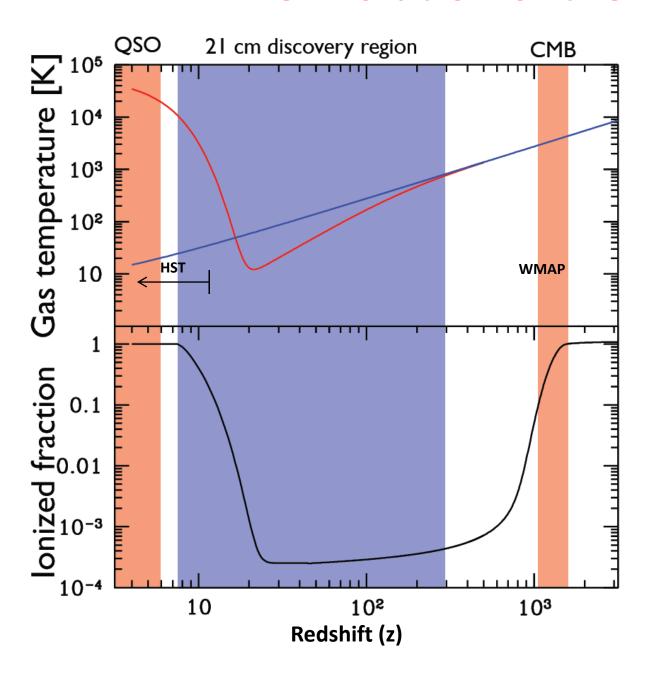
Galaxies evolve

The Solar System forms

Today: Astronomers figure it all out!

S.G. Djorgovski et al. & Digital Media Center, Caltech

#### The Evolution of the IGM



We know nothing concrete about the thermal history of the Universe between z=1100 and z=6

We know little or nothing about galaxies at z>10

