

# OBSERVATIONAL COSMOLOGY

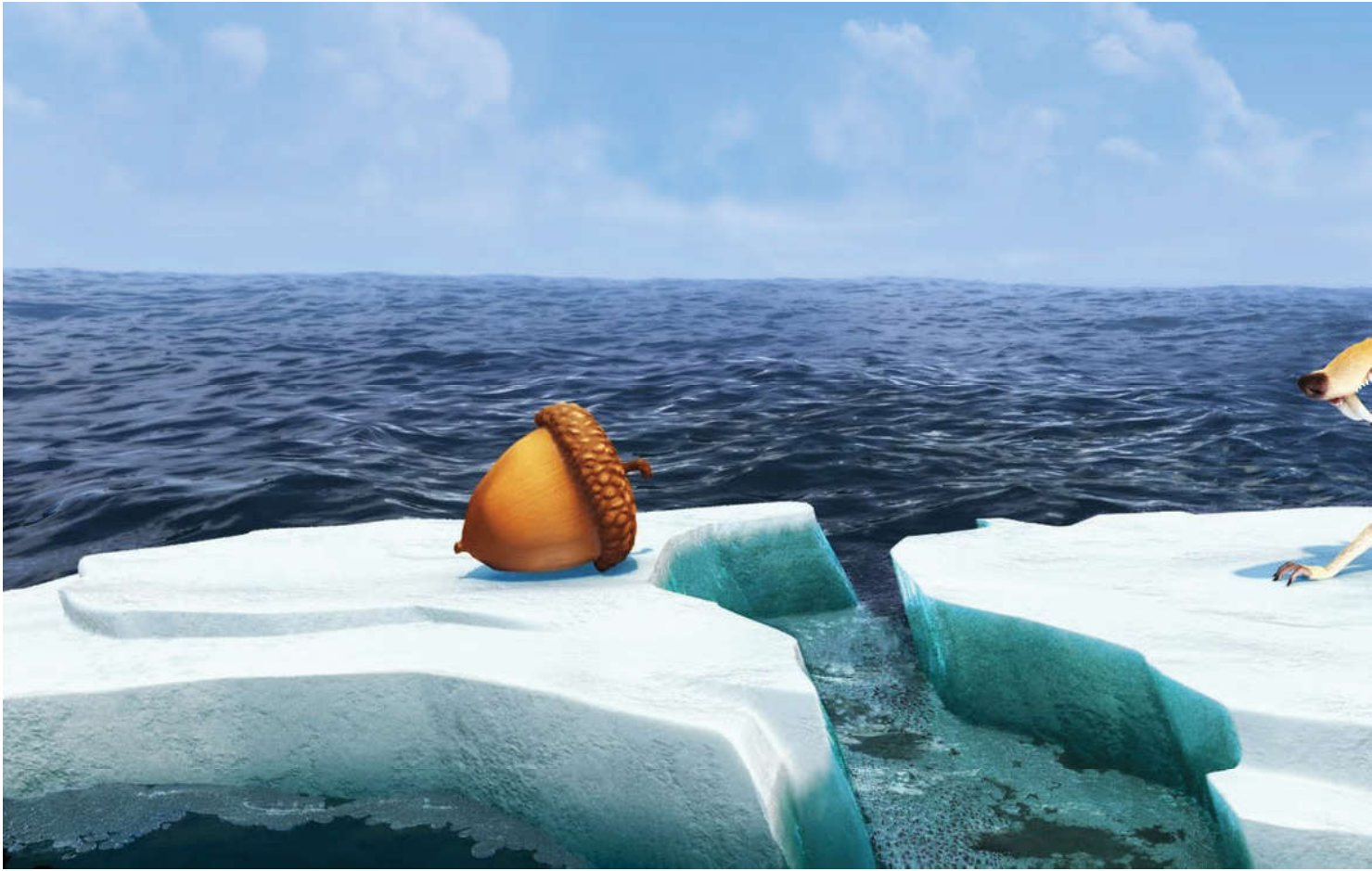


*A 30 Year View*

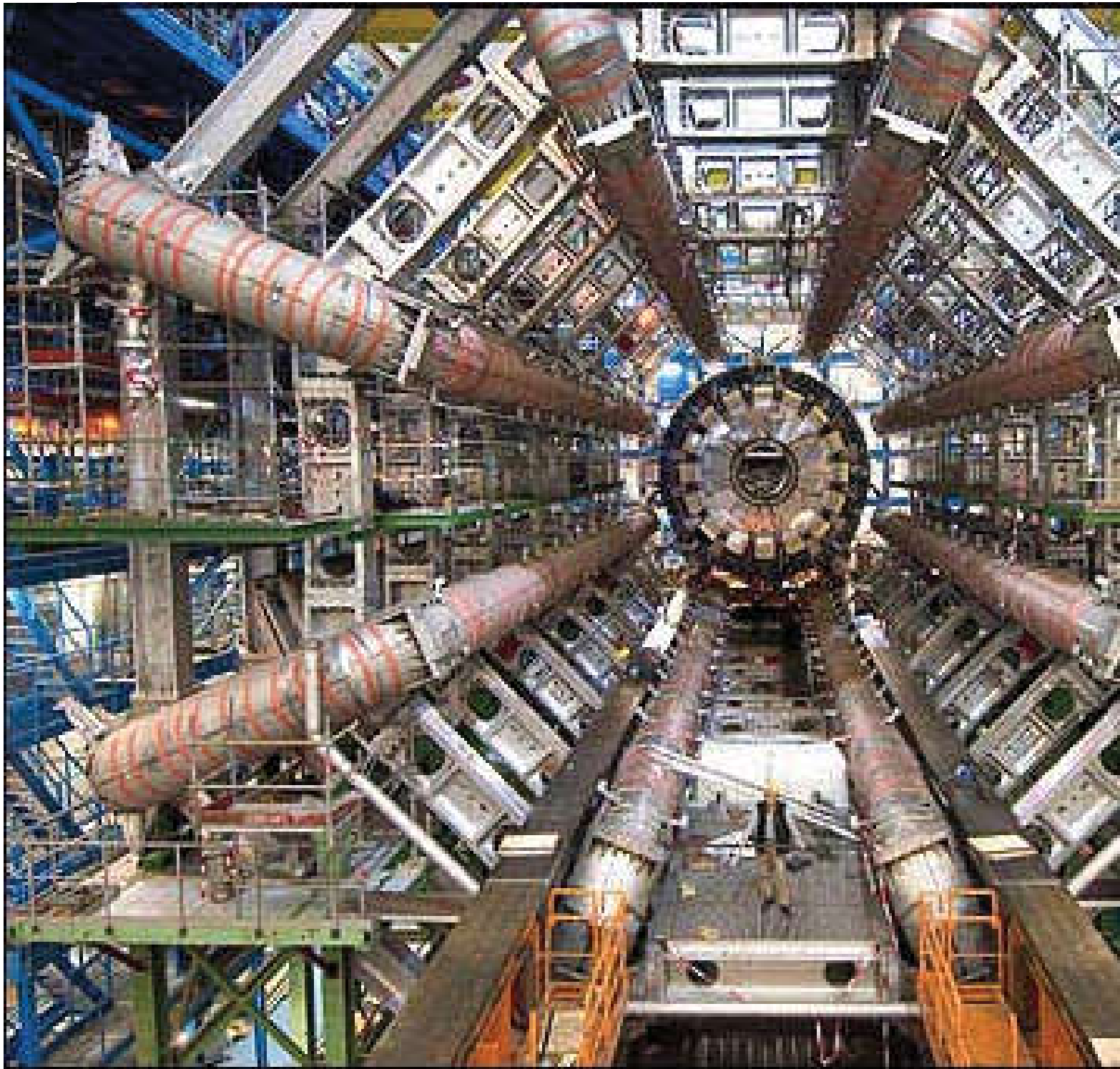


Bruce Bassett

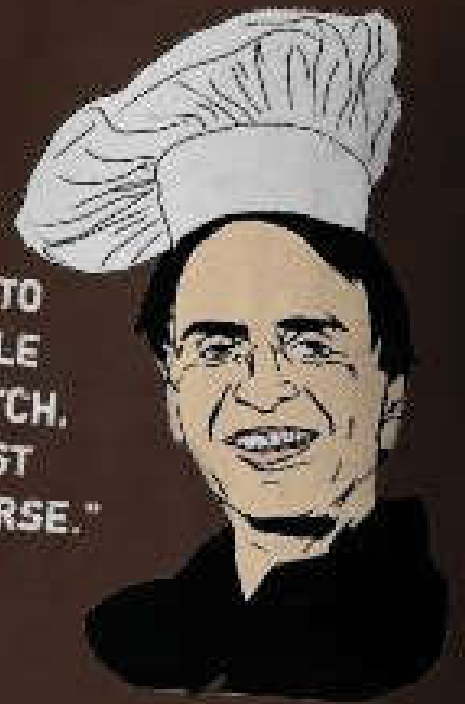
AIMS, SAAO and UCT

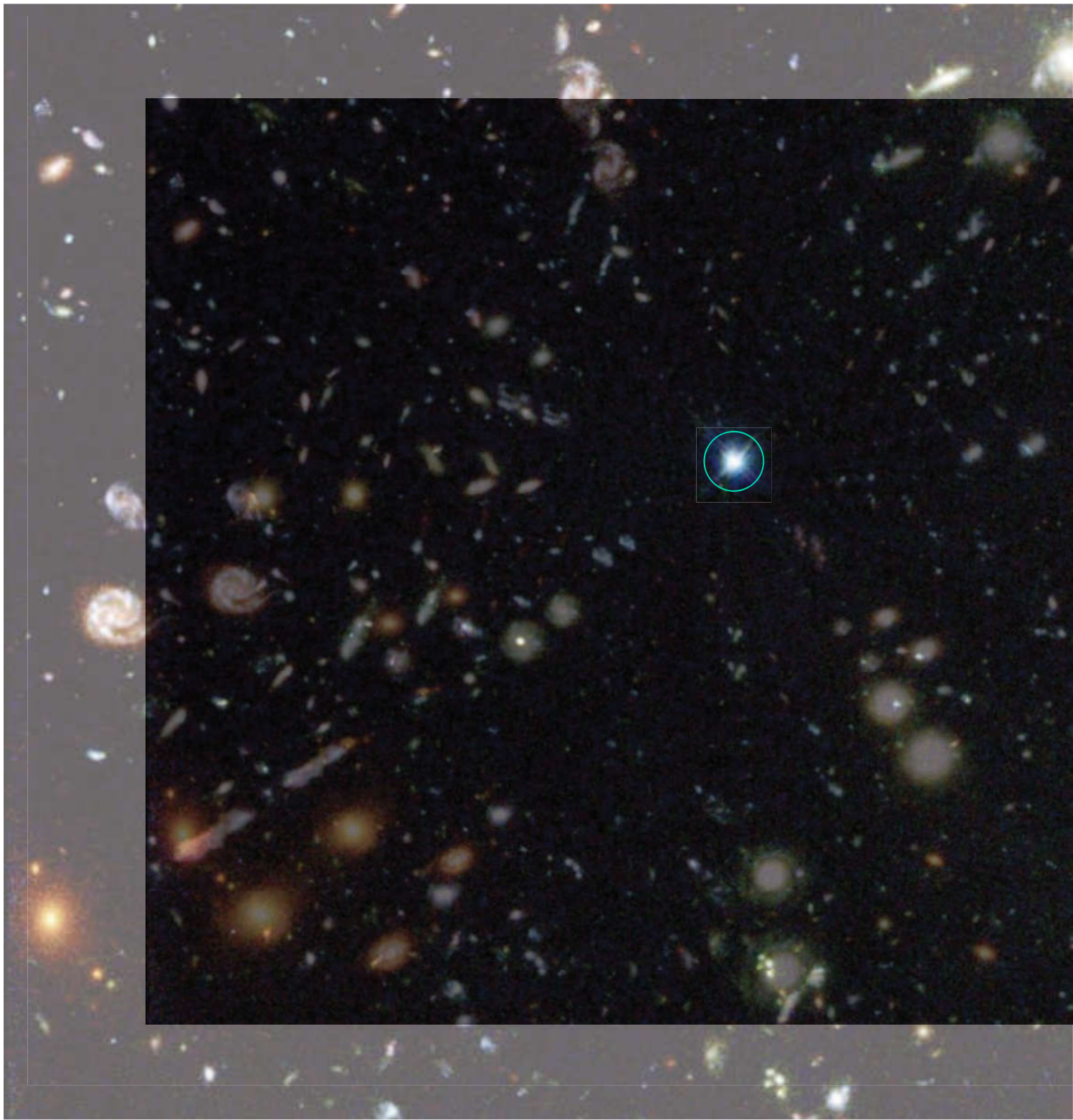


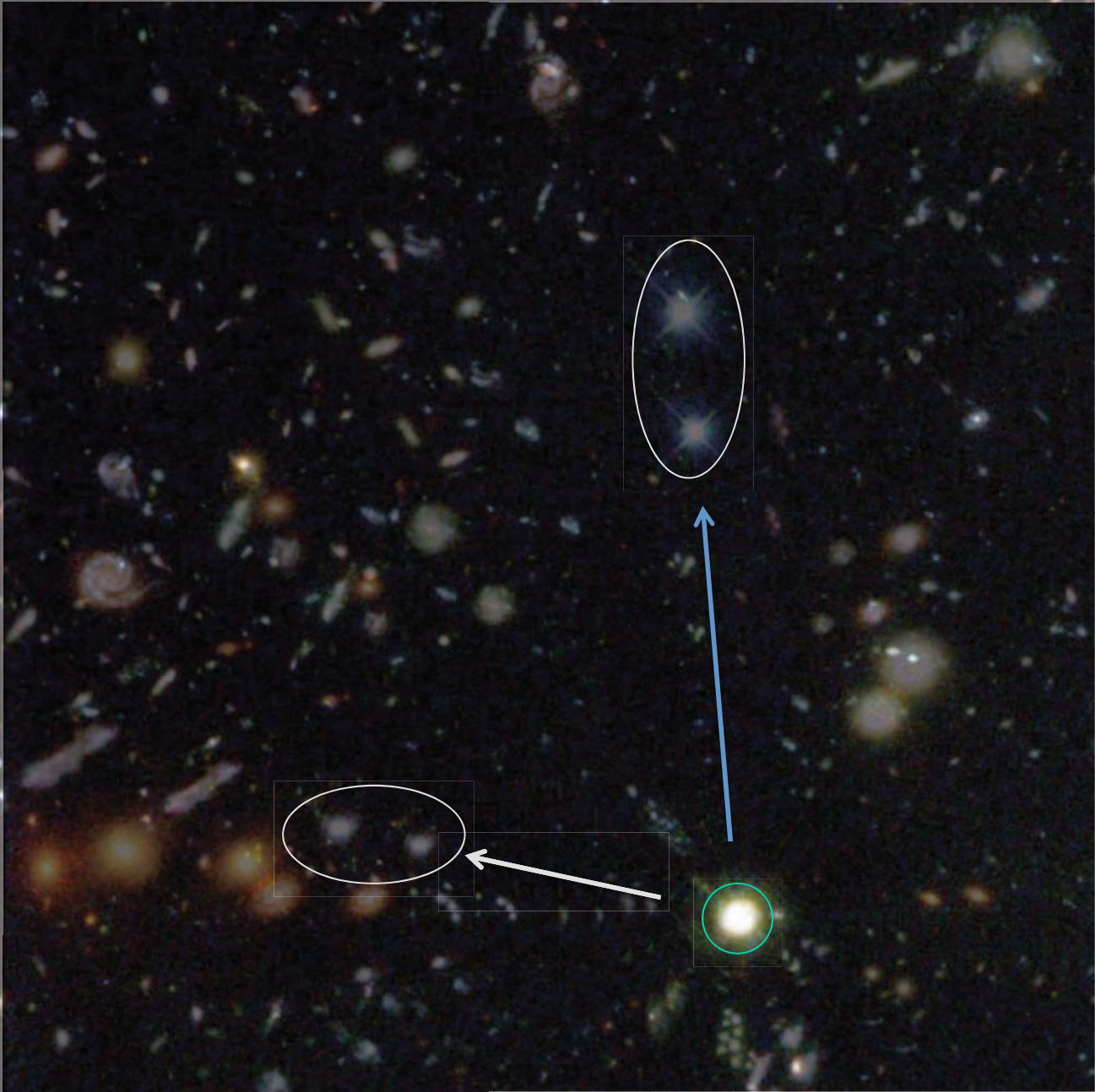
“Hi, Are you a beauty school?  
Because I would like to find out  
more about your beauty course”



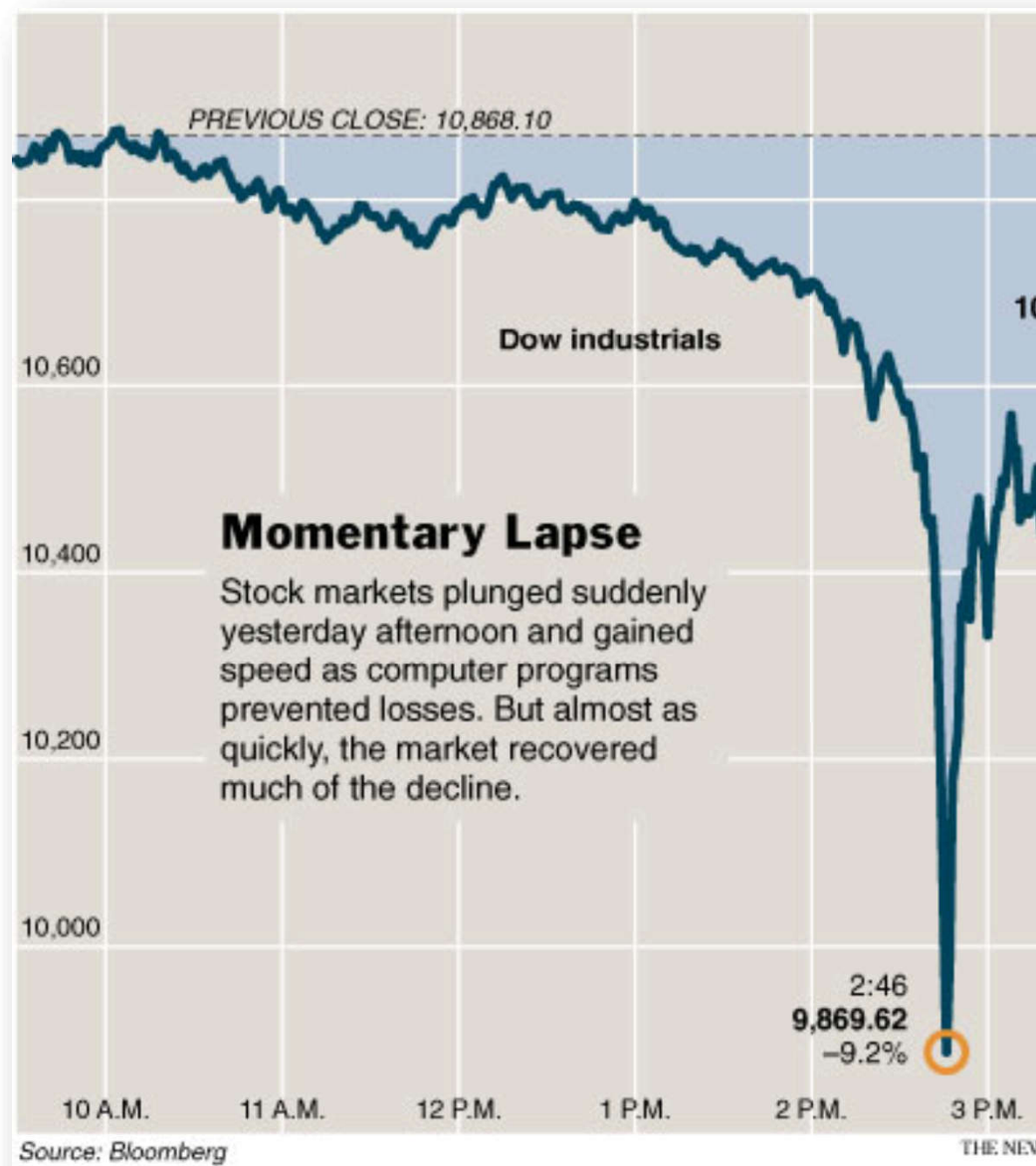
**"IF YOU WISH TO  
MAKE AN APPLE  
PIE FROM SCRATCH,  
YOU MUST FIRST  
INVENT THE UNIVERSE."  
CARL SAGAN**







# The Flash Crash of 2015

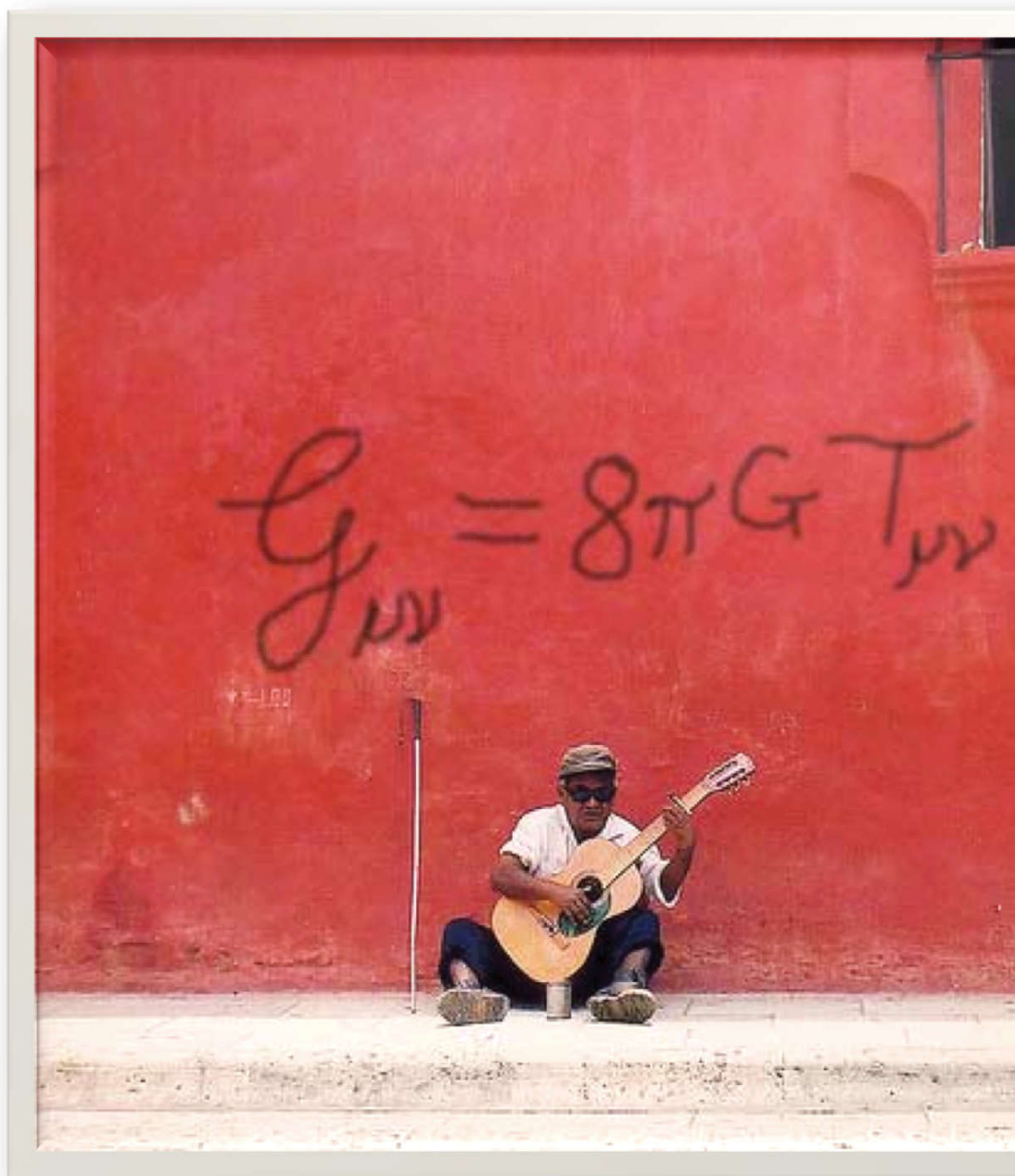


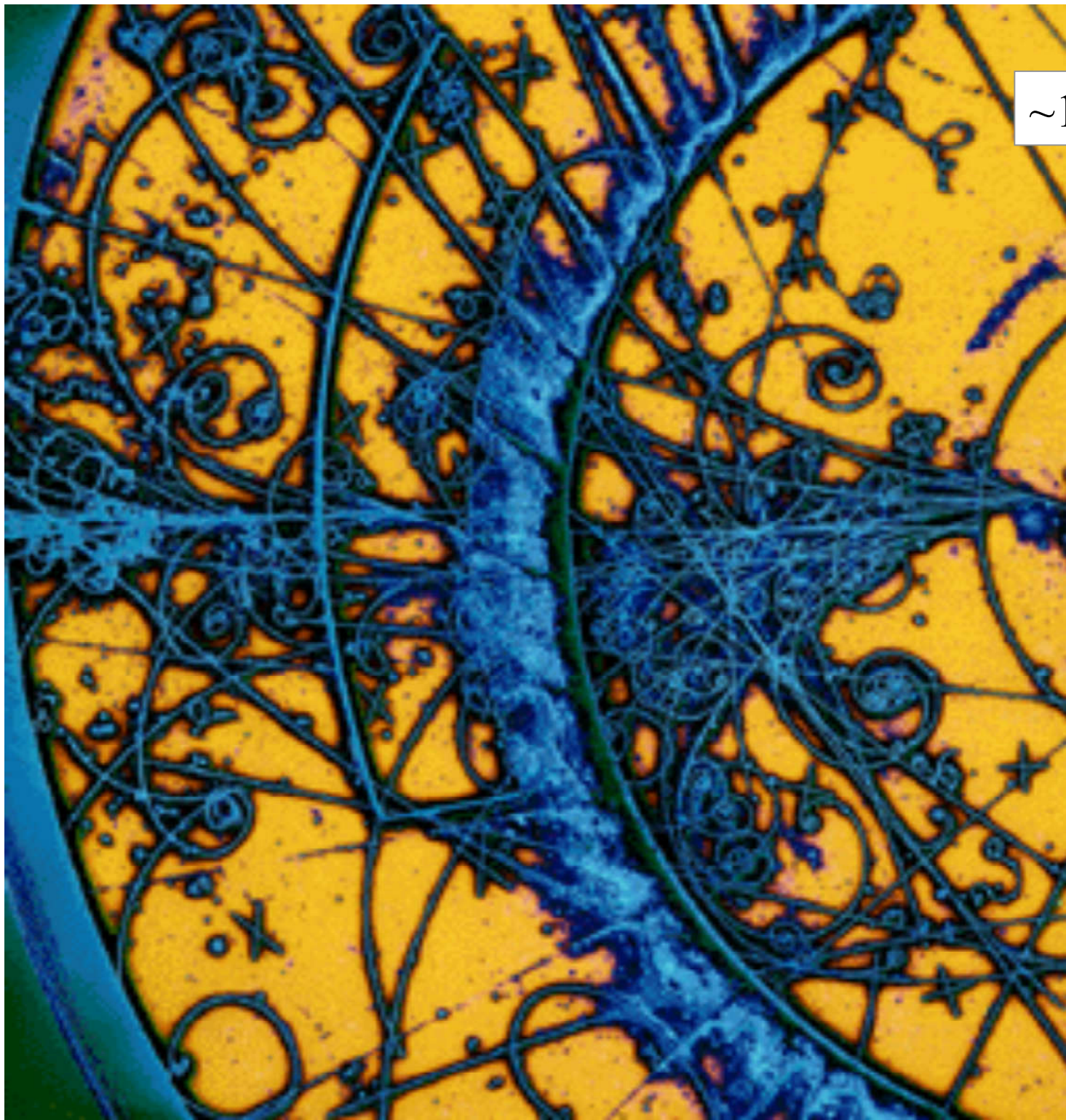
# What is cosmology?

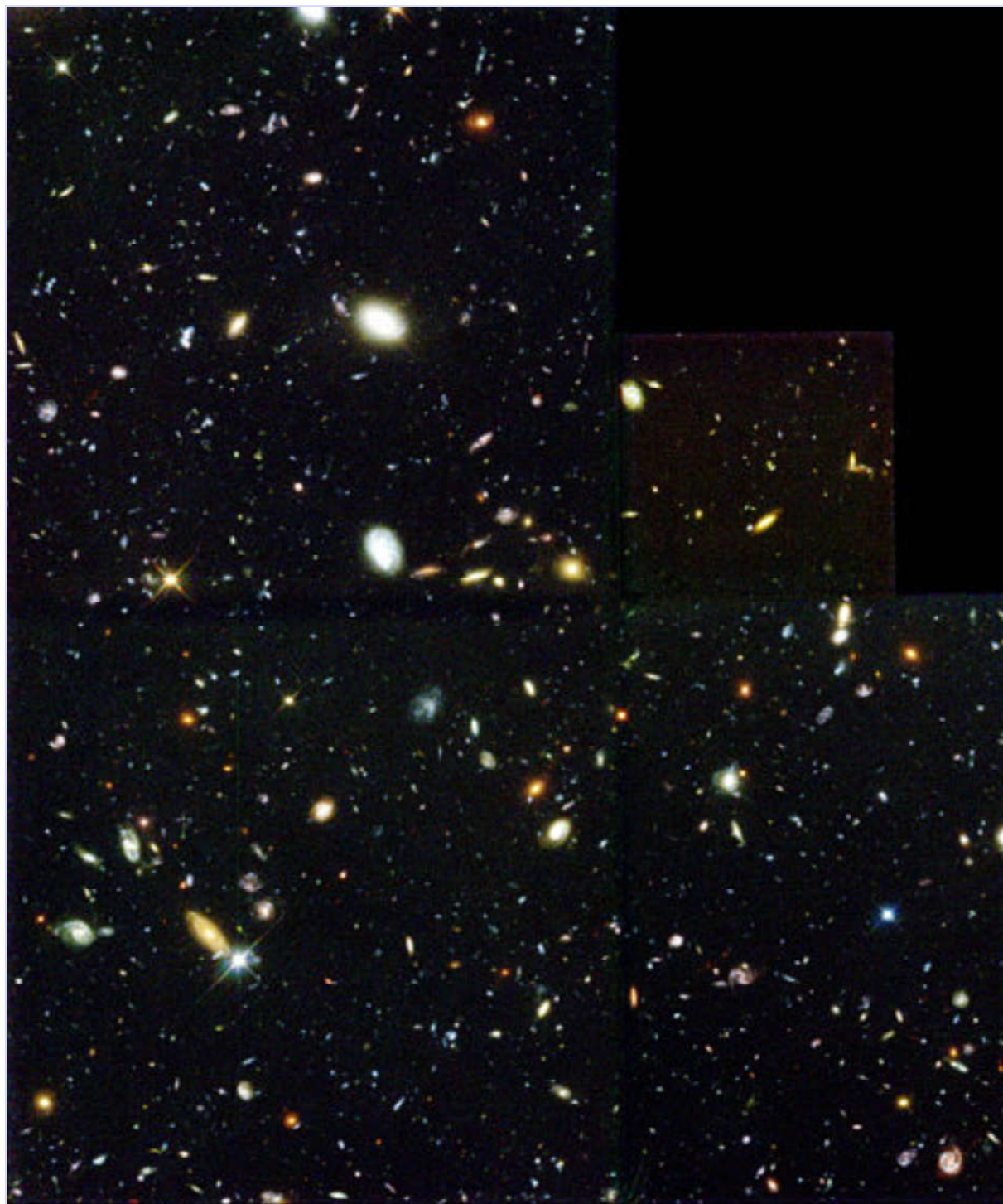


*The evolution of the world  
can be compared to  
fireworks that has just  
few **red wisps, ash**  
Standing on a cooled  
the slow fading of the  
try to recall the vanishing  
of the origin*









**Hubble Deep Field**

ST ScI OPO January 11, 1996 R. Williams and the HDF Team (ST ScI) and NASA

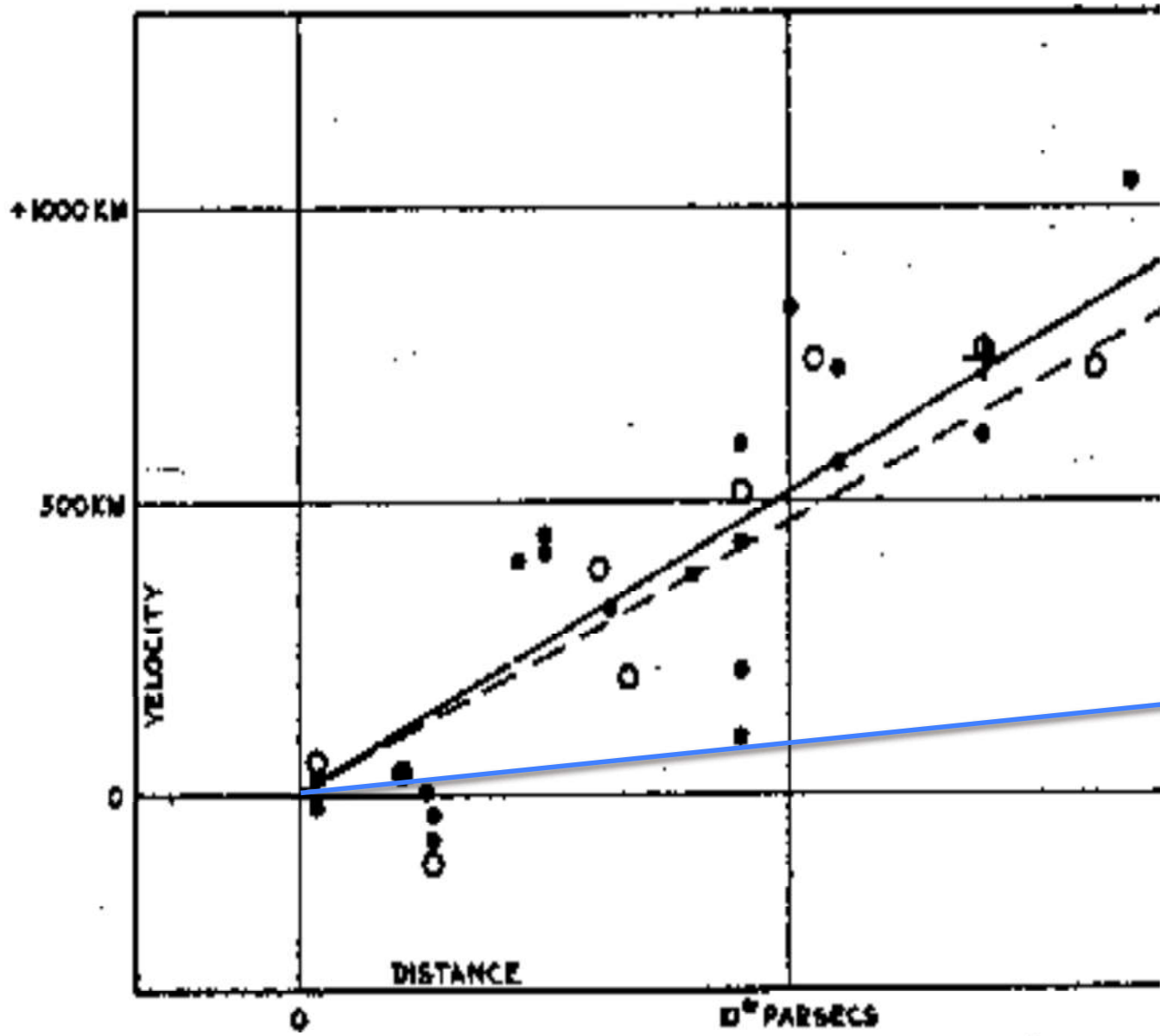
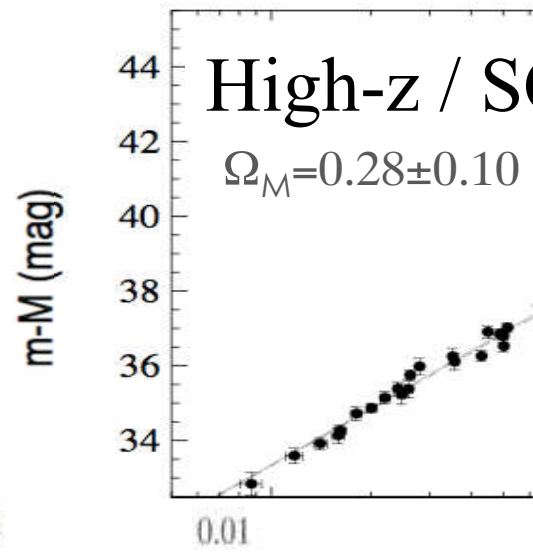
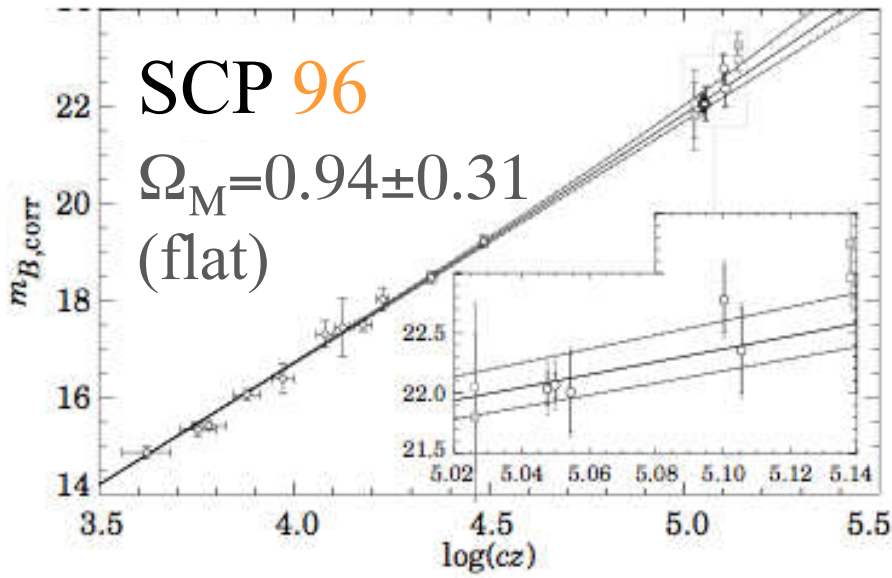
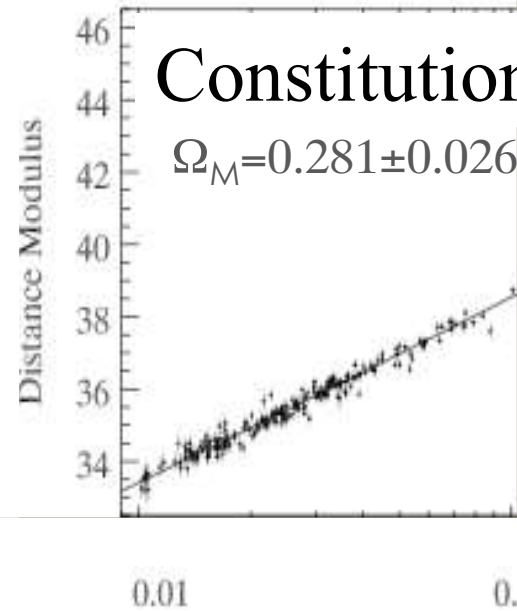
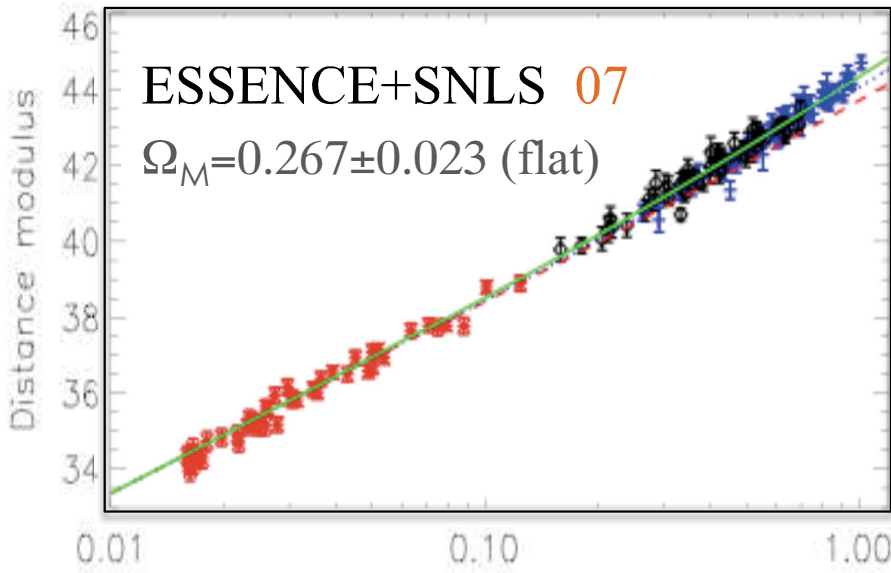


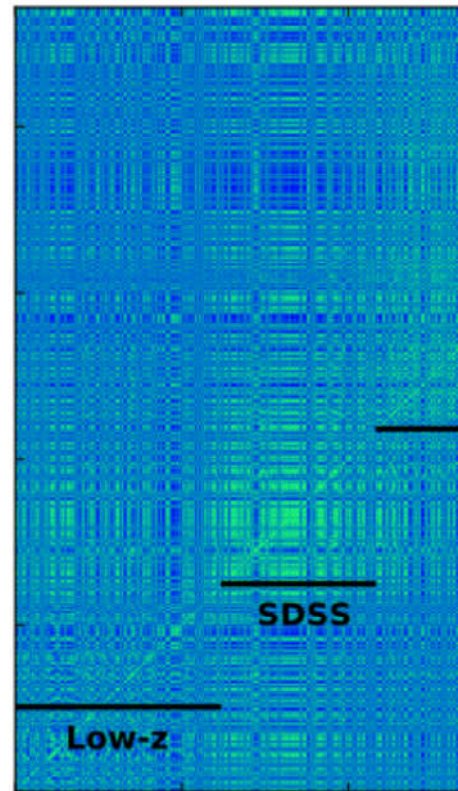
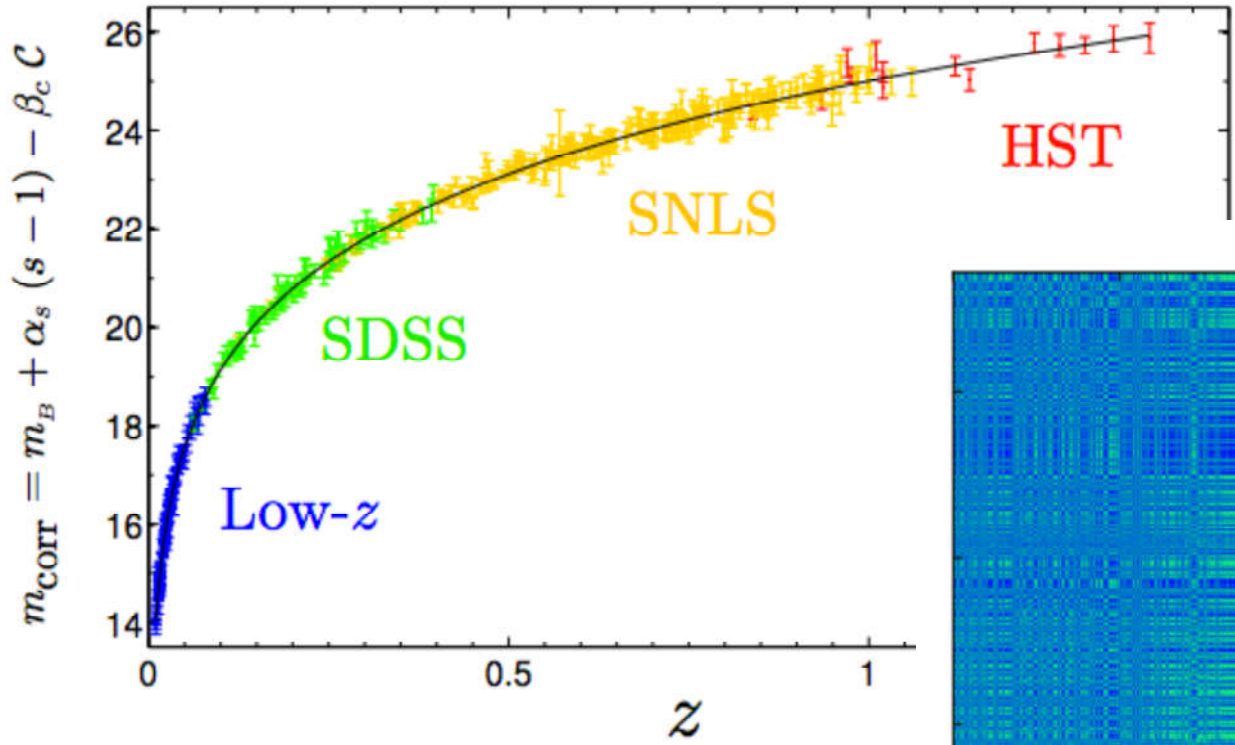
FIGURE 1



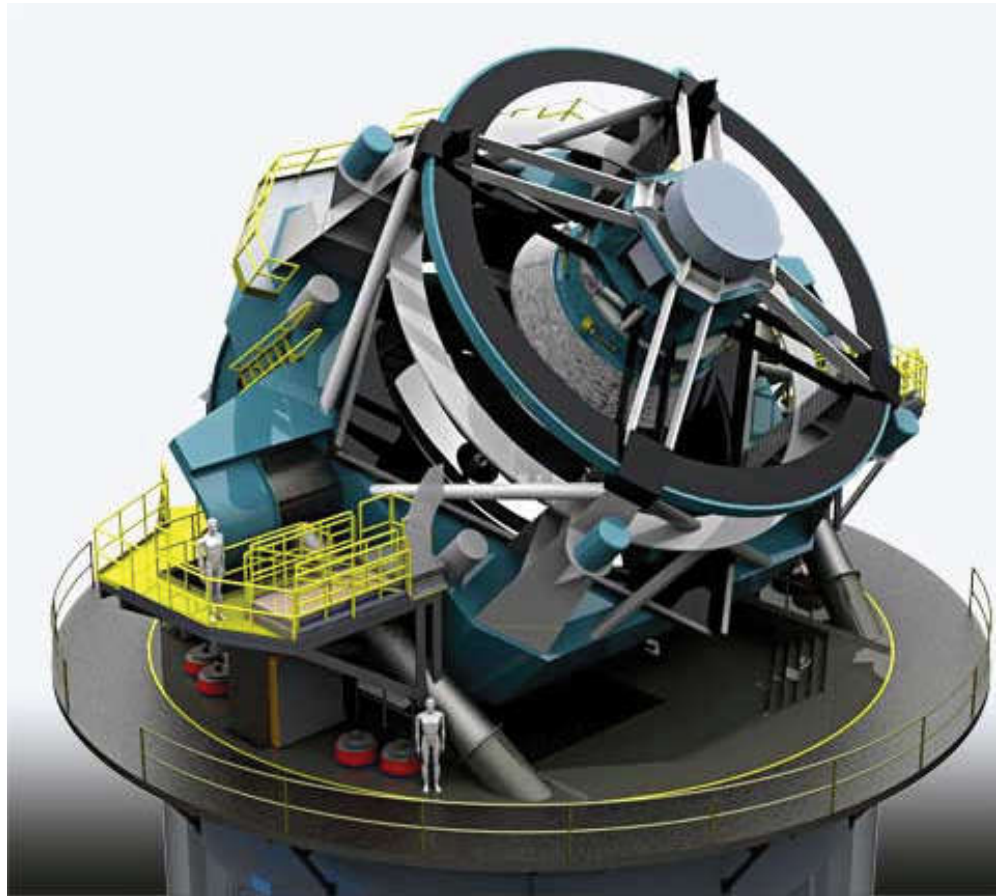
## Evolution of the Hubble Diagram 19



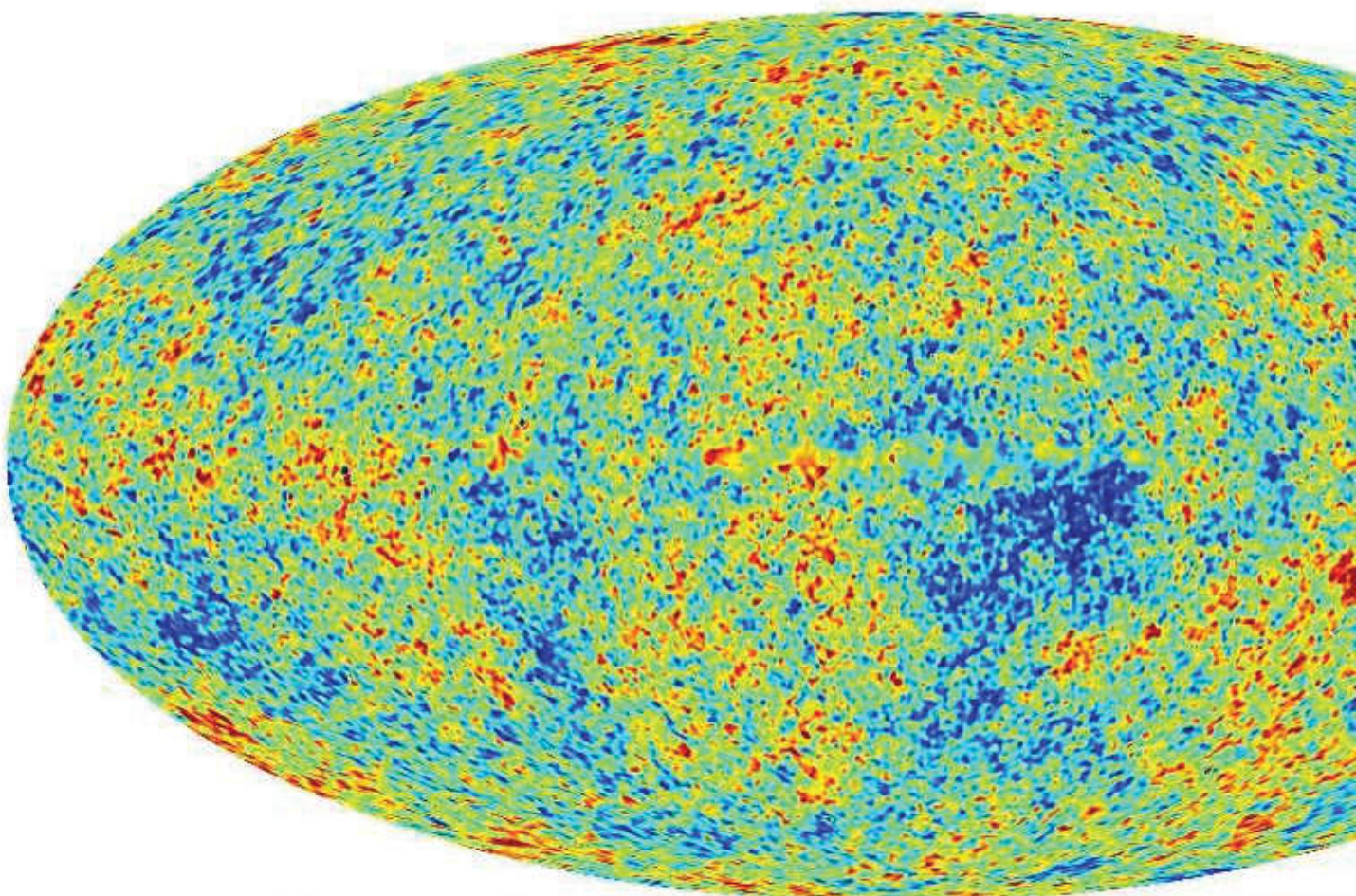
# Today



# The Large Synoptic Survey Telescope (LSST, 2020)

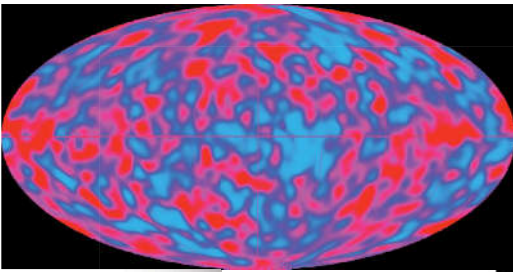


The “40 moons Telescope”



W





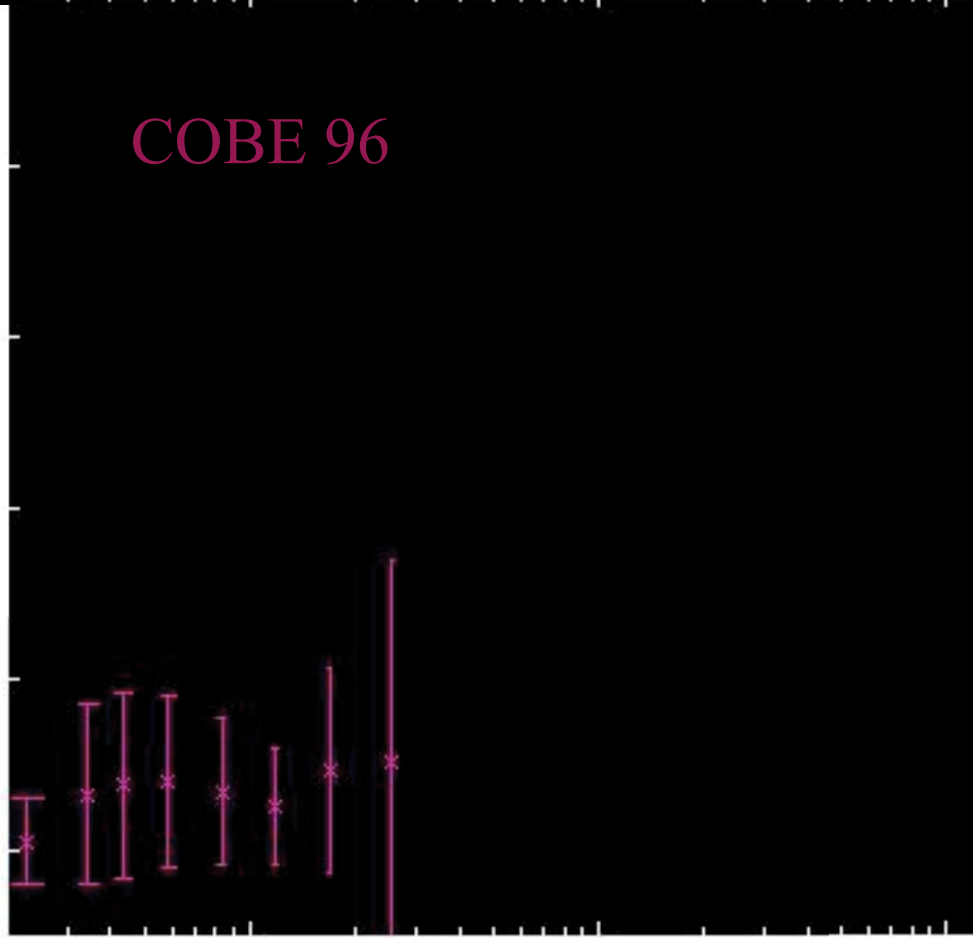
# THE CMB

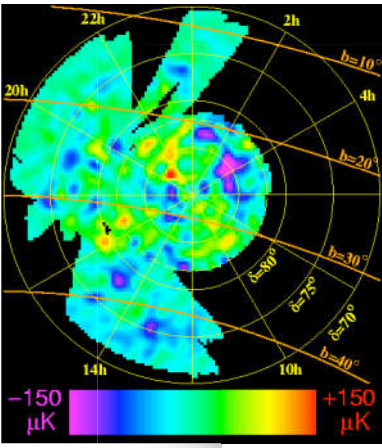
$l(l+1) C_l$

COBE 96

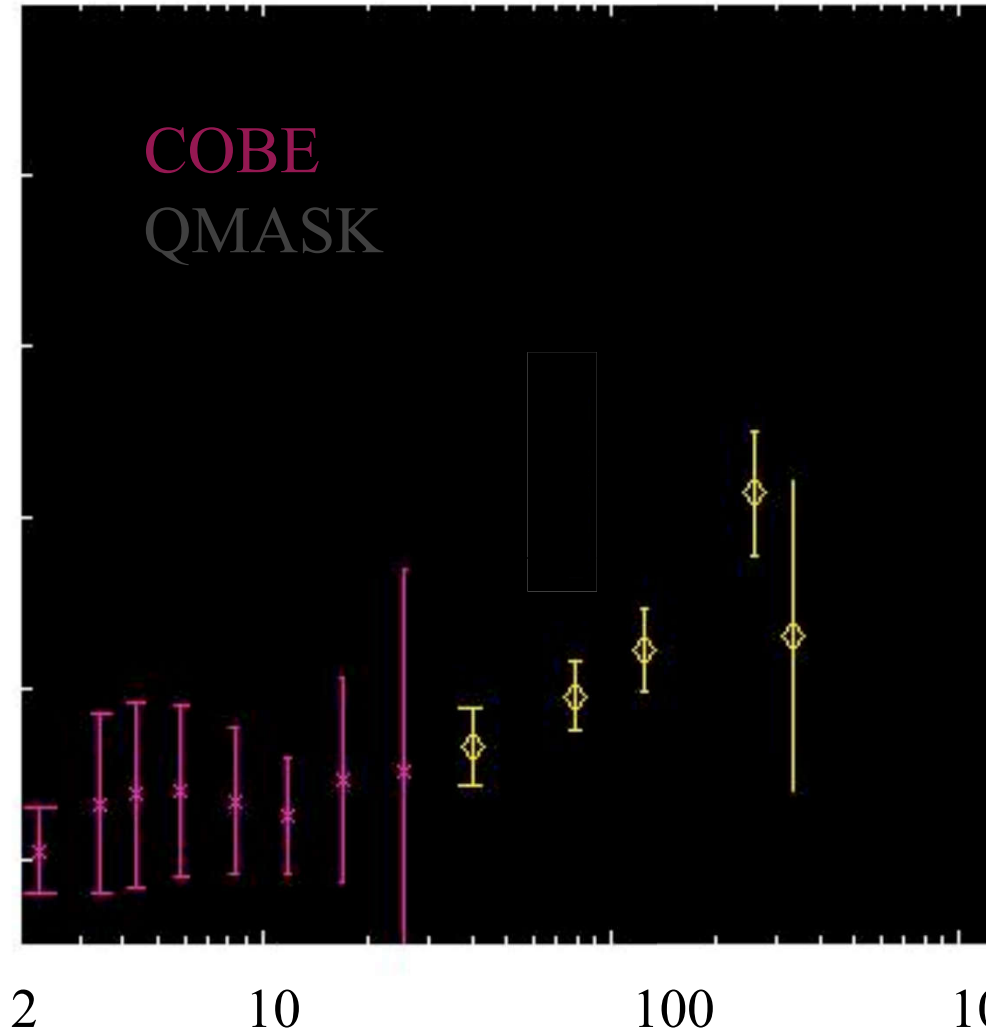
2 10 100 1000

$l$



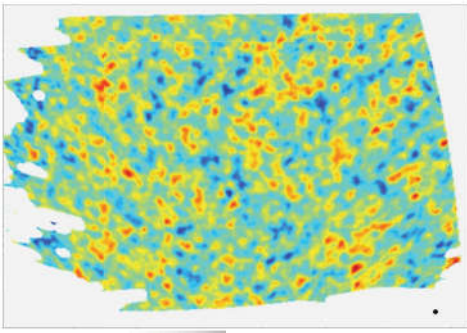


$l(l+1) C_l$

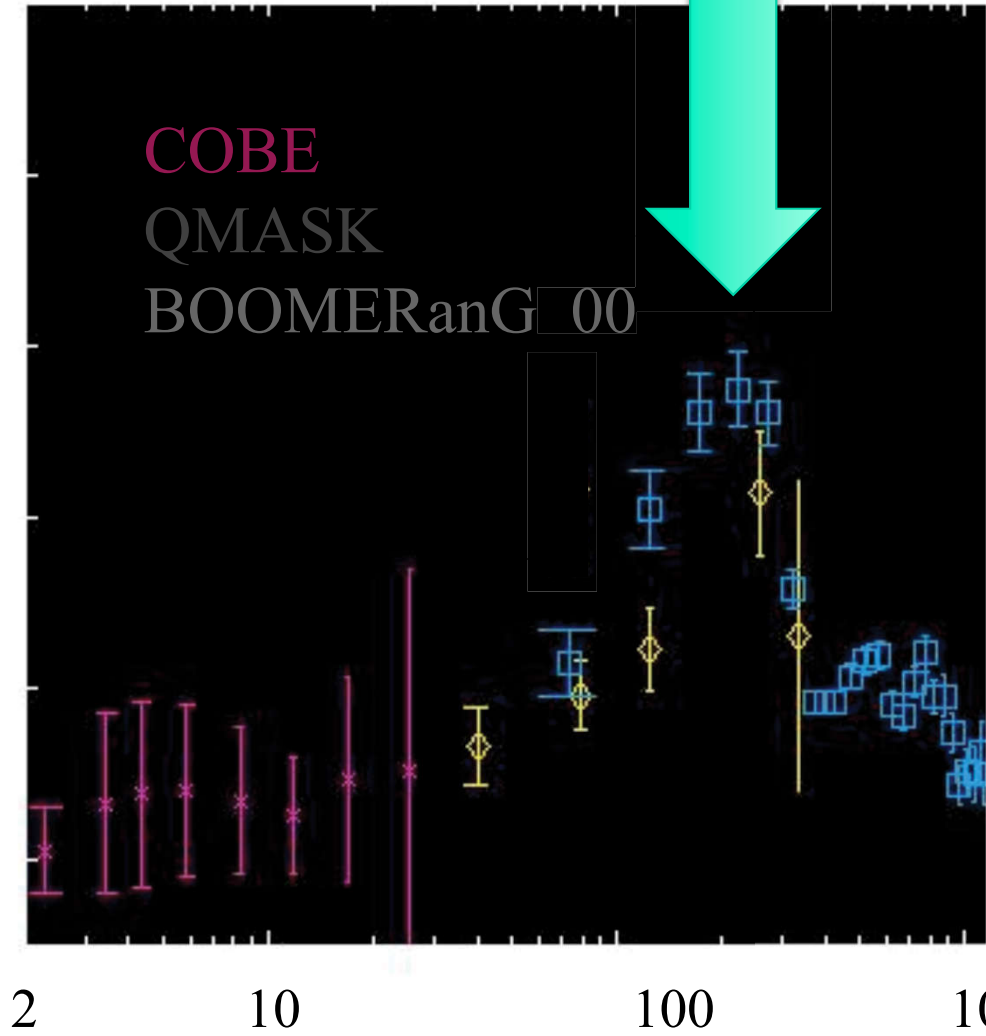


$l$

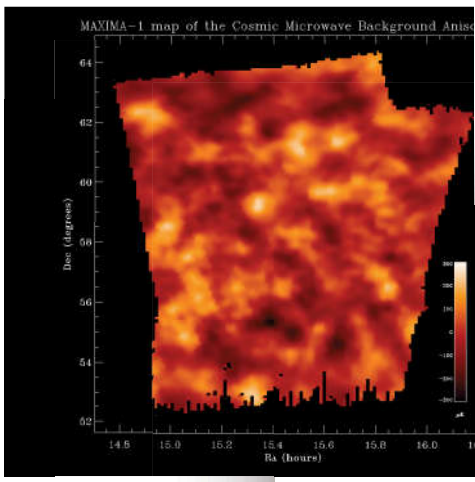
-300  $\mu\text{K}$  -200 -100 0 100 200 300  $\mu\text{K}$



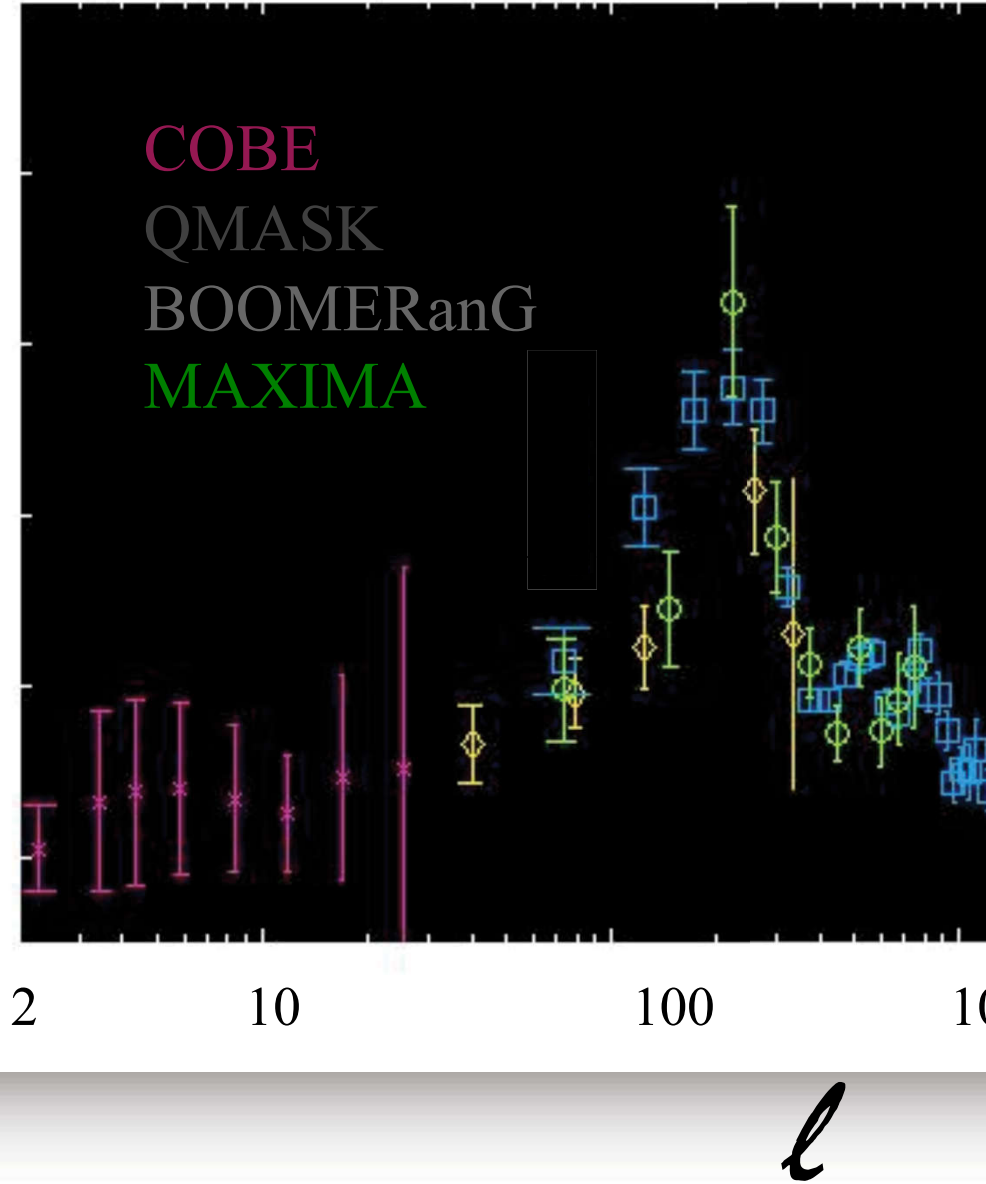
$l(l+1) C_l$

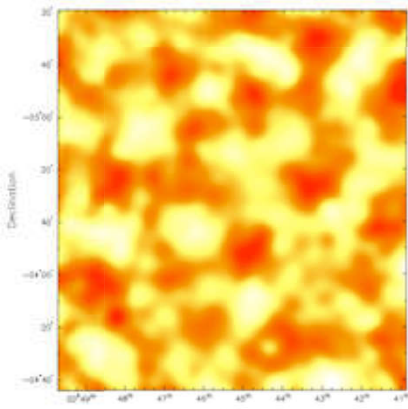


$l$

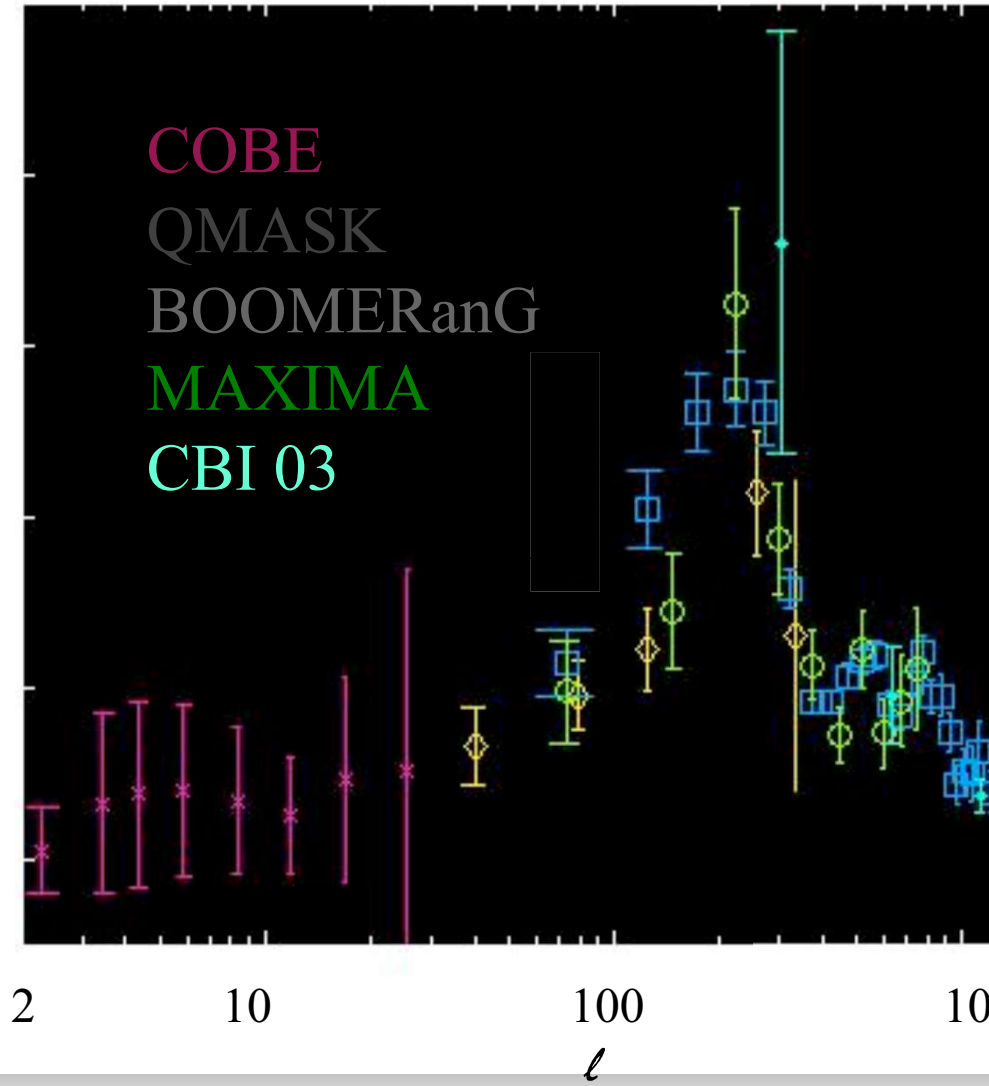


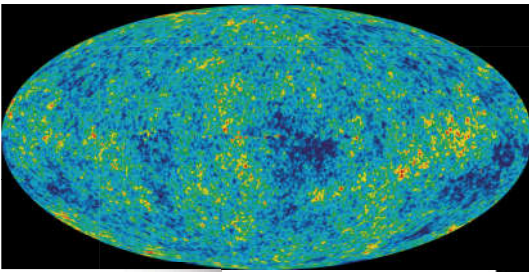
$l(l+1)C_l$



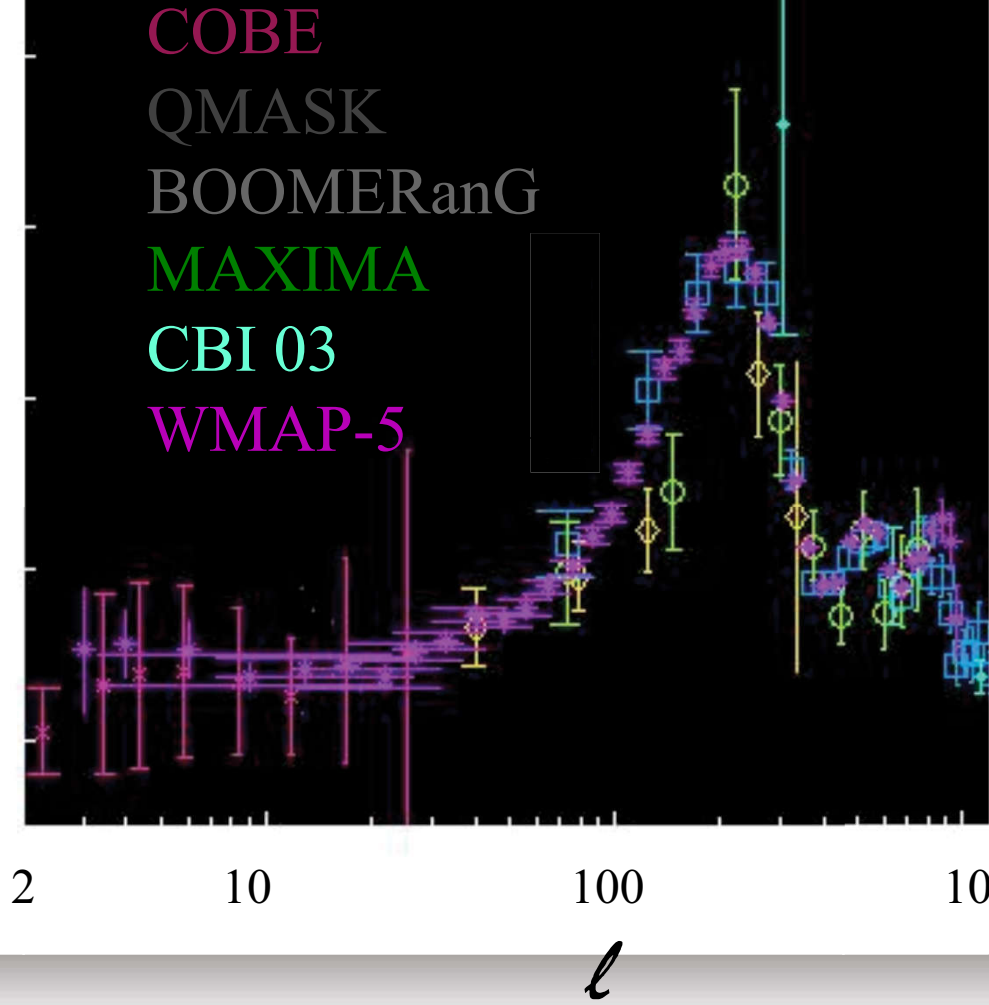


$$l(l+1) C_l$$





$l(l+1) C_l$



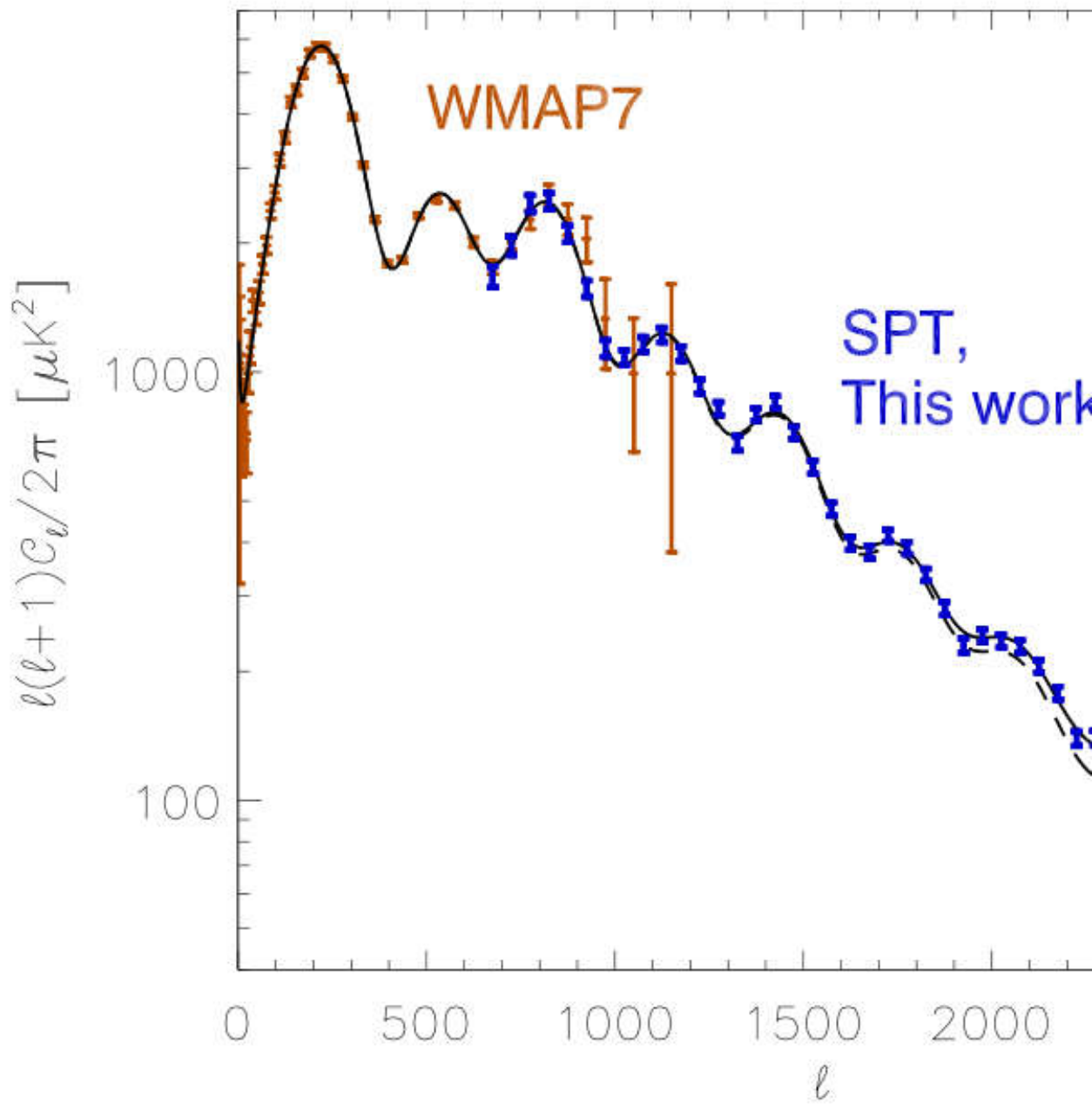


FIG. 5.— The SPT bandpowers, WMAP bandpowers, and best-fit  $\Lambda\text{CDM}$  theory spectrum.