



Astronomical Data

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What can we Observe?

- With the right instruments can see lots of different things!



What can we Observe?

- With the right instruments can see lots of different things!
- Most observations are of *apparent* properties rather than *absolute* ones.



Brightness

- Called **Photometry**
- Also *apparent* measurement
- Modern cameras *count photons!*
- Brightness can tell us about:
 - Distance (via “standard candles”)
 - Energy (if we know distance)
 - Variability

Brightness

- Globular Cluster M15
- All stars at the same distance



Image: Liverpool Telescope

Brightness

- Globular Cluster M15
- All stars at the same distance
- Difference in brightness due to different *sizes*



Image: Liverpool Telescope

But what about colour?

- Cameras *count* photons, but do not tell us their *colour* (wavelength)
- Filters to the rescue!
- Compare the brightness through two different filters – colour!

Some of the
Liverpool
Telescope filters



Colours and Temperature

Image: Liverpool Telescope

Old and New...

- In general, the brightest *young* stars are **blue**, and the brightest *old* stars are **red**



Image: Hubble Space Telescope

Simple Chemistry...

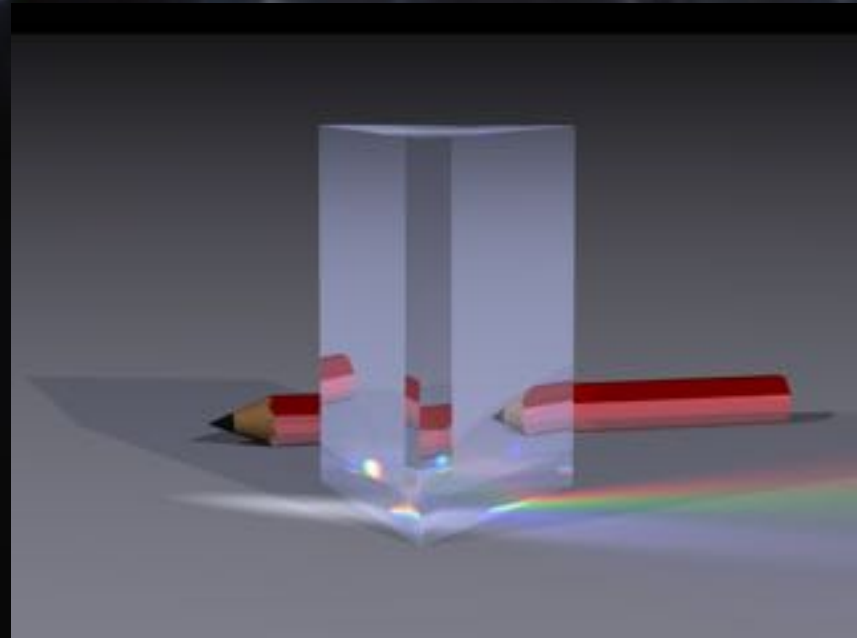
- Red:
Hydrogen
- Green:
Oxygen
- Also depends on
temperature etc



Image: Liverpool Telescope

Complex Chemistry...

- All elements produce particular patterns of *emission* and *absorption* lines
- Details depend on lots of things including:
 - Temperature
 - Density
 - Pressure
 - Magnetic field
 - Speed
 - etc...
- So, we use **Spectroscopy**



FRODOSpec

Image: Liverpool Telescope

Just the beginning...

- Everything so far about *visible* light:

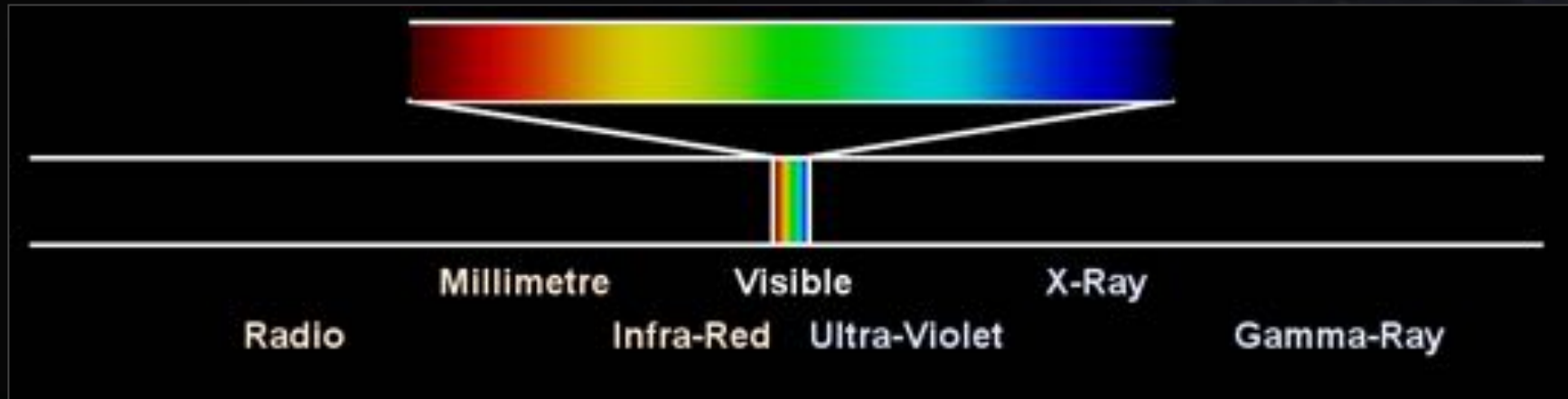


Just the beginning...

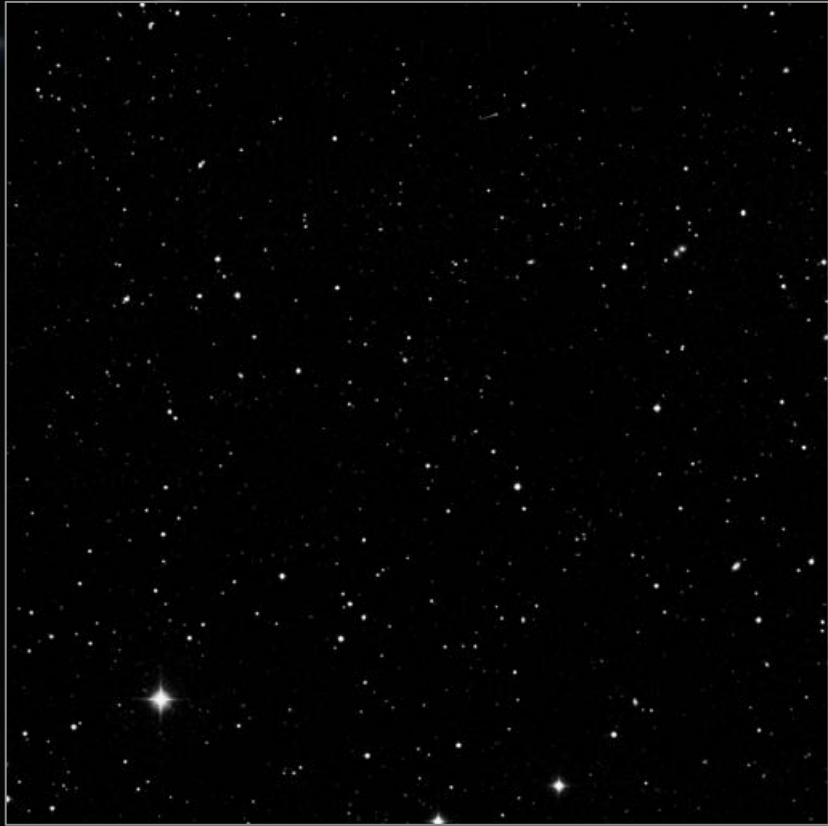
- Everything so far about *visible* light:



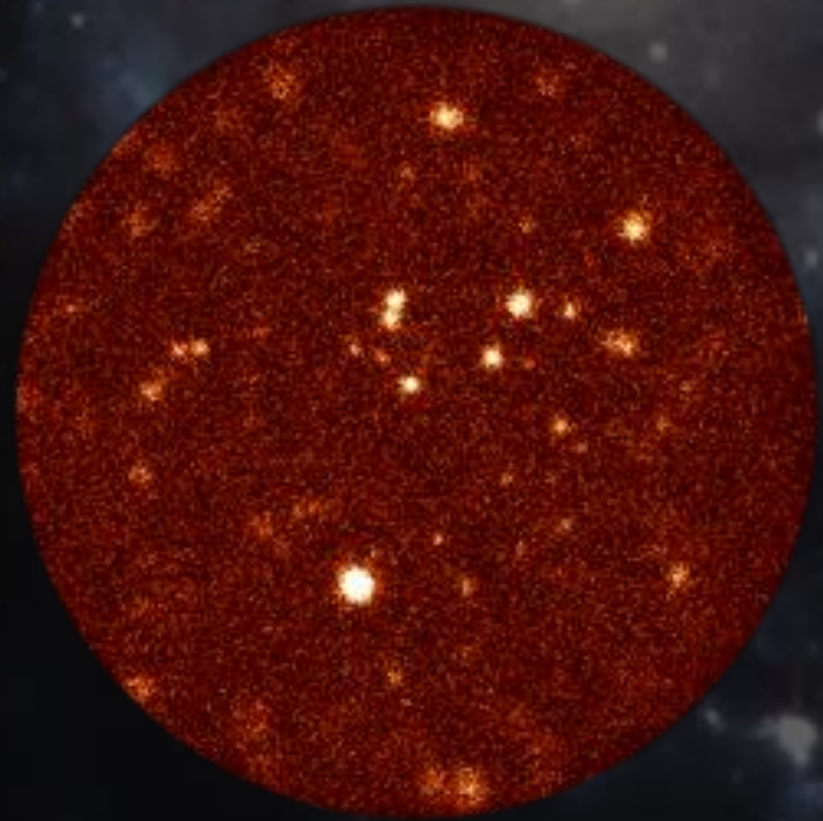
- But this is a tiny part of the ***Electromagnetic Spectrum:***



Example: UK Deep Survey



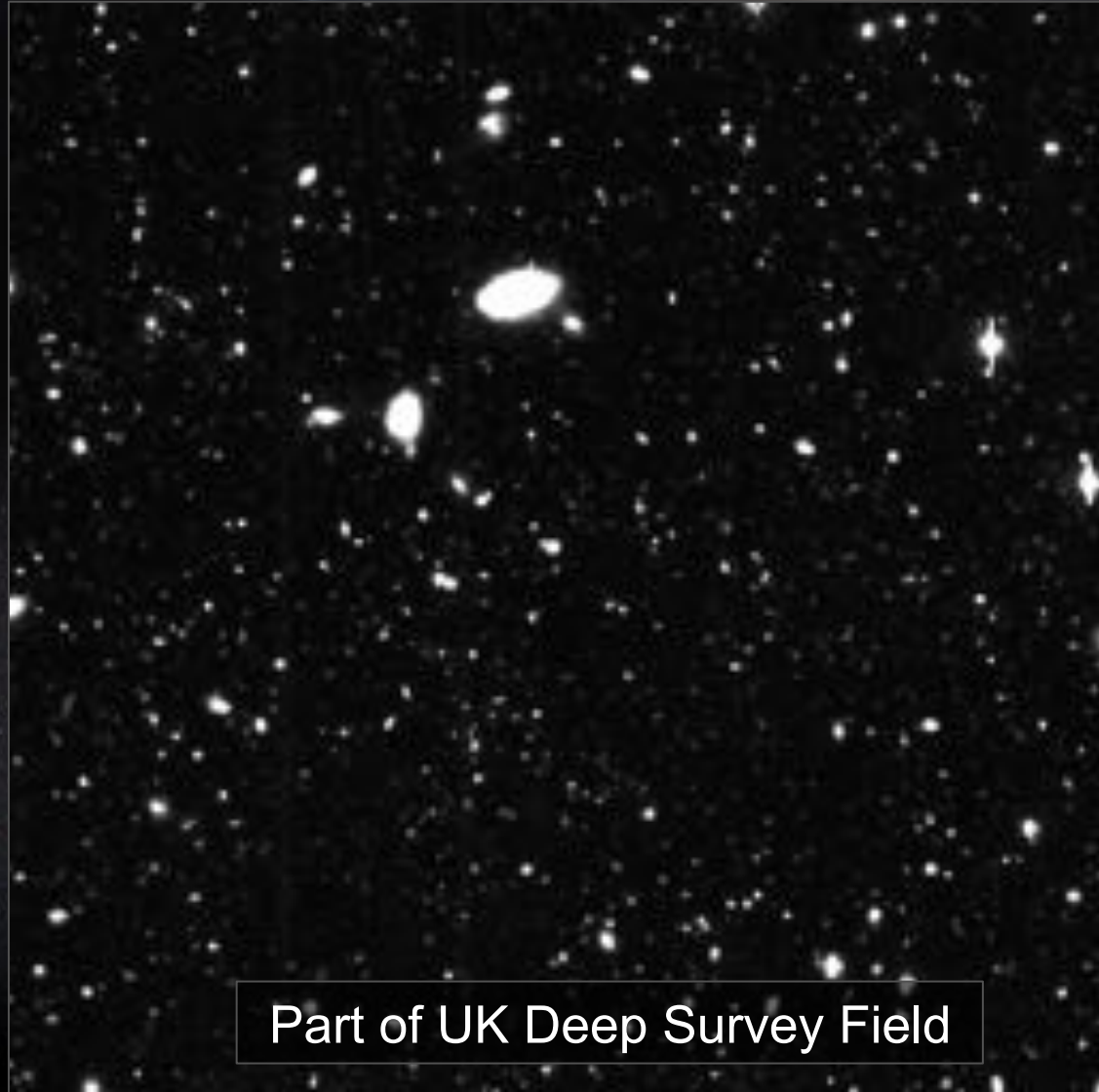
Deep Optical
Observation



Deep X-Ray
Observation

Driven by technology

Subaru Telescope

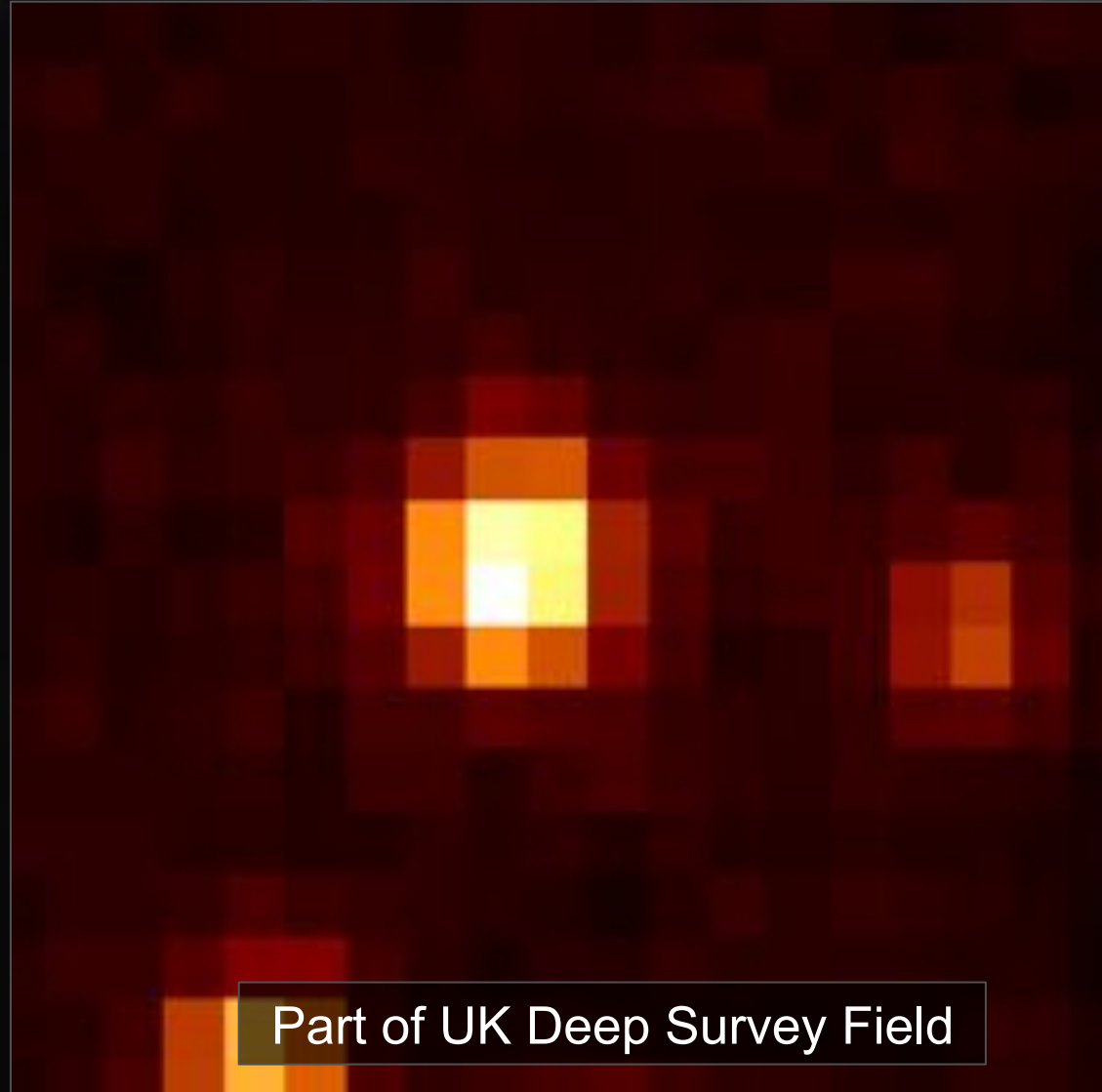


Part of UK Deep Survey Field

Driven by technology



ROSAT Satellite

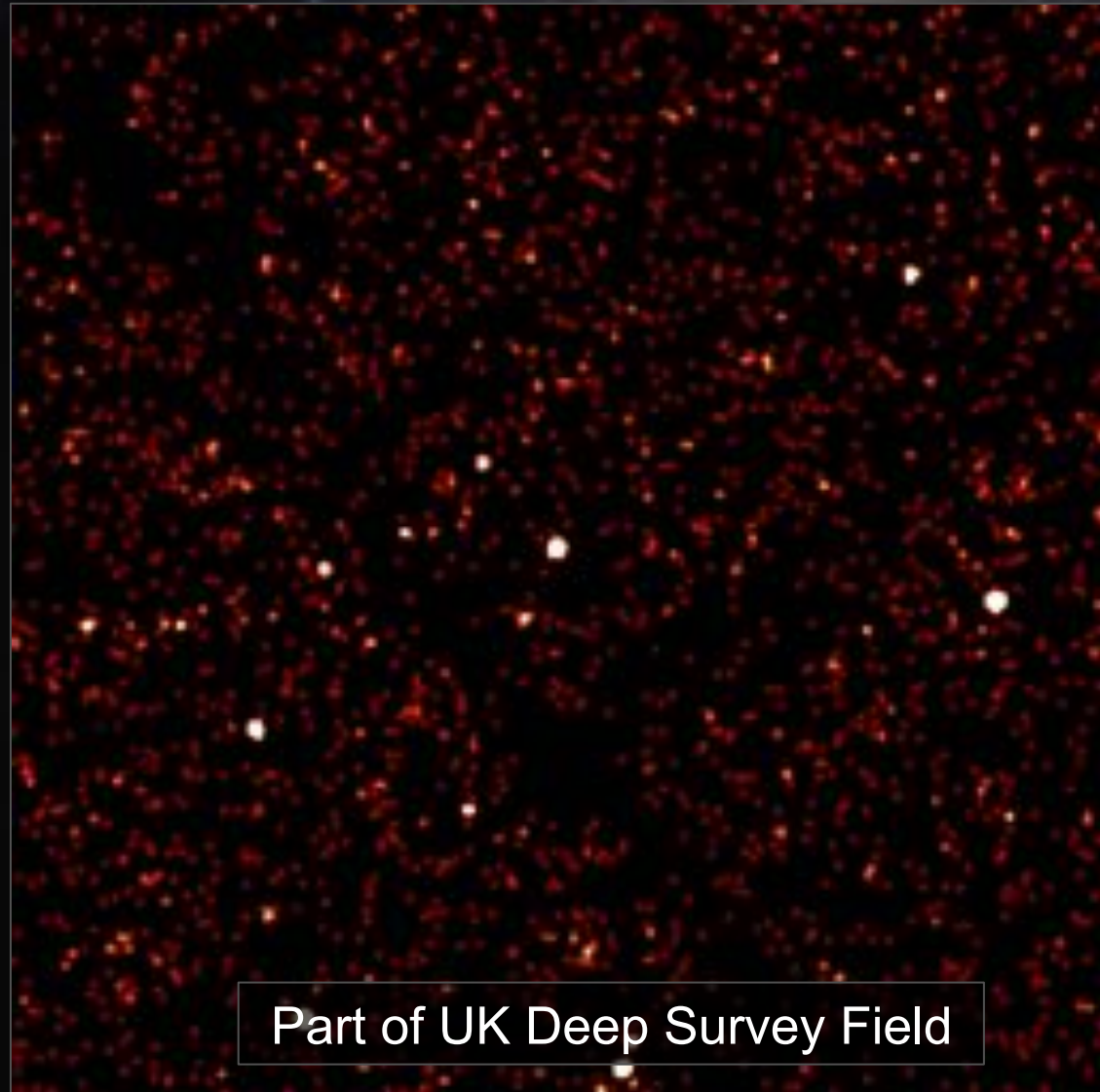


Part of UK Deep Survey Field

Driven by technology



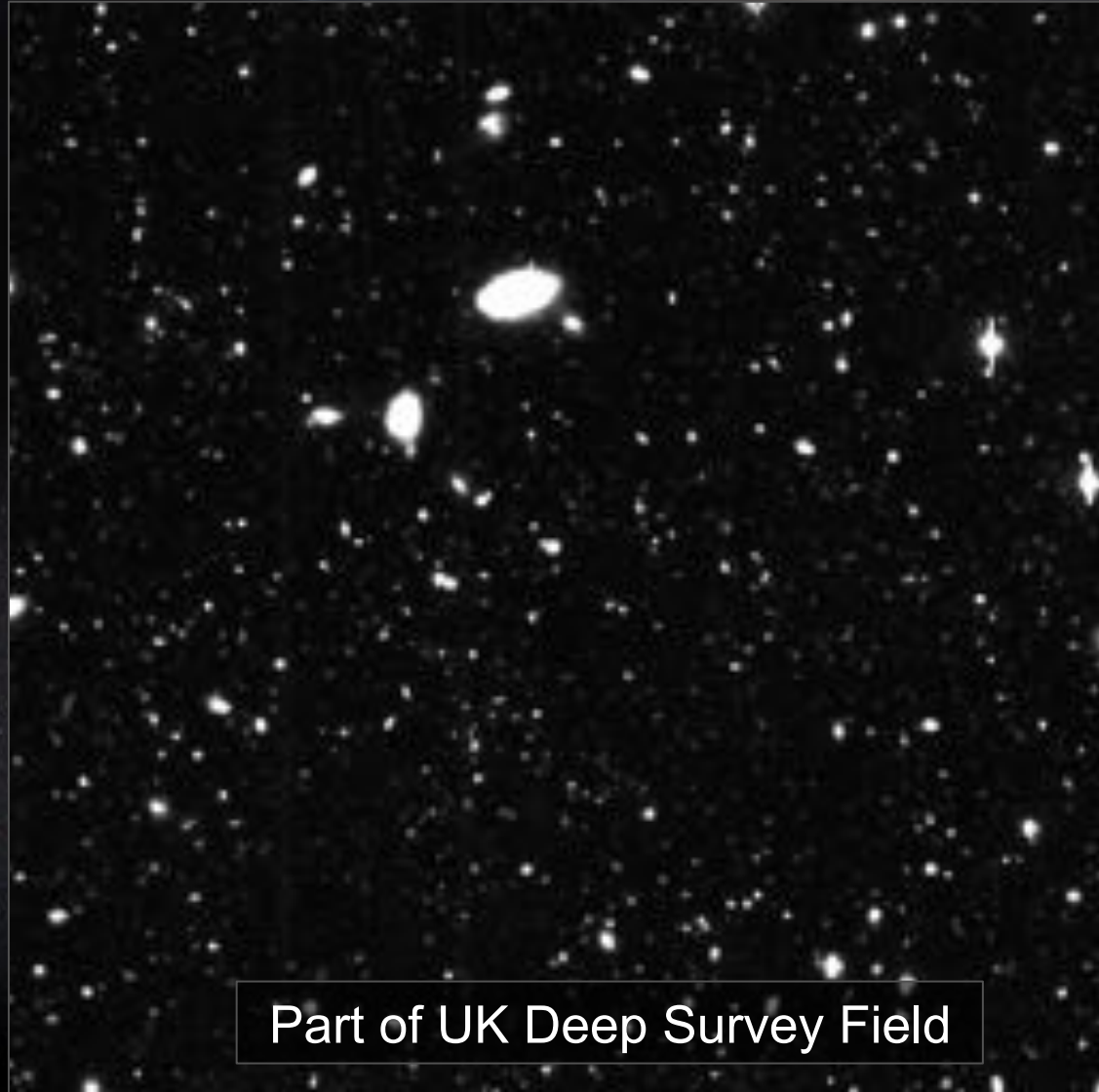
Chandra Satellite



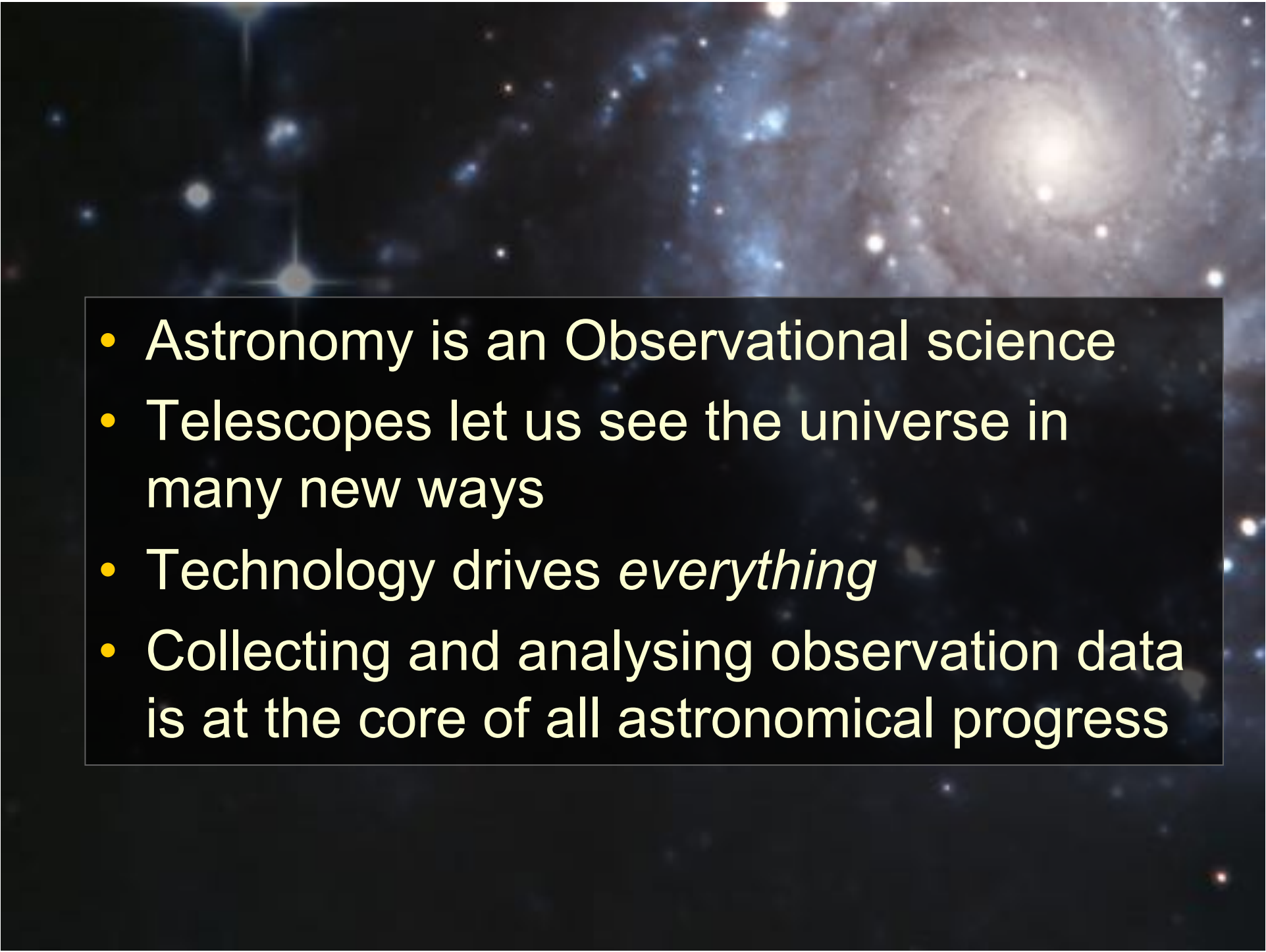
Part of UK Deep Survey Field

Driven by technology

Subaru Telescope



Part of UK Deep Survey Field

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- Astronomy is an Observational science
 - Telescopes let us see the universe in many new ways
 - Technology drives *everything*
 - Collecting and analysing observation data is at the core of all astronomical progress

