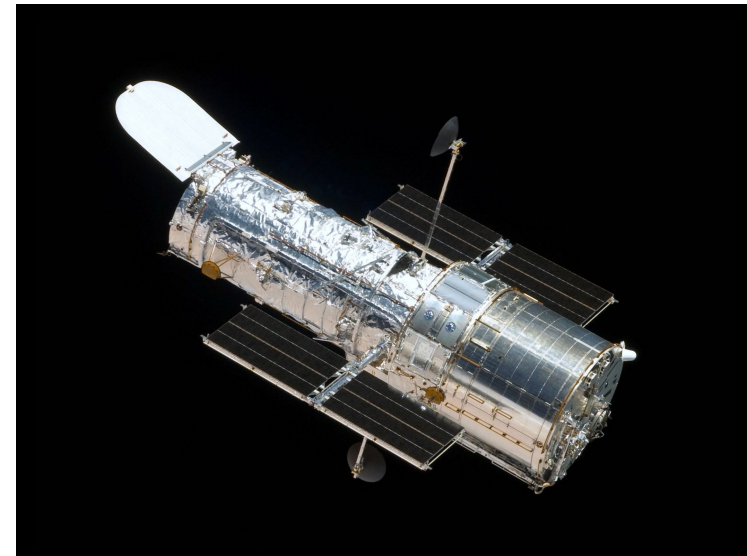
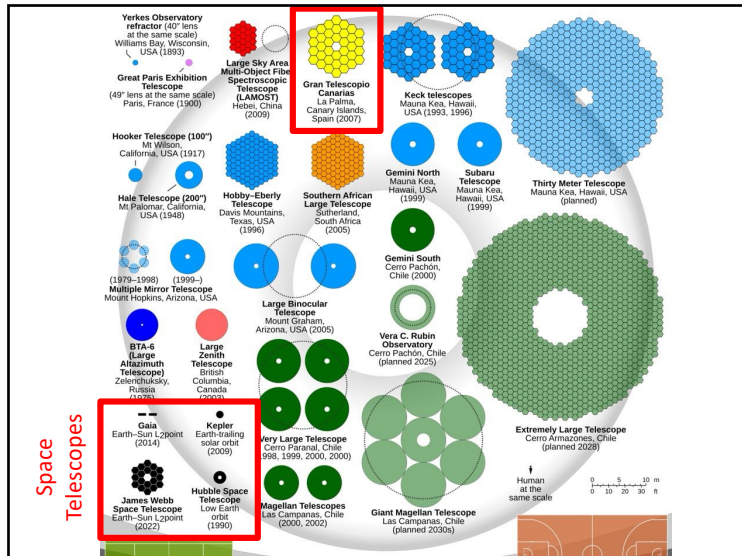
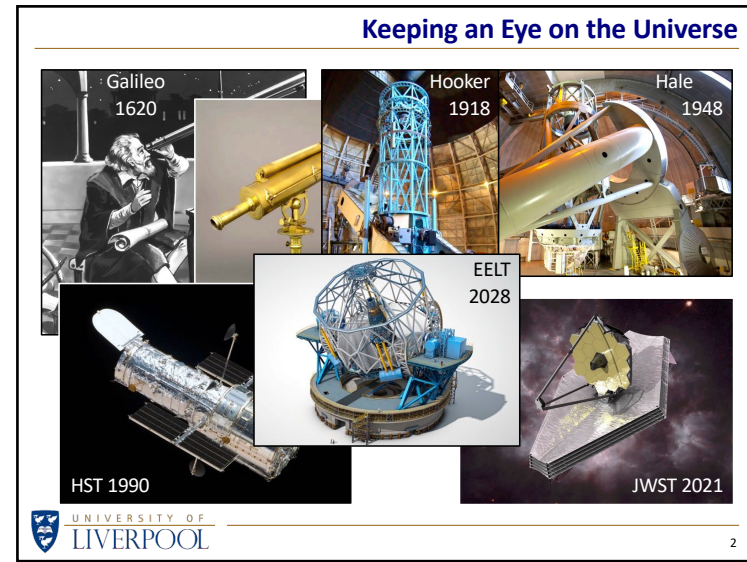
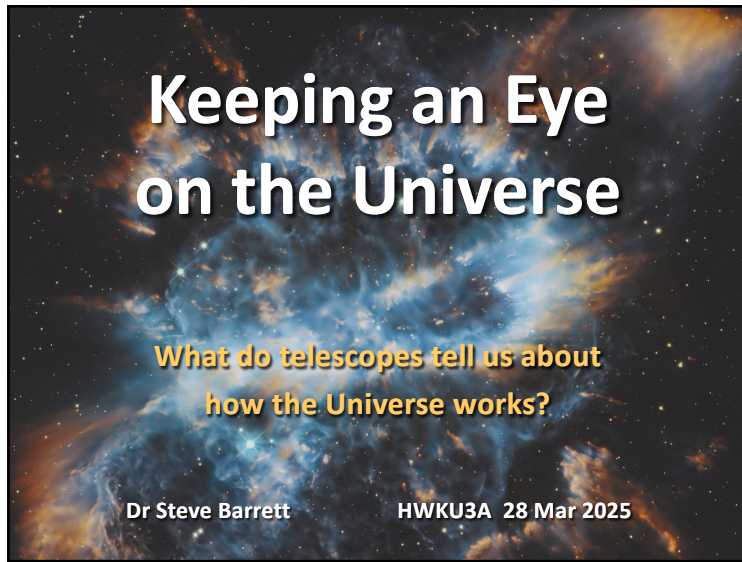
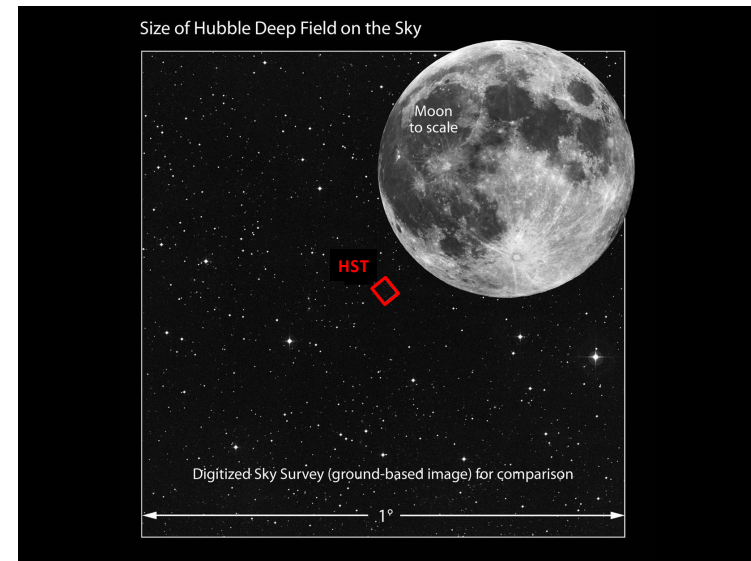
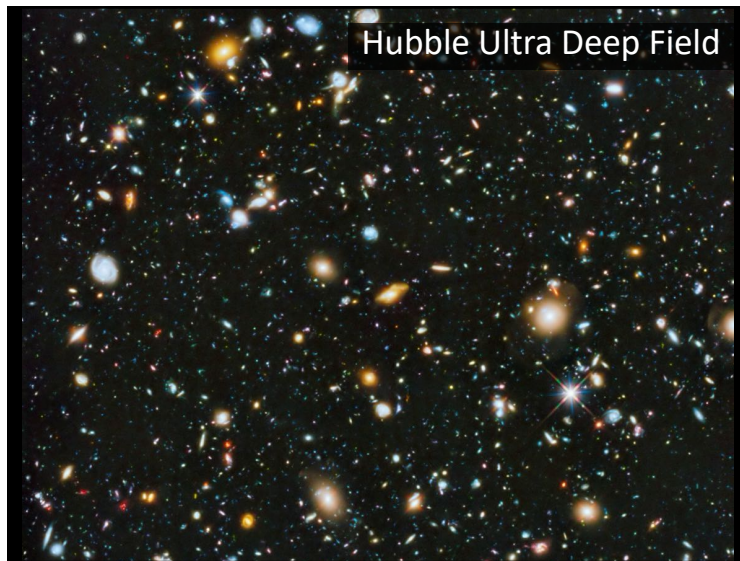


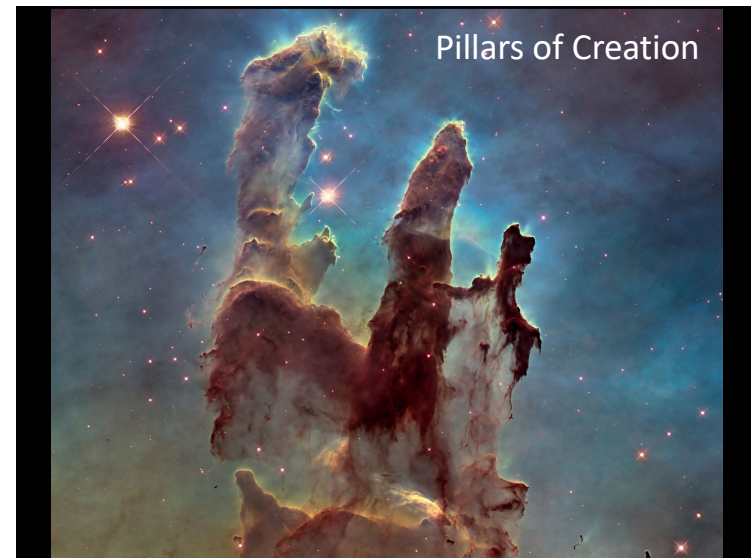
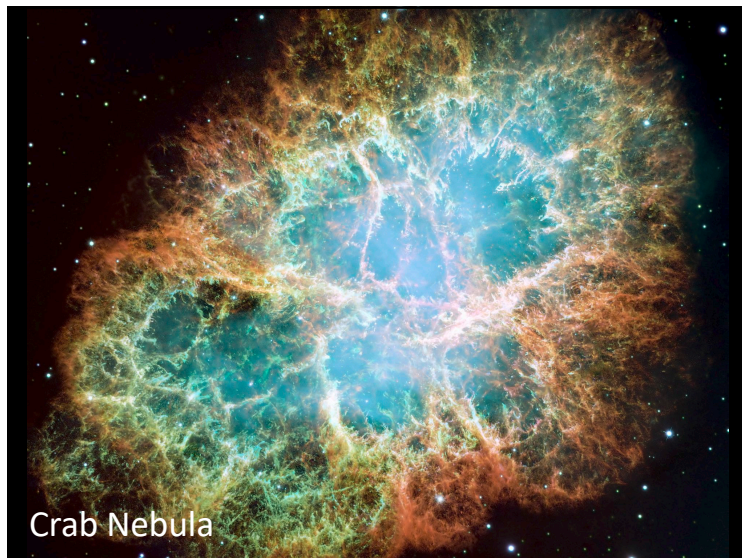
Keeping an Eye on the Universe



Keeping an Eye on the Universe

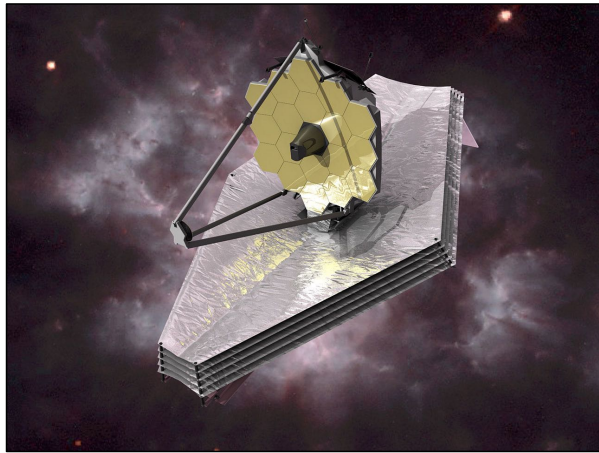


Keeping an Eye on the Universe

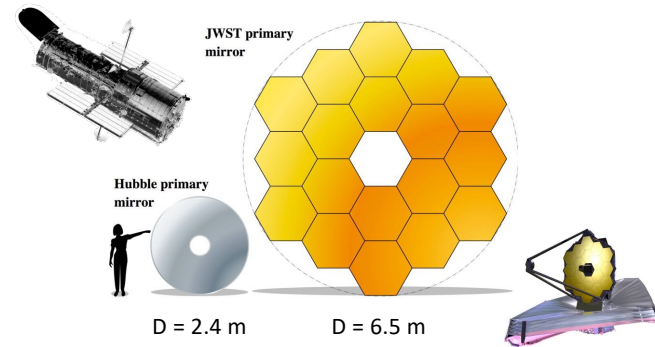


Keeping an Eye on the Universe

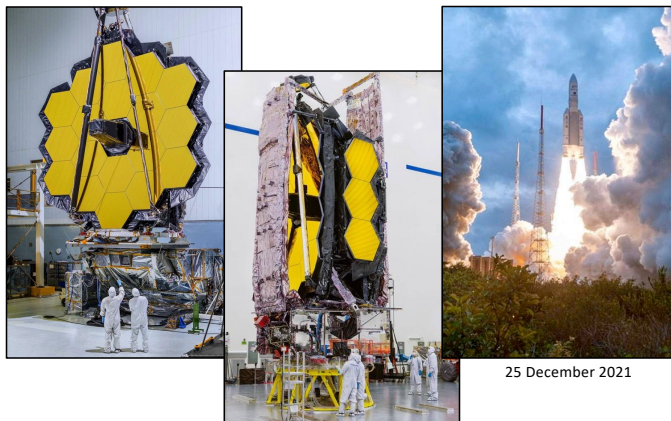
James Webb Space Telescope



James Webb Space Telescope

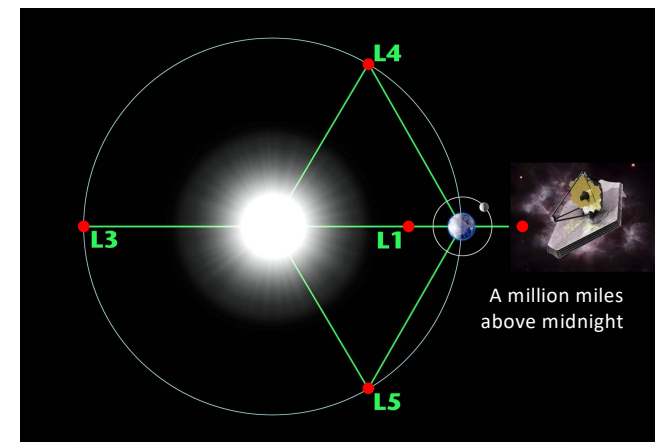


JWST Launch

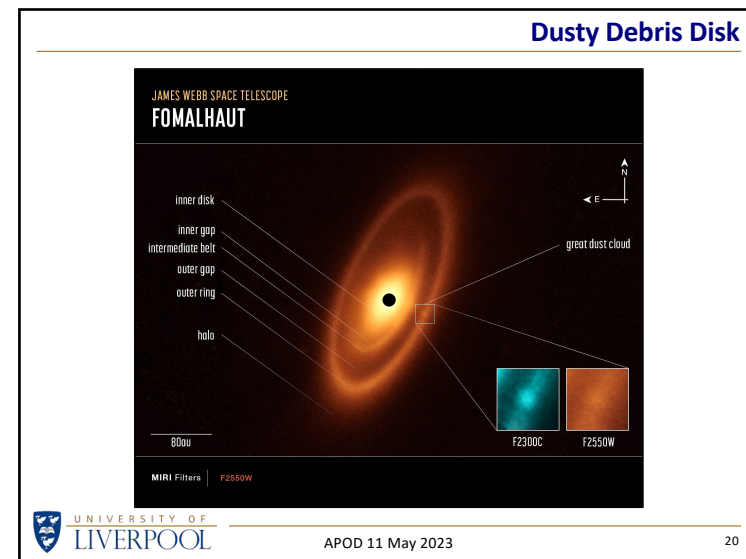
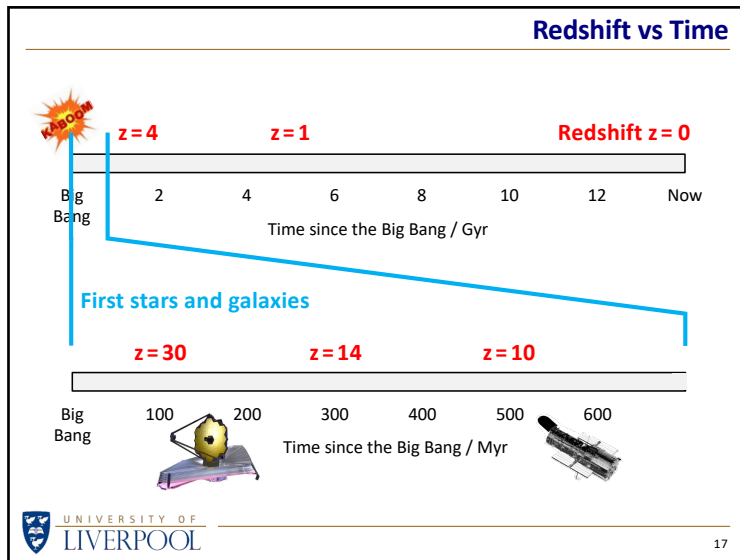


25 December 2021

Lagrange Point 2



Keeping an Eye on the Universe

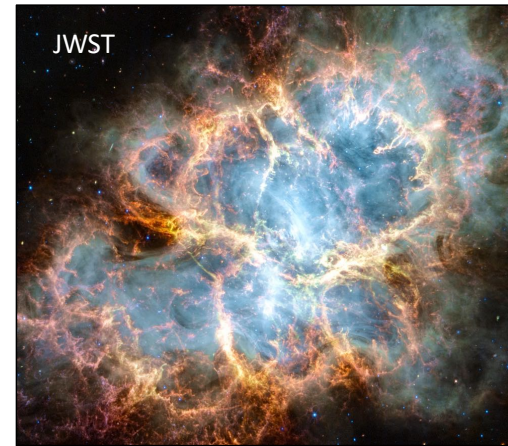


Keeping an Eye on the Universe

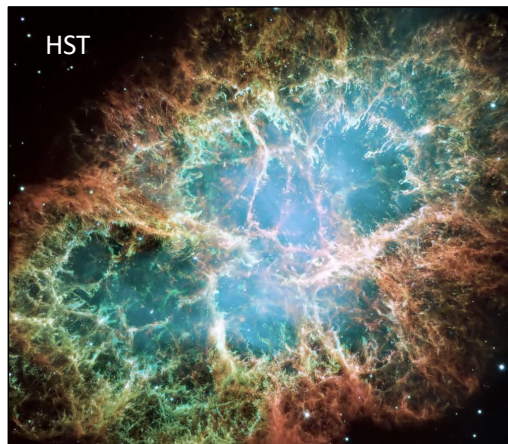
Pandora's Cluster of Galaxies



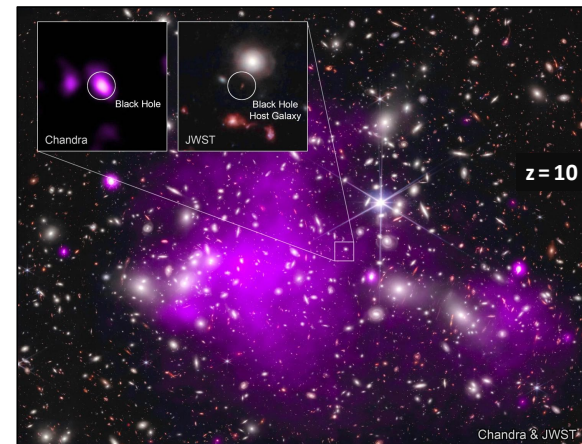
Crab Nebula



Crab Nebula



First Supermassive Black Hole

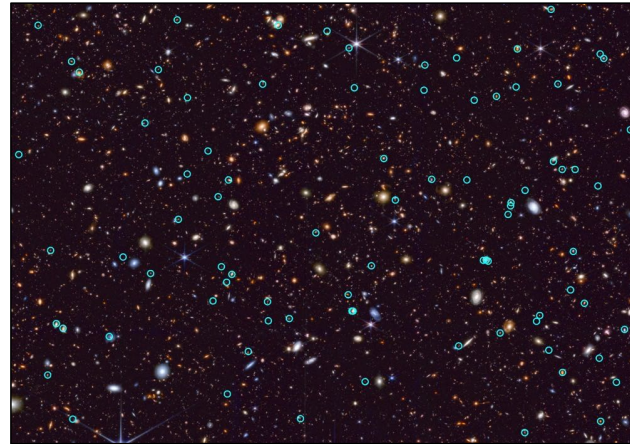


Keeping an Eye on the Universe

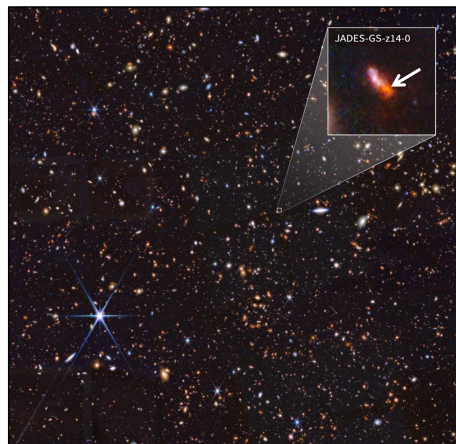
Protostellar Outflows



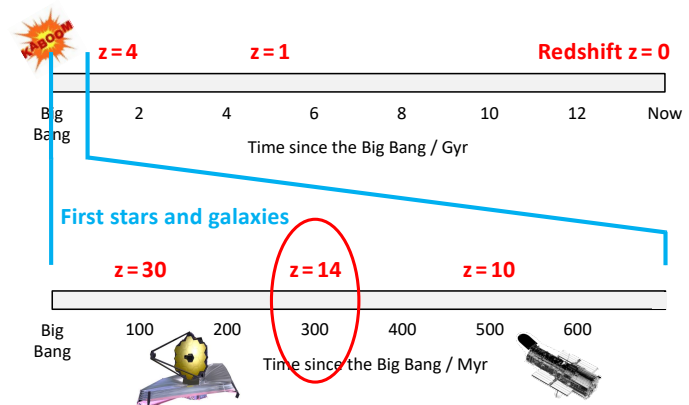
Supernova Science



Most Distant Galaxy



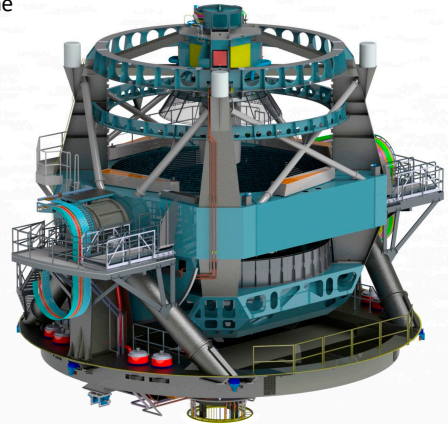
Redshift vs Time



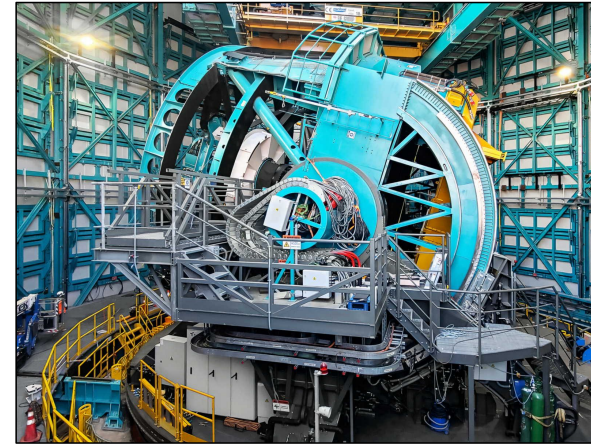
Keeping an Eye on the Universe

Large Synoptic Survey Telescope

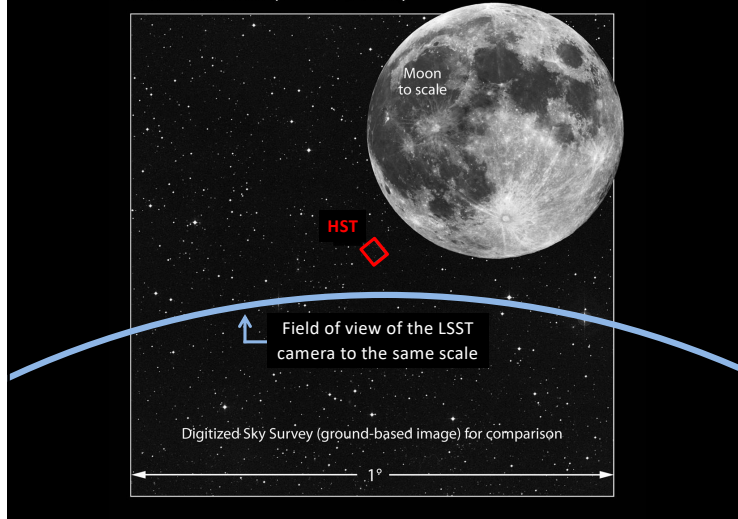
Renamed the
Simonyi
Survey
Telescope



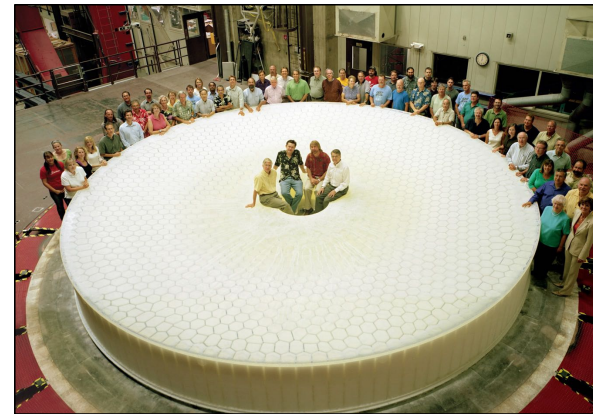
Under Construction



Size of Hubble Deep Field on the Sky



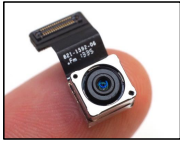
LSST Primary Mirror



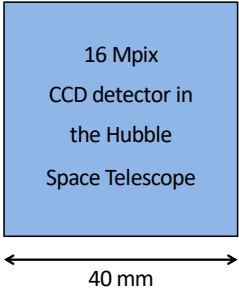
Keeping an Eye on the Universe

Camera CCD

Camera module from a mobile phone



... and at the same scale



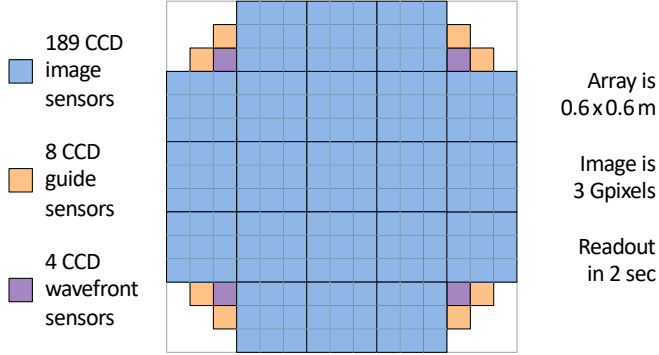
16 Mpix
CCD detector in
the Hubble
Space Telescope

40 mm

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LSST Camera CCD



189 CCD
image
sensors

8 CCD
guide
sensors

4 CCD
wavefront
sensors

Array is
0.6x0.6 m

Image is
3 Gpixels

Readout
in 2 sec

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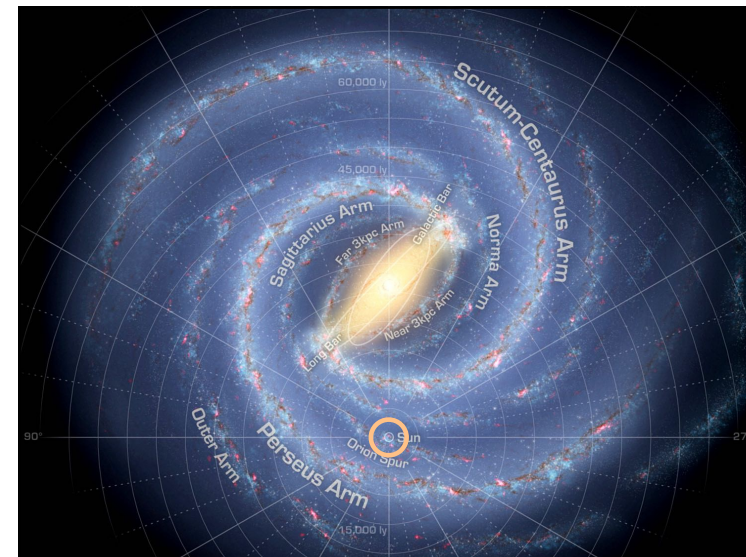
LSST Camera



This simulated image is about a Mpixel, or 0.03% of the full-sized image captured by the camera, and gives an idea of what can be expected to be seen in a single 15 sec exposure.

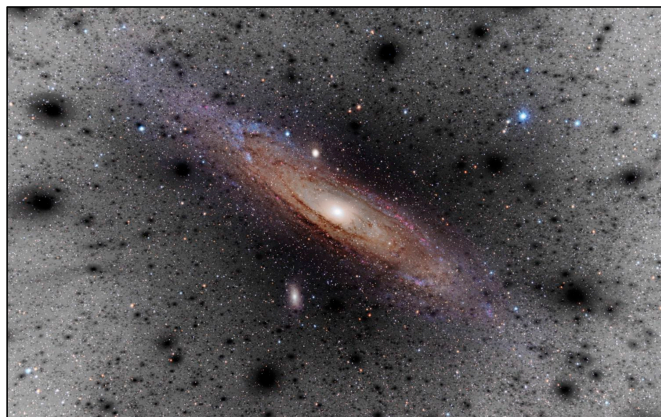
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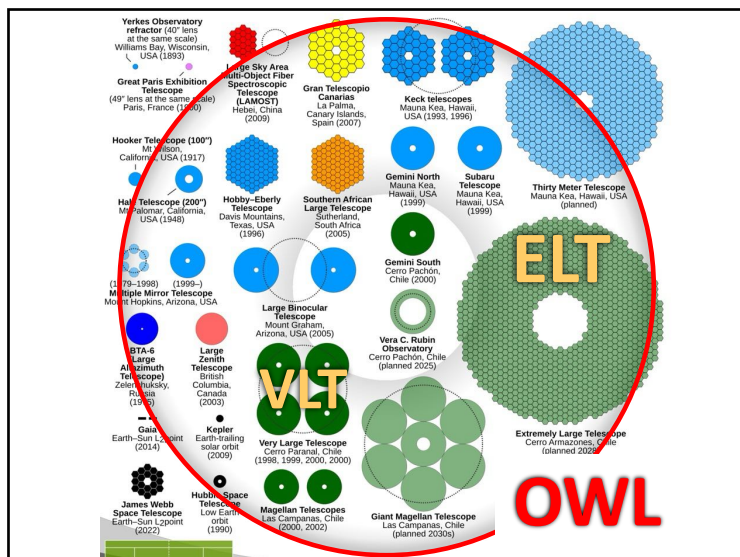


Keeping an Eye on the Universe

LSST Science – Dark Matter



European Extremely Large Telescope



Keeping an Eye on the Universe

www.liverpool.ac.uk/~sdb/Talks

Dr Steve Barrett

HWKU3A 28 Mar 2025