Stargazing

A short introduction to the joys of astronomy

By Furness and South Lakes Astronomy Society

To accompany Cumbria Wildlife's Event

Hosted by Art Gene at Allotment Soup

The Moon

- Craters,
- Mountains,
- and Valleys

  of the Moon.

The Planets

- Phases of Venus.
- Galilean moons of Jupiter.
- Rings of Saturn

Galaxies

Andromeda Galaxy.

Nebula

Orion Nebula

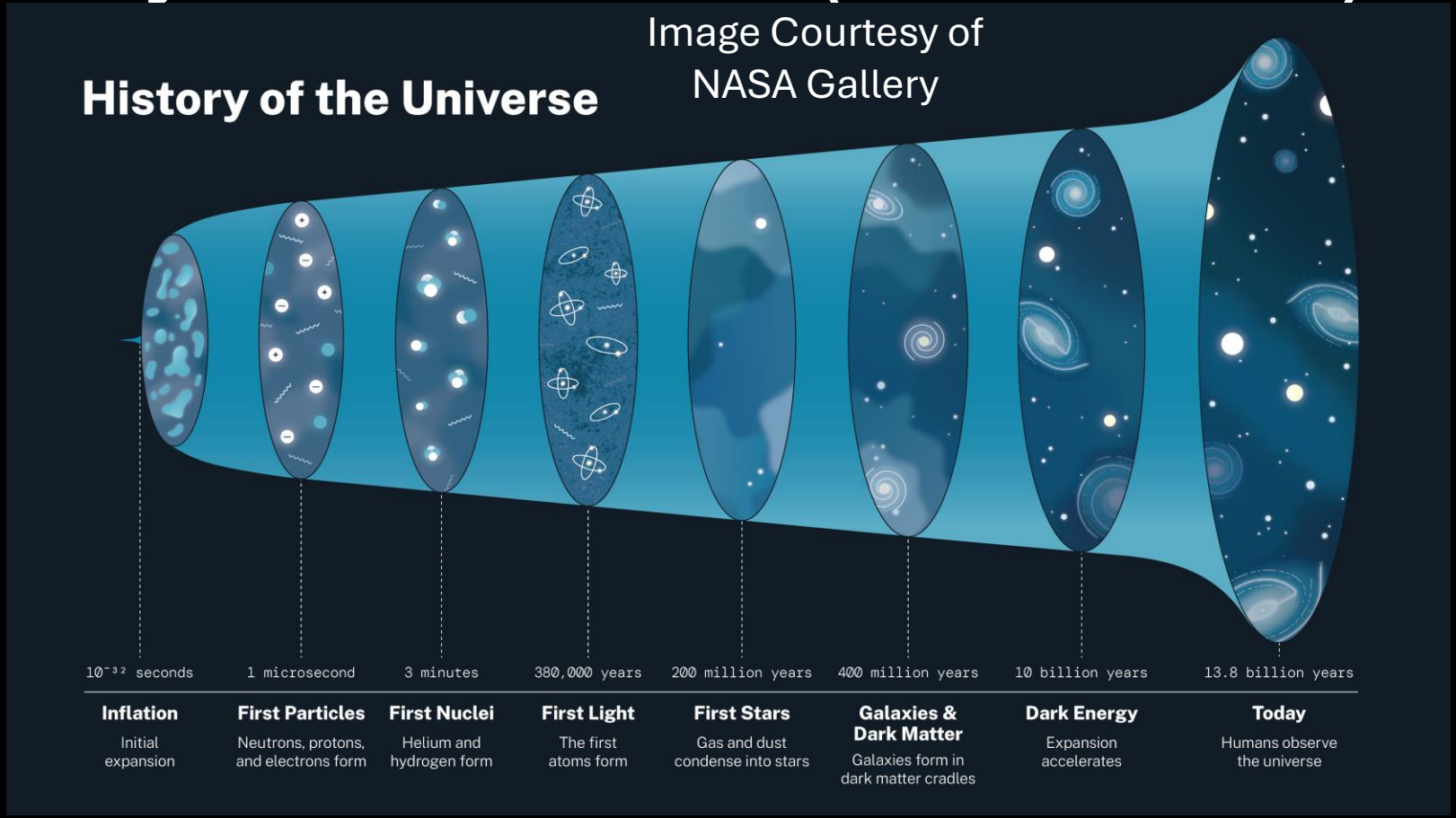
A story for the ages.

The Universe

13.8 billion

- Cosmologists believe the Universe is approximately 13.8 billion (13.8×10^9) years old.
- The Big Bang

Image Courtesy of NASA Gallery



The Milky Way (our) Galaxy

Milky Way 13.6 billion

The Universe 13.8 billion

- Cosmologists believe the Milky Way is approximately 13.6 Billion years old.

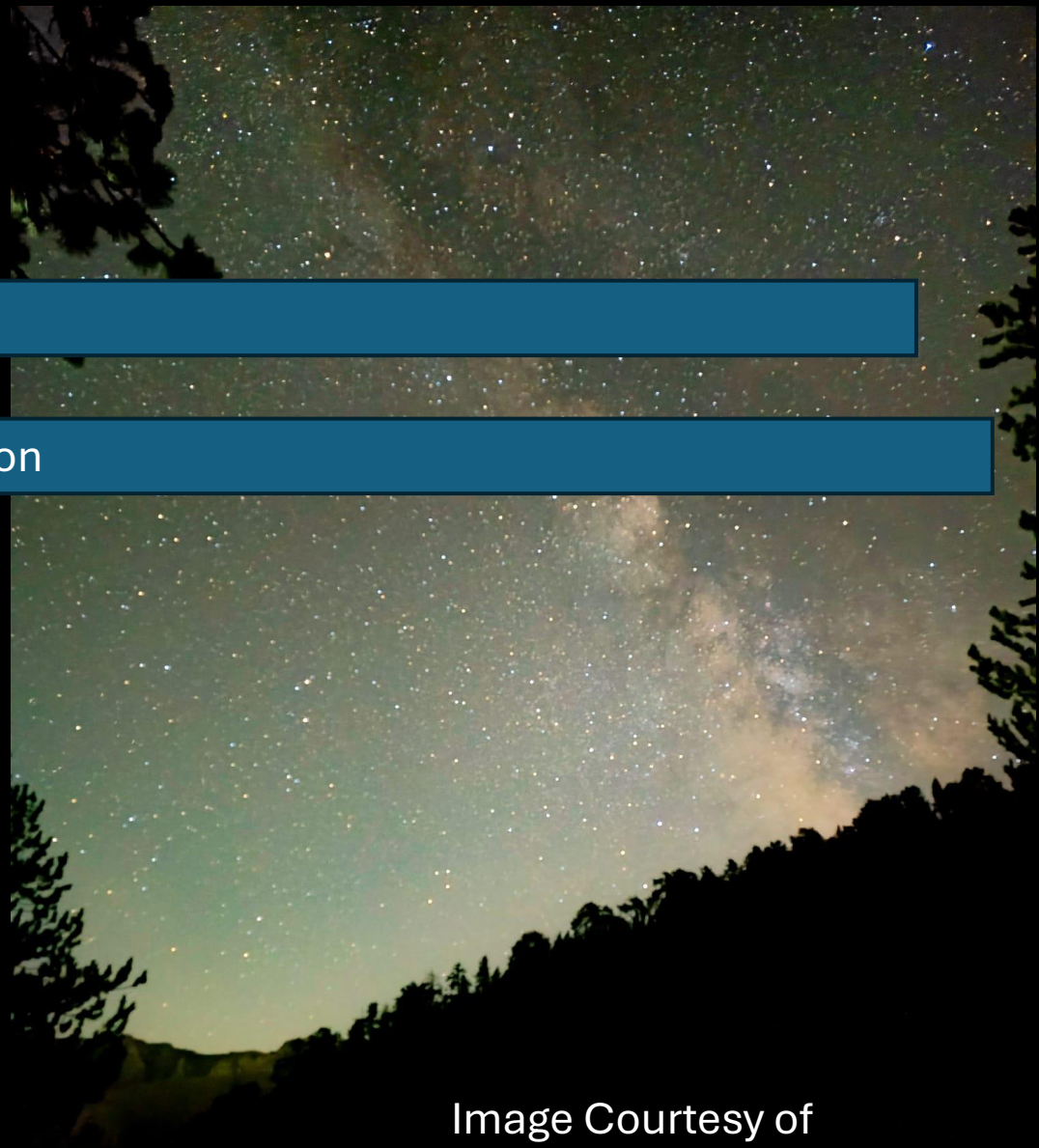


Image Courtesy of Daniel O'Donnel

The Solar System

- Cosmologists believe the Solar System is approximately 4.6 billion years old.

Image Courtesy of NASA Gallery

Solar System 4.6 billion

Milky Way 13.6 billion

Universe 13.8 billion

The Moon

- Current theories are that the Moon formed approximately 4.46 billion years ago, when a small planet called Thea, no longer in the solar system, collided with a young Earth. Analysis of crystals brought back by Apollo 17 astronauts have been helped to estimate its age.

Image Courtesy of NASA Gallery

Moon 4.46 billion

Solar System 4.6 billion

Milky Way 13.6 billion

Universe 13.8 billion

What is in the sky tonight?

What equipment do we need to see it?

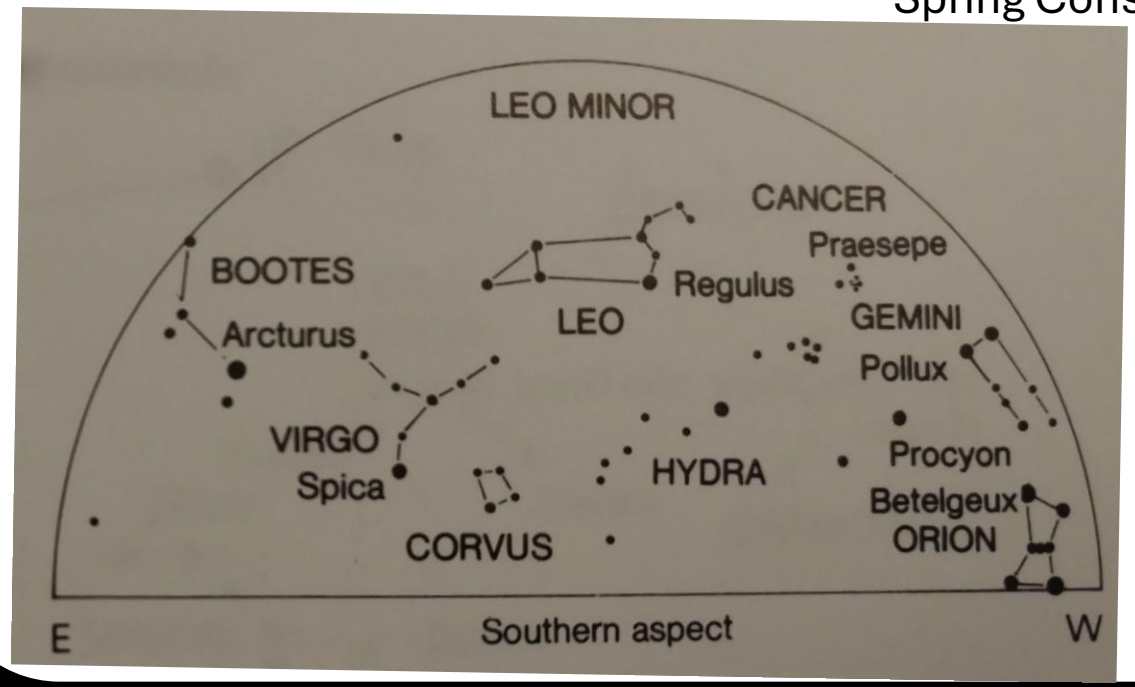
Constellations

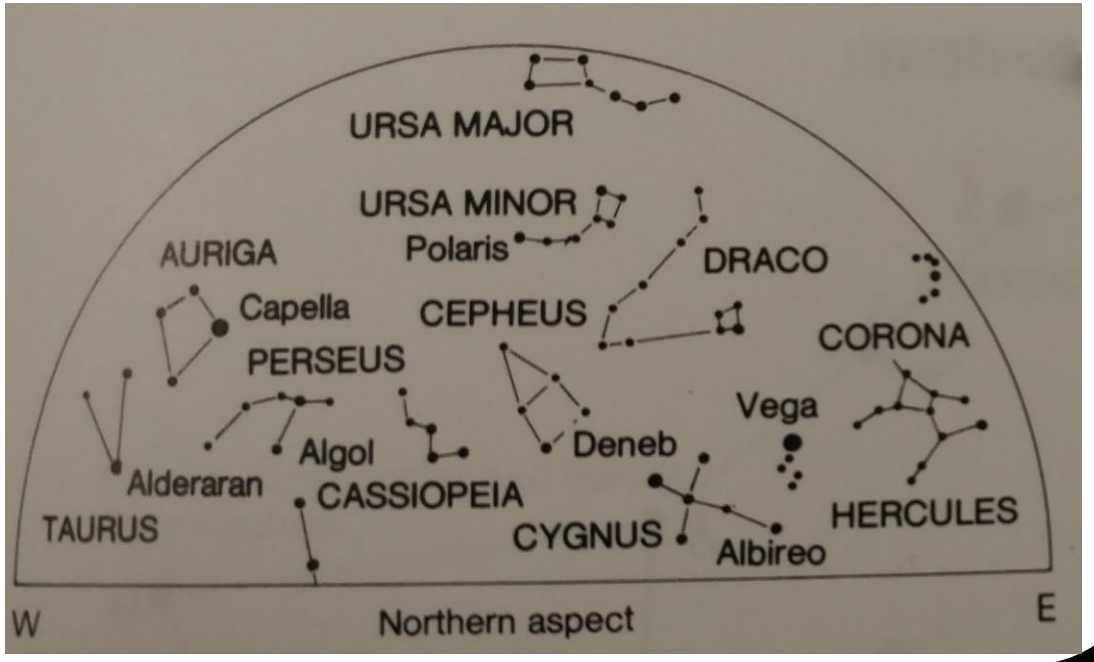
Constellations are patterns of stars in the night sky.

The constellations we see in the sky vary with the seasons.

The spring constellations visible from the UK are:

Spring Constellations





All we need to observe the constellations are our eyes and a clear sky.

Stars - Arcturus

- Some stars are given individual names.
- All stars within constellations are named after the Latin derivation of their constellation proceeded by a Greek letter assigned in order of the star's brightness in the constellation.
- For example:
  - Arcturus is the fourth brightest star in the night sky.
  - Arturus is in the constellation Bootes (T̤he Herdsman).
  - Arcturus is also called Alpha (α) Bootiș.

We observe stars:

Unaided,
Through Binoculars,
Through Telescopes.

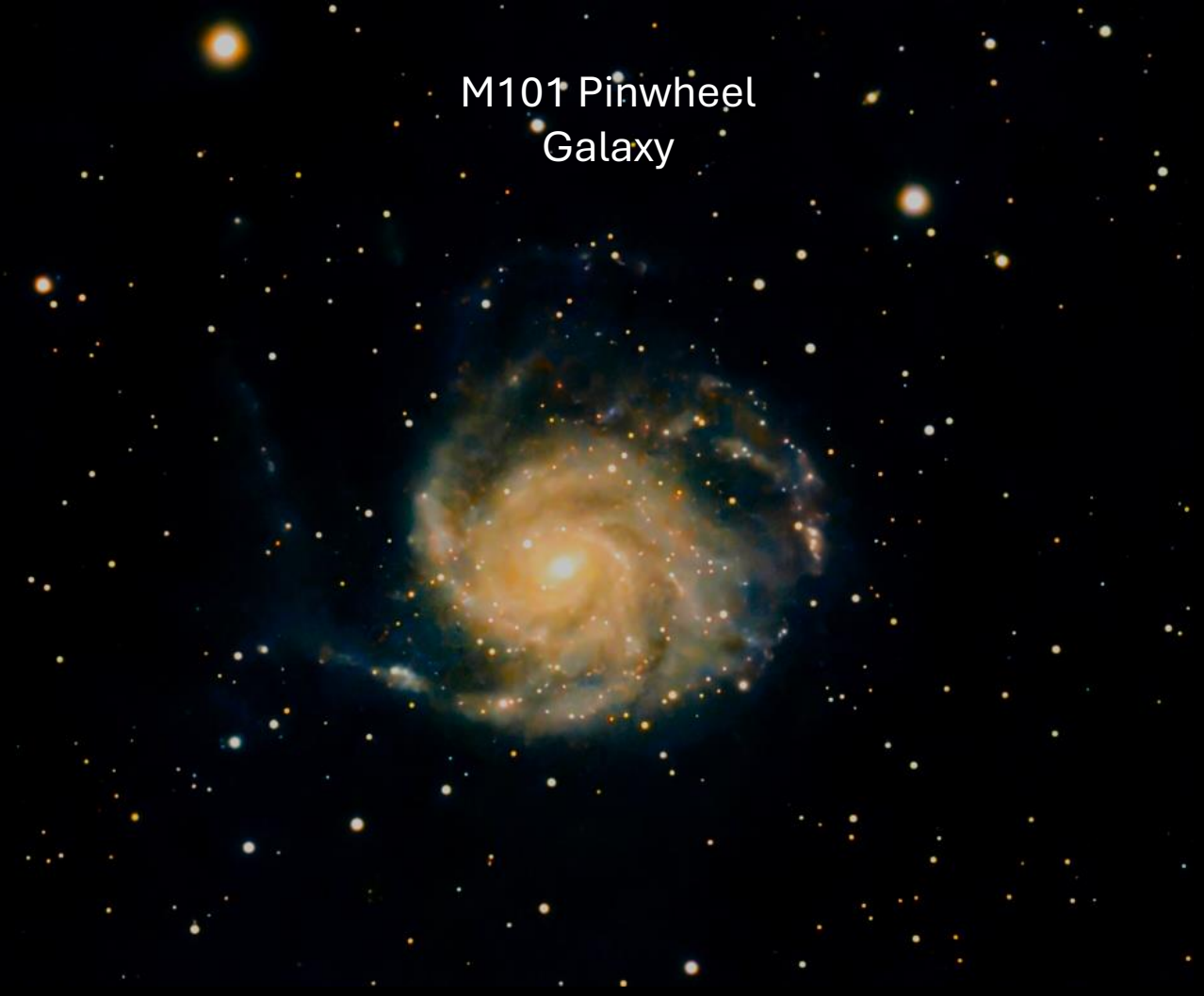
Star Clusters

- Star clusters are groups of stars that share an origin, forming at roughly the same time and location.
- Clusters may be open or globular.
- The Pleiades (M45 also called the 7 Sisters) is an open star cluster in the constellation Taurus visible to the naked eye in winter.
- M13 is a globular star cluster in the constellation Hercules, just visible to the naked eye in dark sky areas.
- A telescope is needed to make out the individual stars in star clusters.
- The Mily Way contains approximately 150 known star clusters that can be observed through armature telescopes.

M45 The Pleiades

M13 Great Globular Cluster in Hercules

Galaxies



M101 Pinwheel Galaxy

- Galaxies are very large groups of stars and nebula.
- Current thinking is that most galaxies have a black hole at their centre.
- The Milky Way is our solar systems home galaxy.
- The Andromeda galaxy is a similar in size to the Milky Way.
- It is predicted that the two galaxies will collide in 7 to 10 billion years.
- The Milky Way and Andromeda galaxies can be seen with the naked eye. Telescopes with large apertures (usually Newtonian Reflectors) help to provide clear views of galaxies as they gather more light. As well as the visible light emanating from galaxies astrophotography can be used to show emissions outside the visible spectrum.

Nebula

- Nebula are large clouds of gas, often light years in size.
- The constellation of Orion contains one of the easiest to locate nebula.
- The Orion nebula (M42) is a stella nursery.
- The Orion Nebula is visible to the naked eye.
- Smaller nebular are viewed through telescopes.
- Because many of the gases in nebula emit light outside the visible spectrum astrophotography is often used to show them in their full glory.

Aurora Borealis

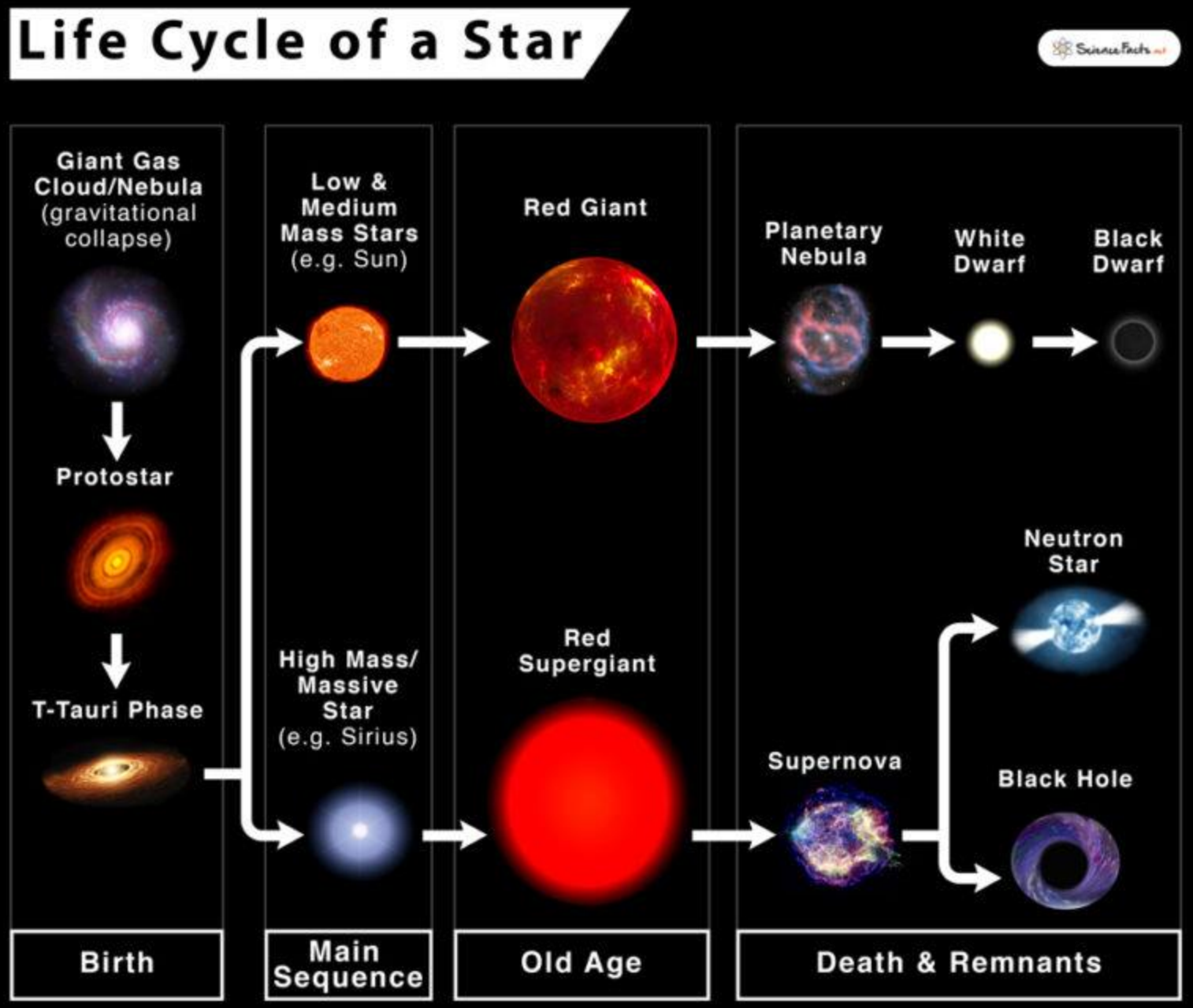
- Occur when particles from the solar wind hit the Earth's atmosphere.
- Activity on the surface of the Sun has a 7 year cycle.
- We are currently at the peak of a cycle of solar activity.
- This level of activity means that Aurora can be seen at lower altitudes and at times they are visible across the UK.
- Many examples have been captured by mobile phone.
- Websites forecasting Aurora visibility let Aurora hunters know when there a potential opportunity to see an Aurora.

Lancaster University Aurora Watch UK

Image Courtesy of Daniel O'Donnel

We Are Stardust

- Stars are formed in nebula when gravity compresses the gas Hydrogen until its temperature reaches approximately 150 million ºC.
- During the millions of years of a star's main sequence nuclear fusion turns Hydrogen into Helium.
- When the star uses up all its Hydrogen Helium undergoes nuclear fusion.
- When Helium is used up fusion progressively creates heavier elements until all that remains is Iron.
- What happens next depends on the size of the star.



How the Moon and the Sun affect tides on earth.

Observing The Moon

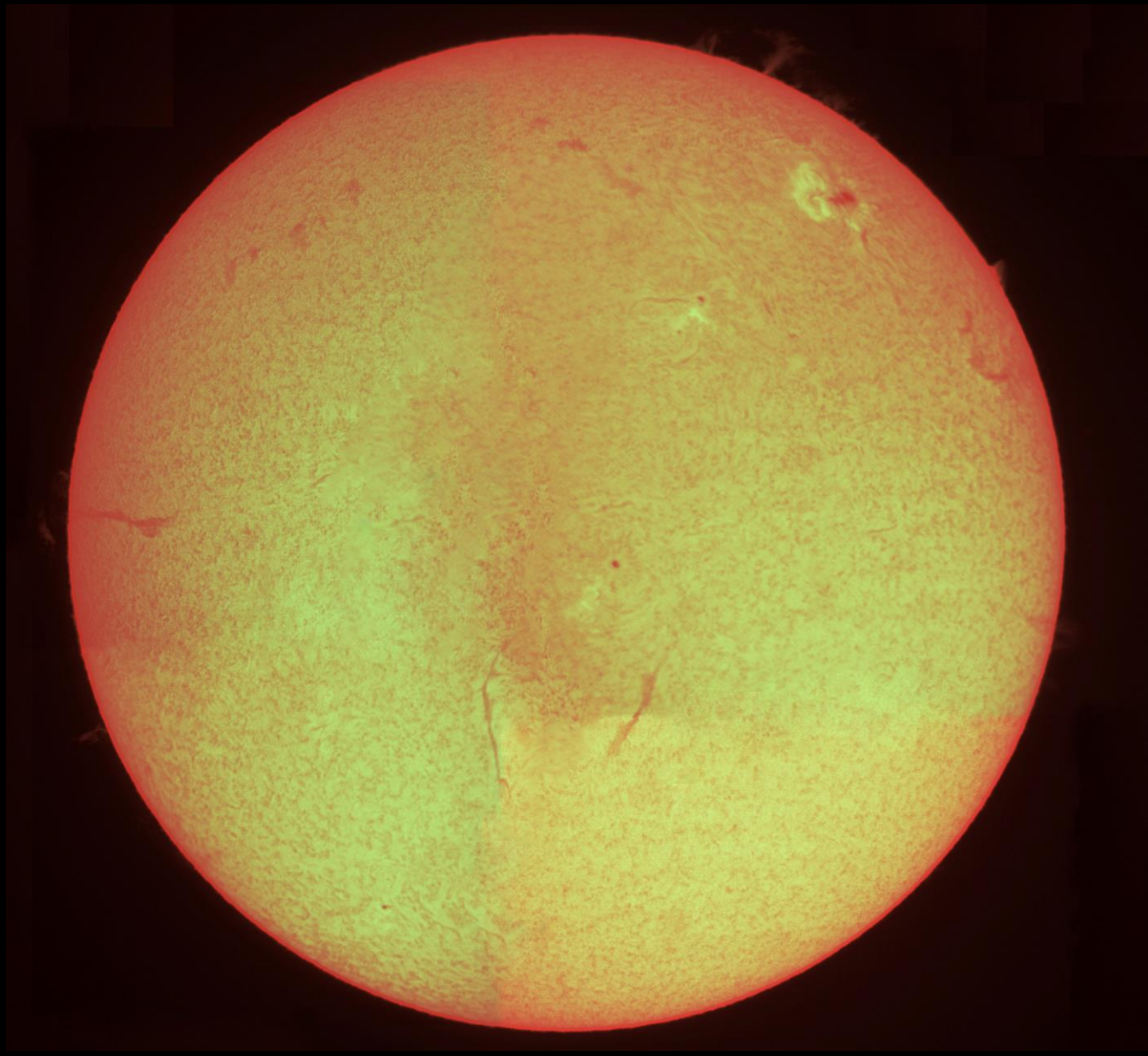
- It’s features:
  - Large planes of lava (Mare / Maria),
  - Impact craters,
  - Mountains (Mons / Montes),
  - Valleys (Vallis / Valles),
  - Cracks in its surface ((Rima/Rimae),
  - Escarpments (Rupis / Rupes),
  - Lakes (Lacus), very small luna mare.
  - Bays (Sinus) where mare meet mons.
  - Marshes (Palus / Paludes) Low lying area
    similar to of mare that have but with rugged
    floors.
- Provide endless observation opportunities via small scopes and binoculars.

The Moon

- The Moon has a crust, mantel and a metallic core.
- The Moon is more massive relative to its primary planet (Earth) than the moons of the other planets in the Solar System.
- The mass of the Moon is related to the gravitation force exerted on the Earth by the Moon.
- As the Moon rotates around the Earth gravity causes a bulge in the Oceans and Seas of the Earth.
- We see this as the rise and fall of the tides.

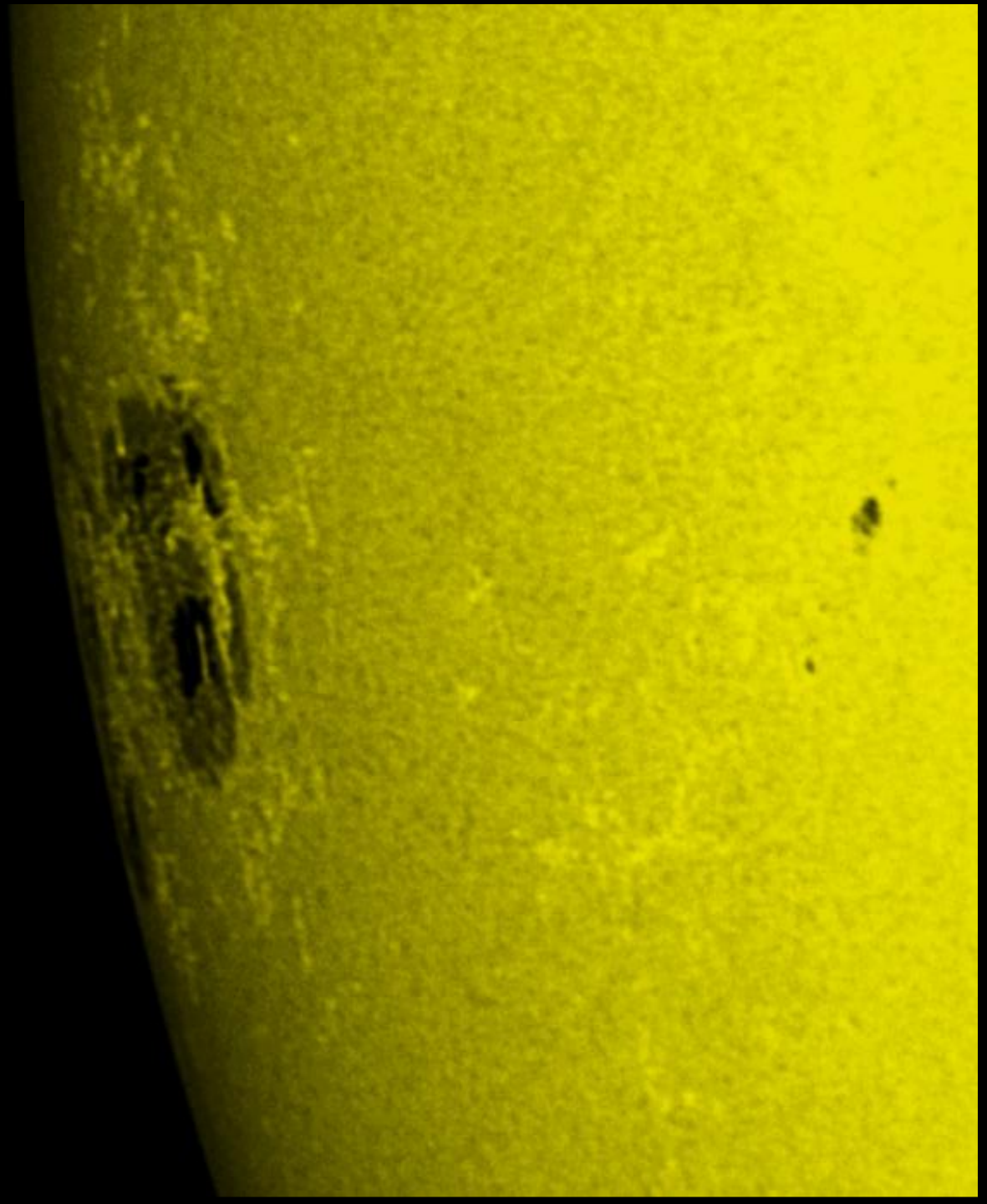
Observing The Sun

- DO NOT LOOK DIRECTLY AT THE SUN it can damage your eyes.
- The simplest low cost equipment for observing the Sun is solar film, used to create glasses or filters for refracting telescopes.
- A Herschel Wedge can be can also be used with a refracting telescope.
- High cost specialist hydrogen alpha telescopes allow us to observe the Sun’s Chromosphere revealing filaments and prominences
- Calcium-K telescopes are primarily used for high-contrast, detailed imaging of magnetic activity on the sun's surface.



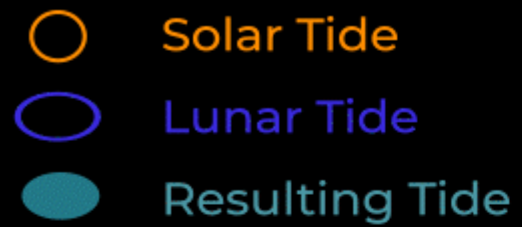
The Sun and the Tides

- Like the Moon the Sun exerts a gravitation force on the Earth.
- Mass of the Sun 1.988×10^{30} kg.
- Mass of the Moon 7.35×10^{22} kg.
- Although the Sun is much more massive than the Moon gravity weakens as the distance from an object increases.
- Distance to the Sun 149.6×10^{6} km.
- Distance to the Moon 384.4×10^{3} km.

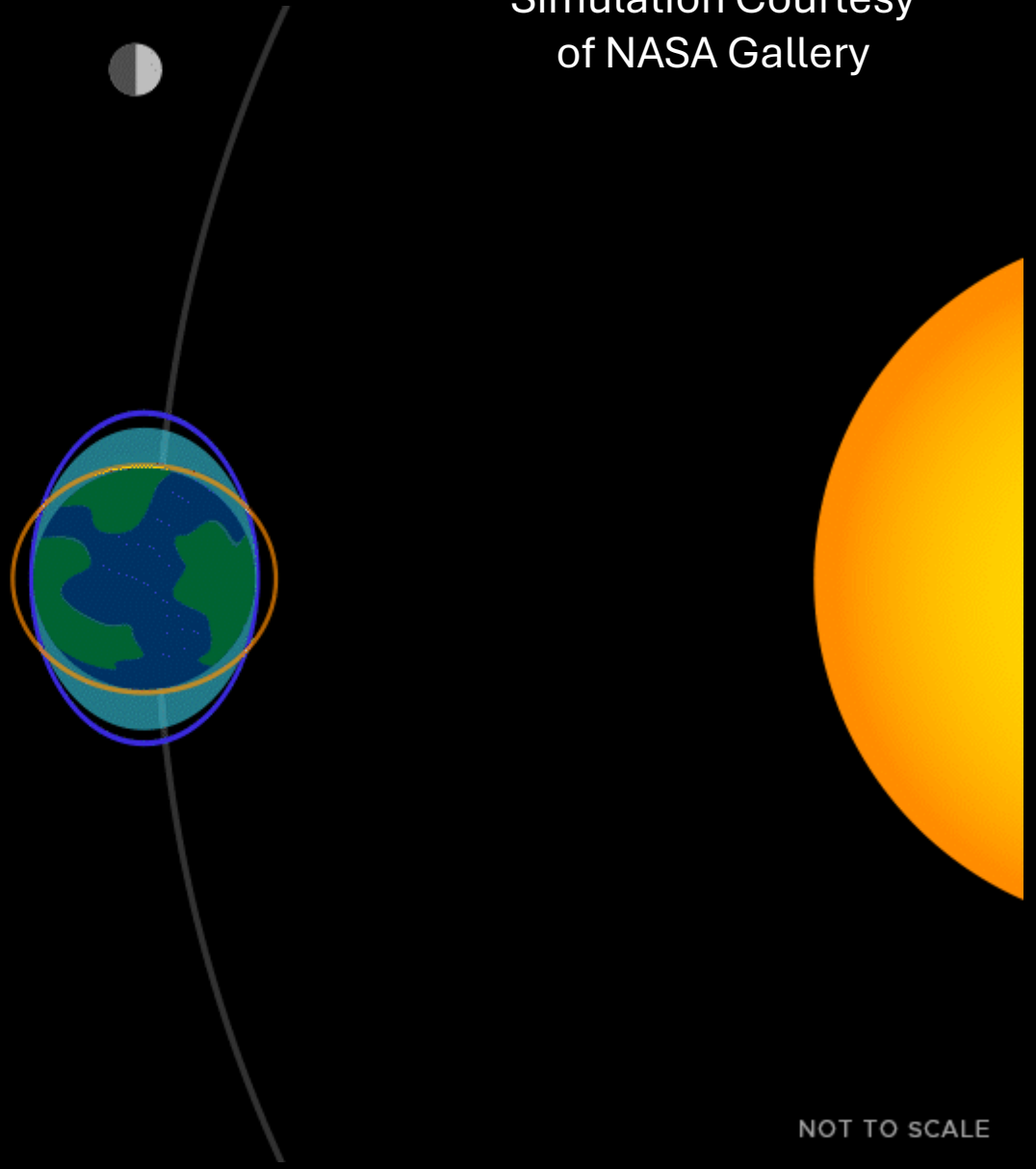


The Spring and Neap Tides

Simulation Courtesy of NASA Gallery



- When the Moon, Earth and Sun align the combined gravitational effects generate the highest's, Spring, tides.
- When the Moon and Sun form a right angle in relation to the Earth the lowest, Neap, tides occur.
- The tides are believed to have contributed to the development of life on Earth.



Astronomy Equipment

- Scopes, mounts and eyepieces vary in price from less than £100 to over £10,000.
- Starting out it's not easy to know which equipment if right for you.
- Consider joining an astronomy club, members can give you advice and will be happy to let you observe through the equipment they have so you can work out which equipment is suited to your needs before you buy.
- Barrow's local club is:
  Furness and South Lakeland Astronomical Society

The End

Any Questions?