Through the new session 2021 -2022 we intend to present talks designed to provide an introduction to some of the skills that are needed when starting astronomy as a hobby.

As a precursor presentation, this is a beginner's guide to exploring the summer night sky.

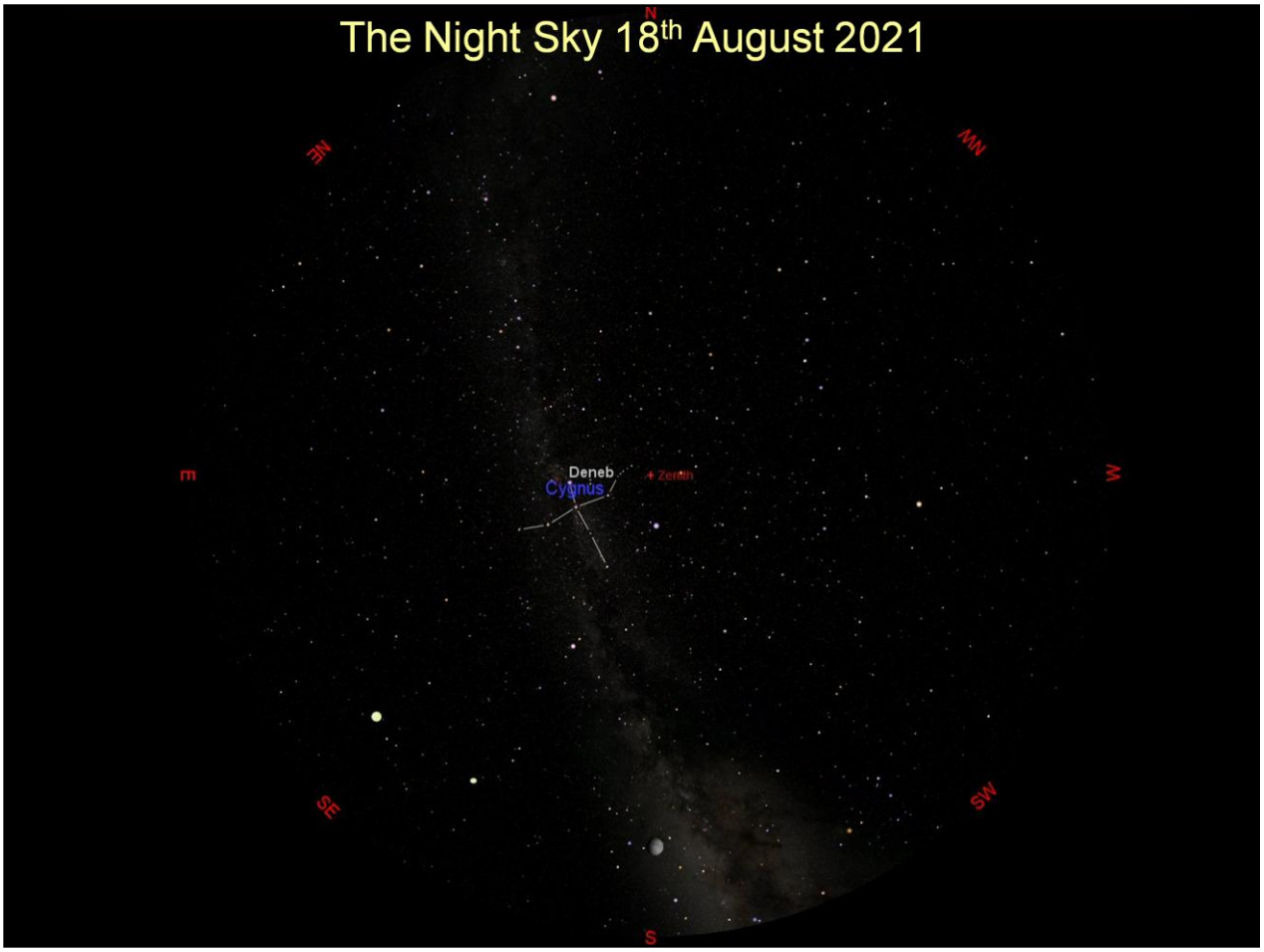
There are no signposts or directions in the sky so the only things that do not change their position in the sky are the stars.

The night sky has no guides written on it to show us what is where.

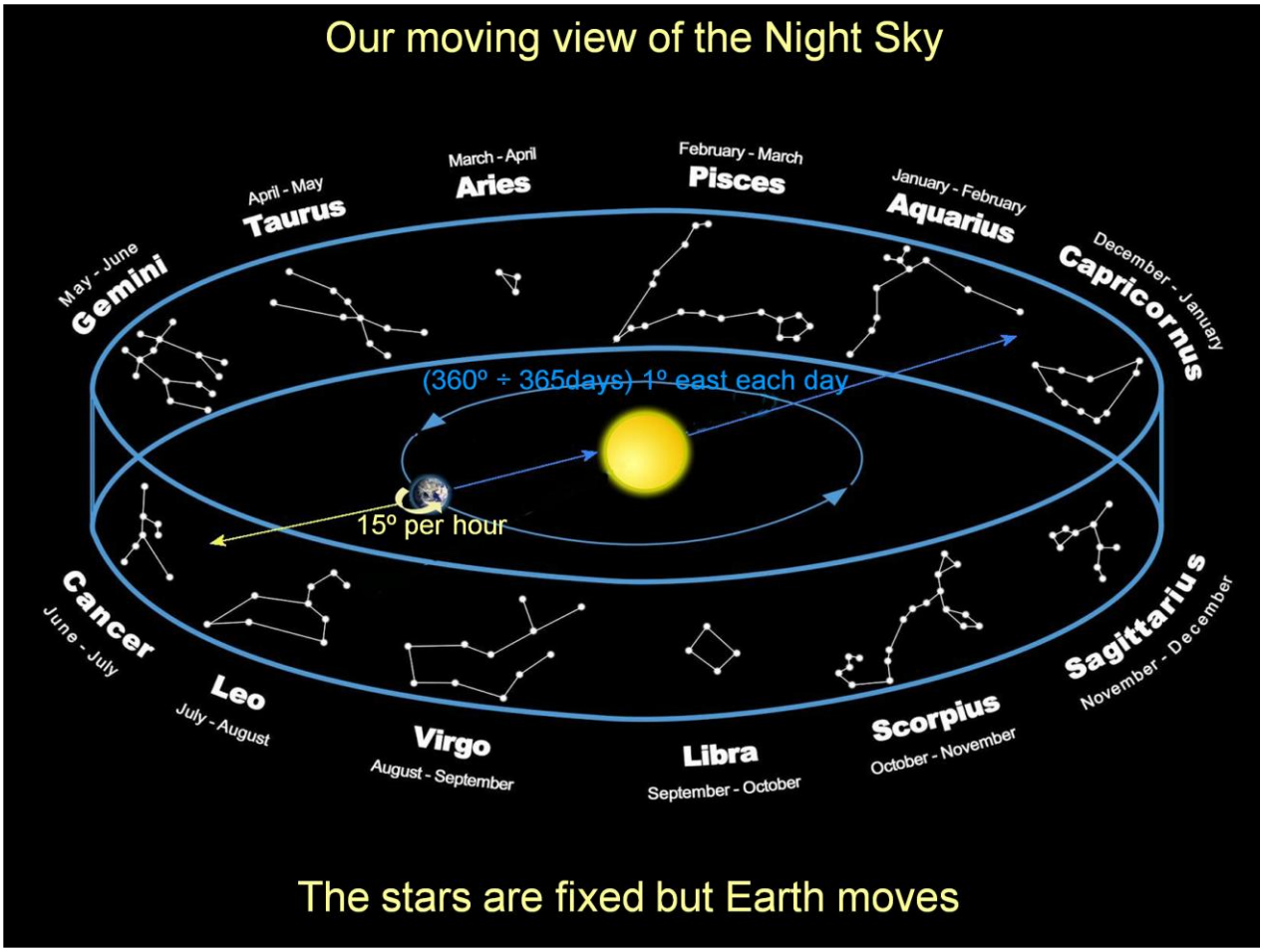
The chart above shows the whole night sky. The horizon is shown around the outside and the Zenith (the point directly overhead) is at the centre of the chart.

So we need to use some ‘easy to recognise’ features to get us started.

Stars look much the same, the only difference that we can see is some appear brighter than others.



Almost directly overhead this month is a bright star called Deneb.
Deneb is close to the point in the sky directly overhead that is called the Zenith.
Deneb is the brightest star in a noticeable (cross shaped) group of stars.
We can join the stars in this group with dot to dot lines to create a stick figure.
This recognised shape helps us to remember this part of the sky.
These noticeable groups of stars we call ‘Constellations’.
Deneb is the brightest star in the noticeable group that we call Cygnus.
This is the constellation of Cygnus (the Swan) and it looks a little like a swan.

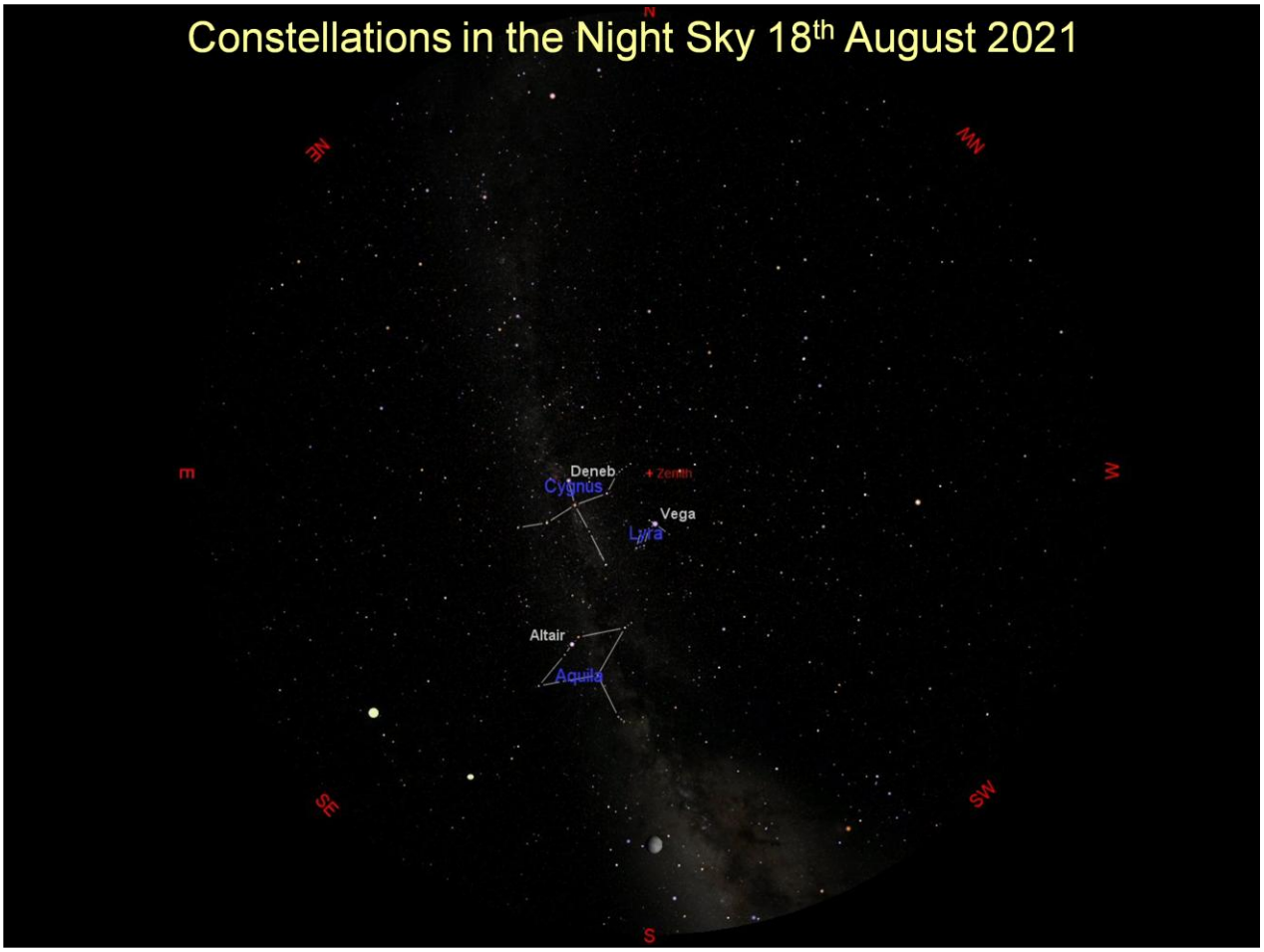


Although the stars are in fixed positions in the sky, the sky does change slightly from night to night due to the movement of Earth as it orbits the Sun once a year.

This means the stars move (360º ÷ 365days) approximately 1º east each day. (indicated by the blue arrows)

The stars do also process across the sky noticeably, hour by hour, due to Earth's daily rotation on its axis. (indicated by the yellow arrow)

This means the stars appear to move (east to west) (360º ÷ 24hrs) 15º every hour. A star rising in the east at sunset will cross the sky during the night and set in the west at sunset. (Ignoring the seasonal change in the length of the day)



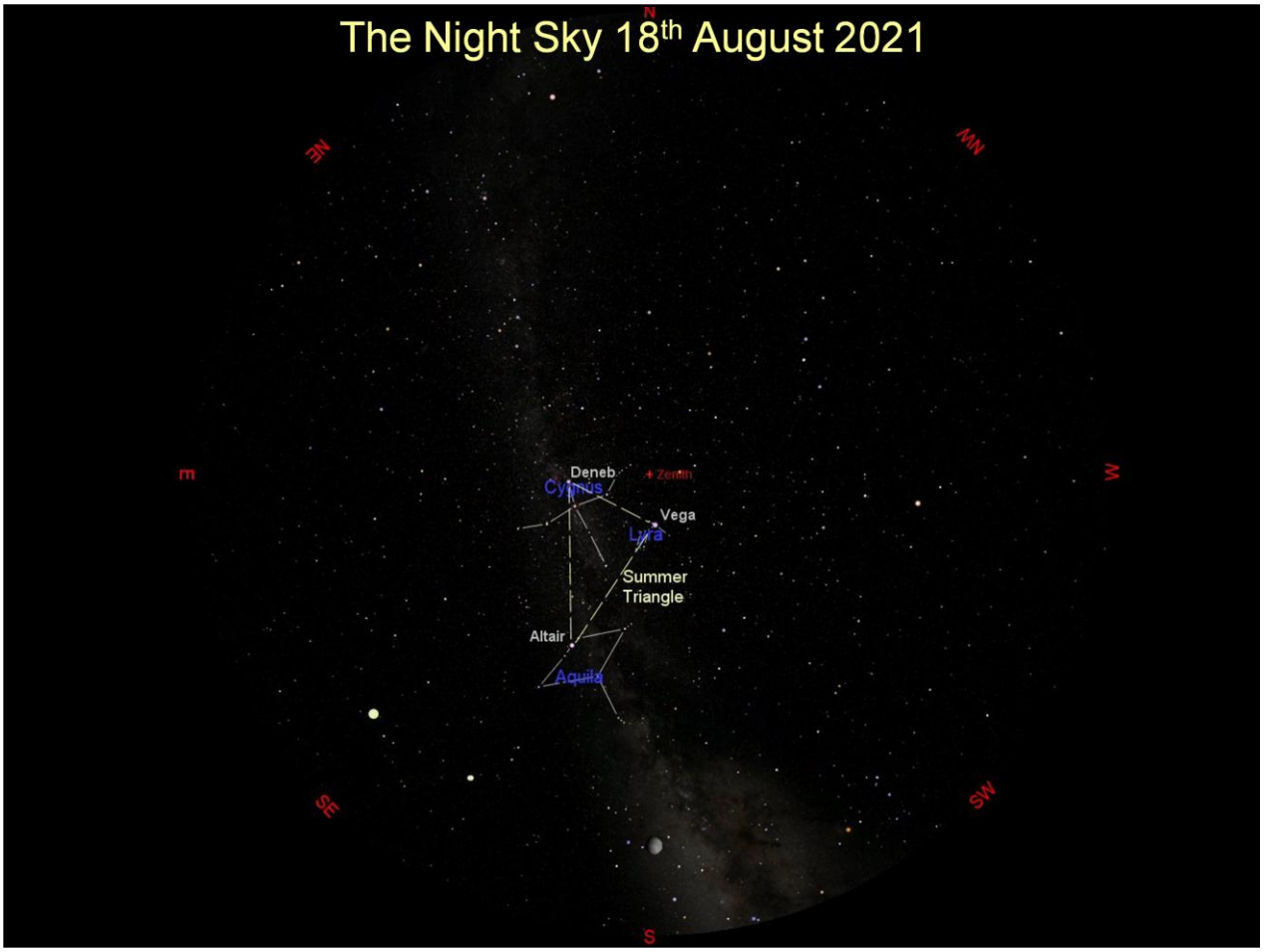
There are two other bright stars close to Deneb.

The three bright stars appear to mark out the corners of a triangle.

Vega is the brightest star in the constellation we call Lyra (the Small Harp)

Altair is not quite so bright but is noticeable as it has a star to either side.

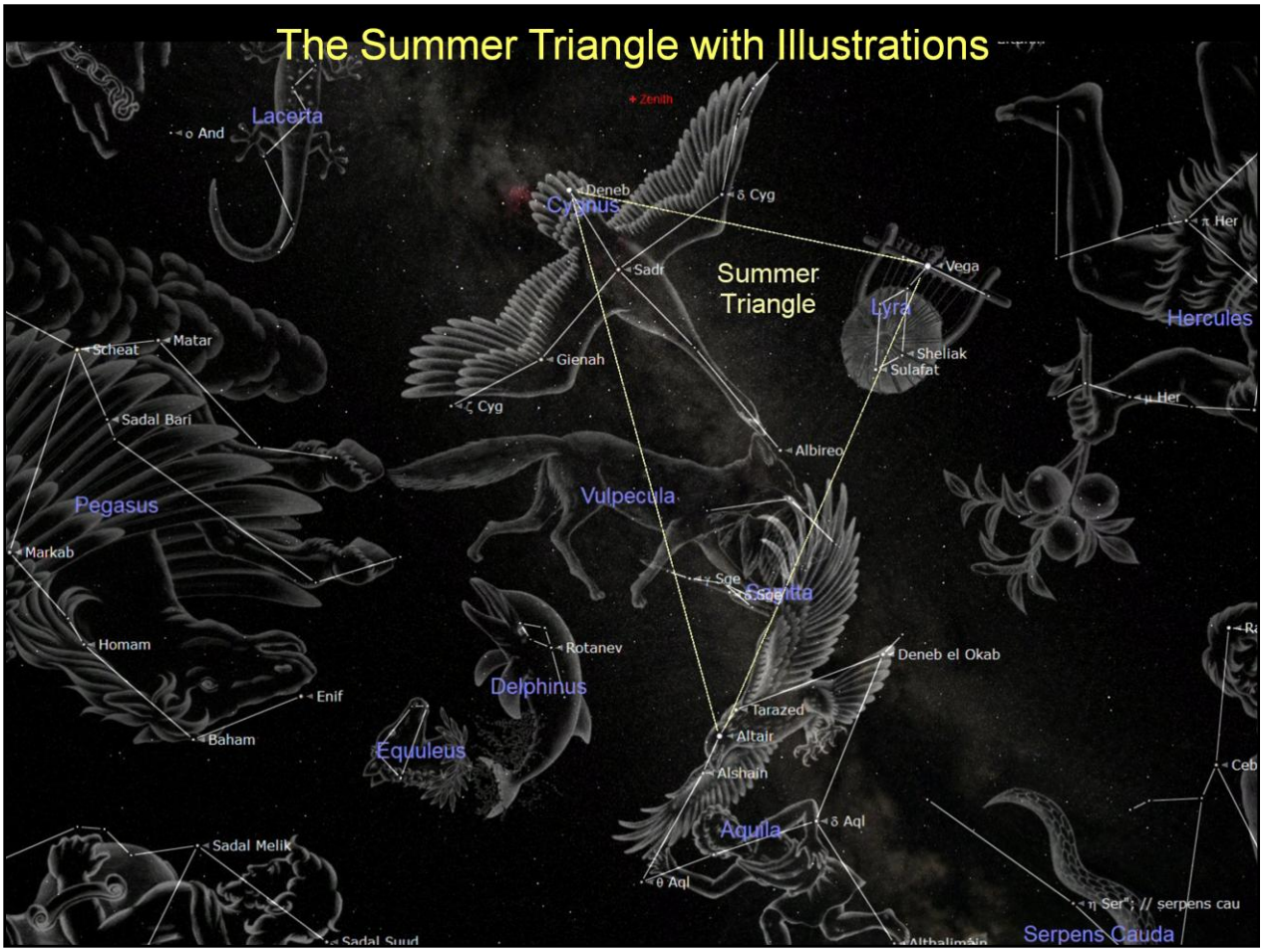
Altair is the brightest star in the constellation of Aquila (the Eagle).



The famous astronomer Sir Patrick Moore suggested the name ‘The Summer Triangle’.

This has now become a very familiar feature of the summer night sky.

It is easy to find so makes it a good place to start exploring the night sky.



Cygnus is one of the few constellations that does actually look like what is named after, a Swan.

The brightest stars in Cygnus form a quite distinctive cross shape that does, with a little imagination, look like a Swan.

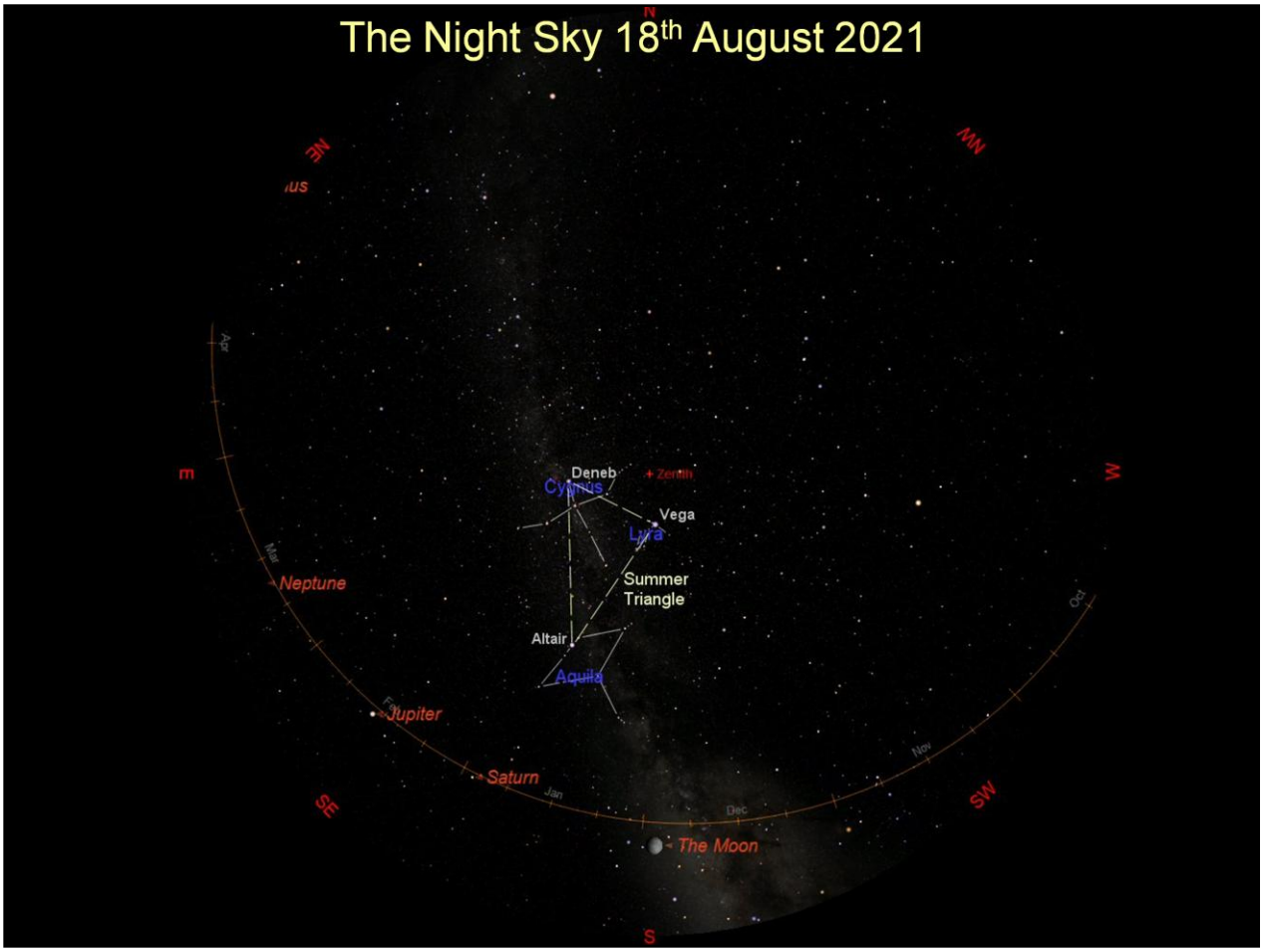
There is a line of stars that run from Deneb to Albireo that represent the body and outstretched neck of the swan.

To either side of the star Sadr lines of stars appear to represent the outstretched wings of the swan.

Vega has a fainter star to either side of it that follow the cross bar that supports the strings of the Lyre shown in the illustration above to represent Lyra.

Below Vega are four fainter stars that make a diamond or parallelogram shape that (with a good imagination) could represent the resonance box of the lyre as shown above.

Although the two stars on either side of Altair make it quite distinctive, the stick figure of Aquila has no resemblance to an Eagle at all.



There are two bright planets to see in the southern evening sky.

Jupiter is the brightest and Saturn is a little fainter.

Both are easy to see with the unaided eye (naked eye).

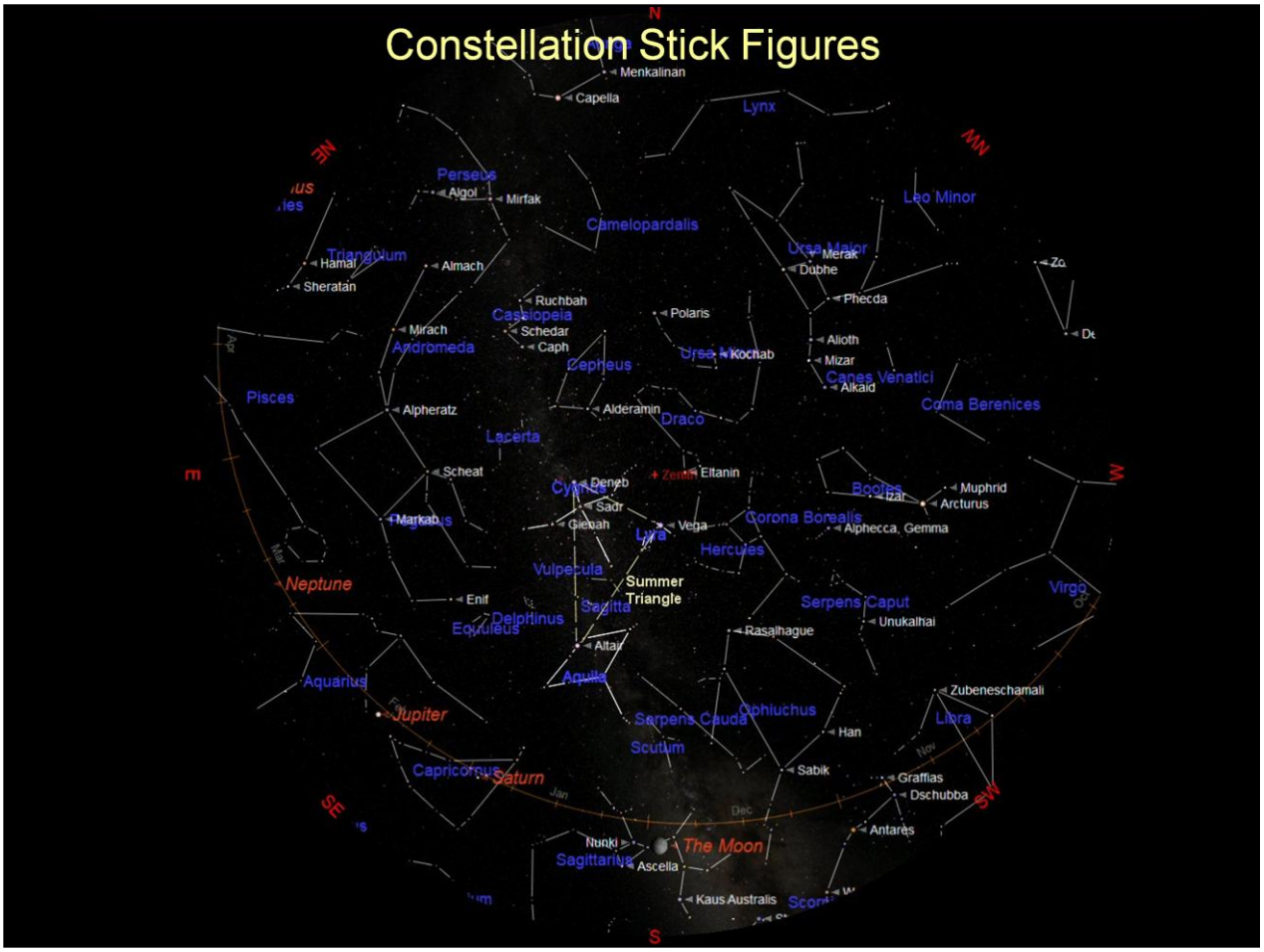
Neptune rises a bit later and needs a telescope to see as a small disc.

The curved line across the bottom of the chart is called the ‘Ecliptic’.

This is the imaginary line along which the planets appear to move across the sky.

The apparent movement of the planets is due to the rotation of Earth.

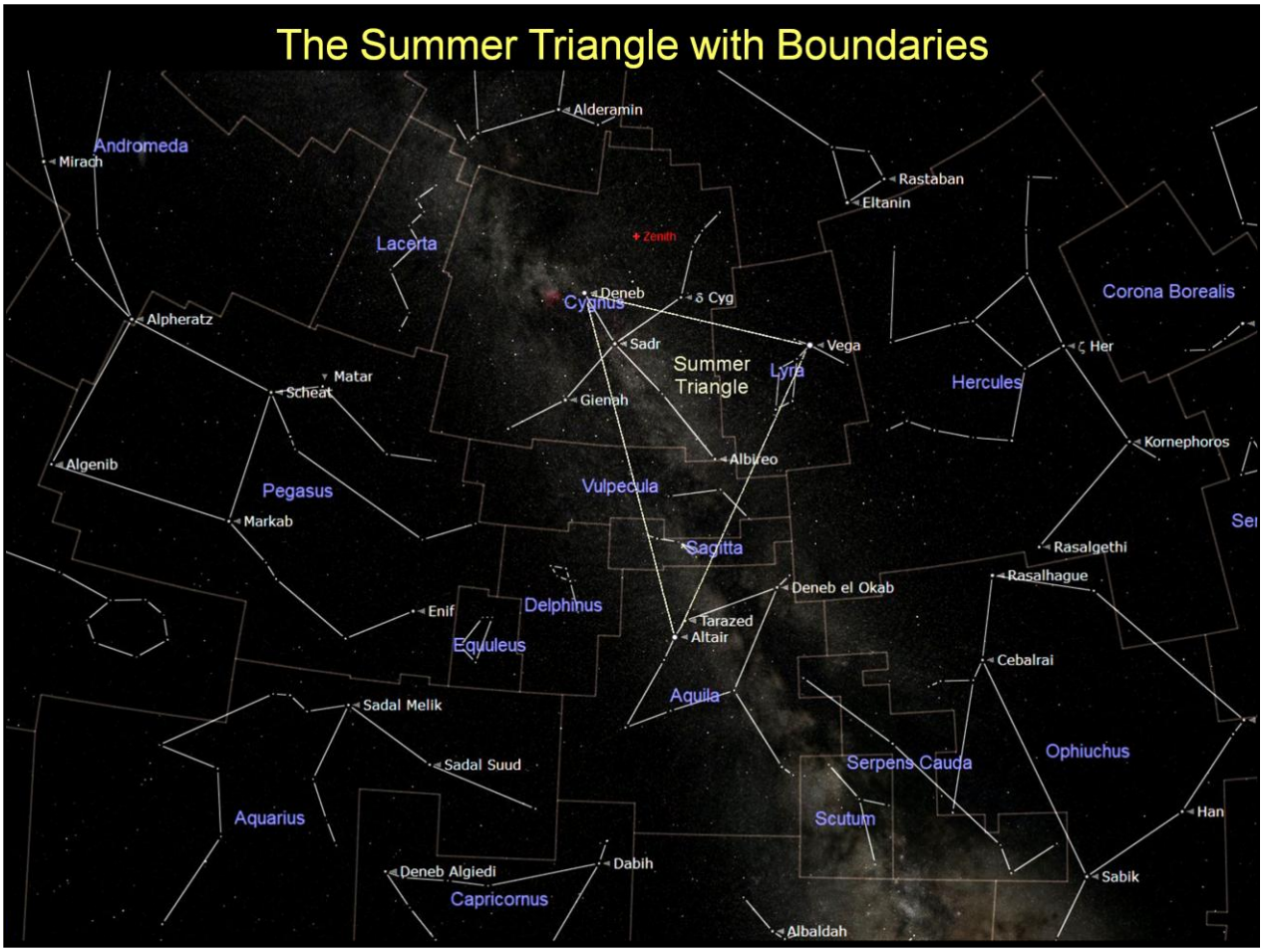
The Moon and the Sun also appear to move along the Ecliptic.



The chart above shows the constellations visible from the northern hemisphere.

There are 88 internationally recognised constellations in the whole sky.

Most of the southern hemisphere constellations are not visible from the UK.

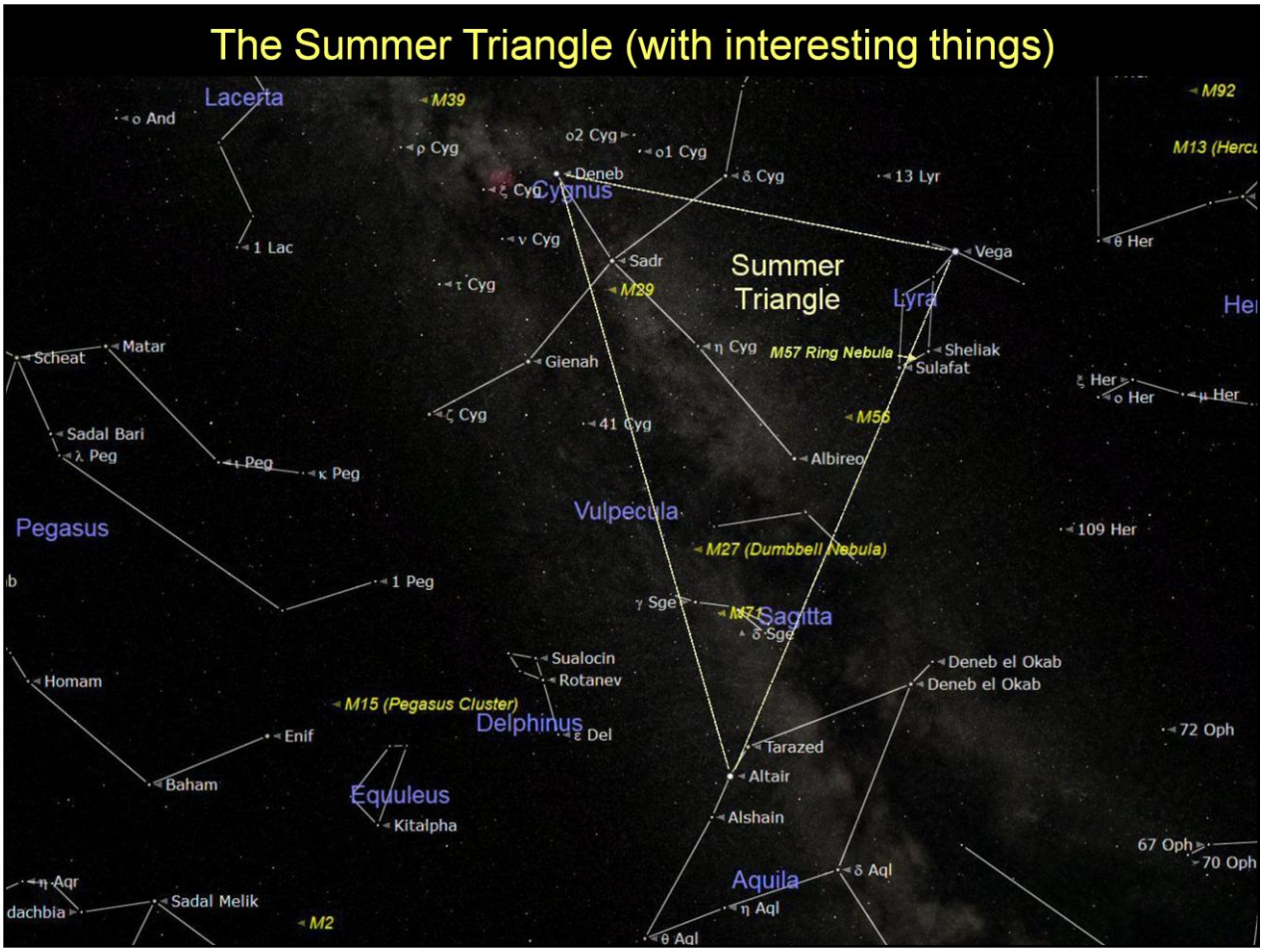


The chart above shows the Summer Triangle with the internationally recognised boundaries of the constellations included.

We do not normally use the boundaries because they are very difficult to relate to the real sky and equally difficult to remember.

Astronomers generally use one the stars in a constellation to begin giving directions to a point of interest in the sky.

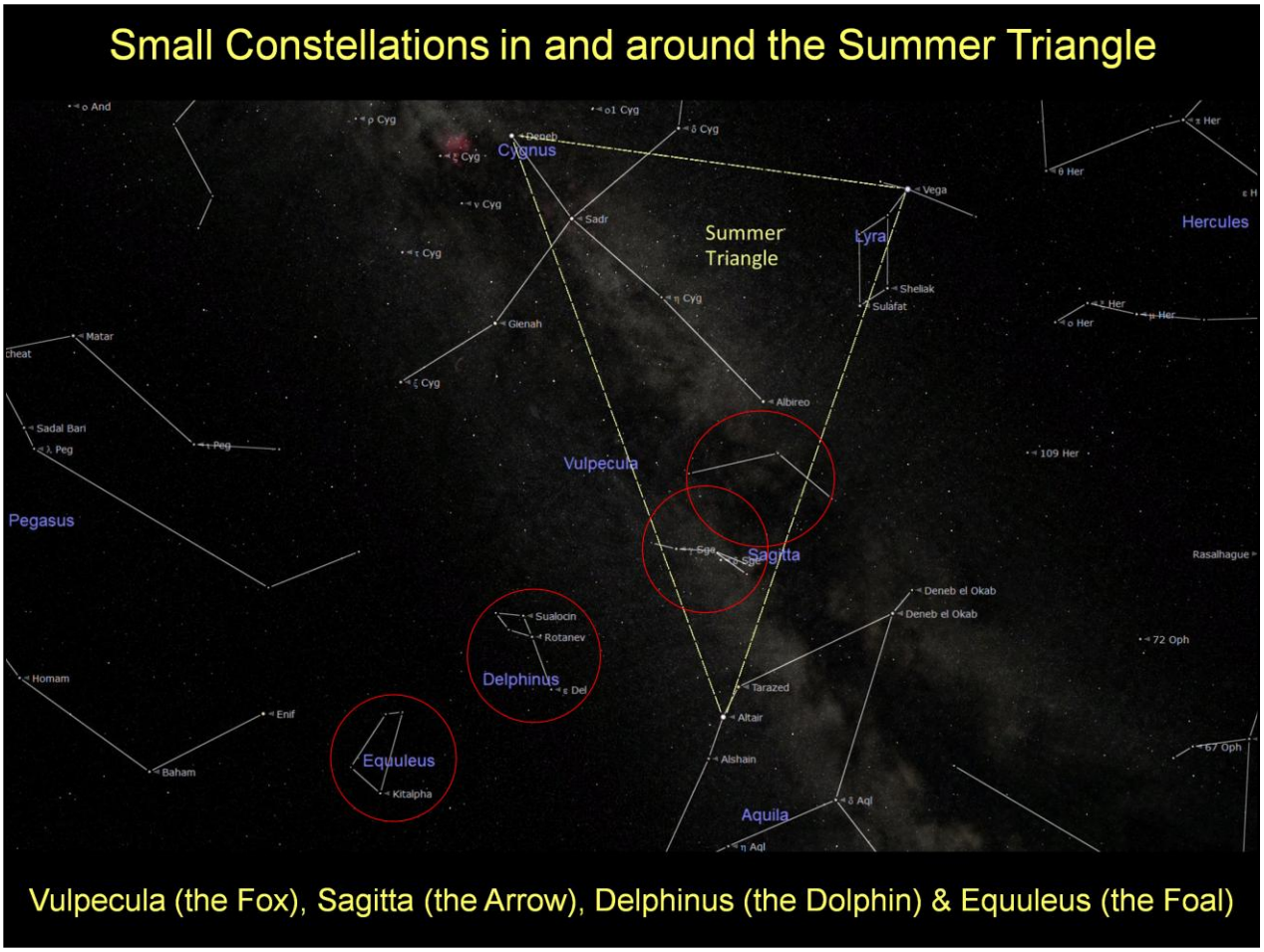
Using directions to other stars in sequence we describe a trail leading to that point of interest. We call this ‘Star Hopping’.



The three stars at the corners of the Triangle are bright and can be easily recognised.

Once the Summer Triangle has been recognised it can be used to identify the other stars and constellations around it.

We can then search out other interesting objects located in the constellations of this area of the night sky.

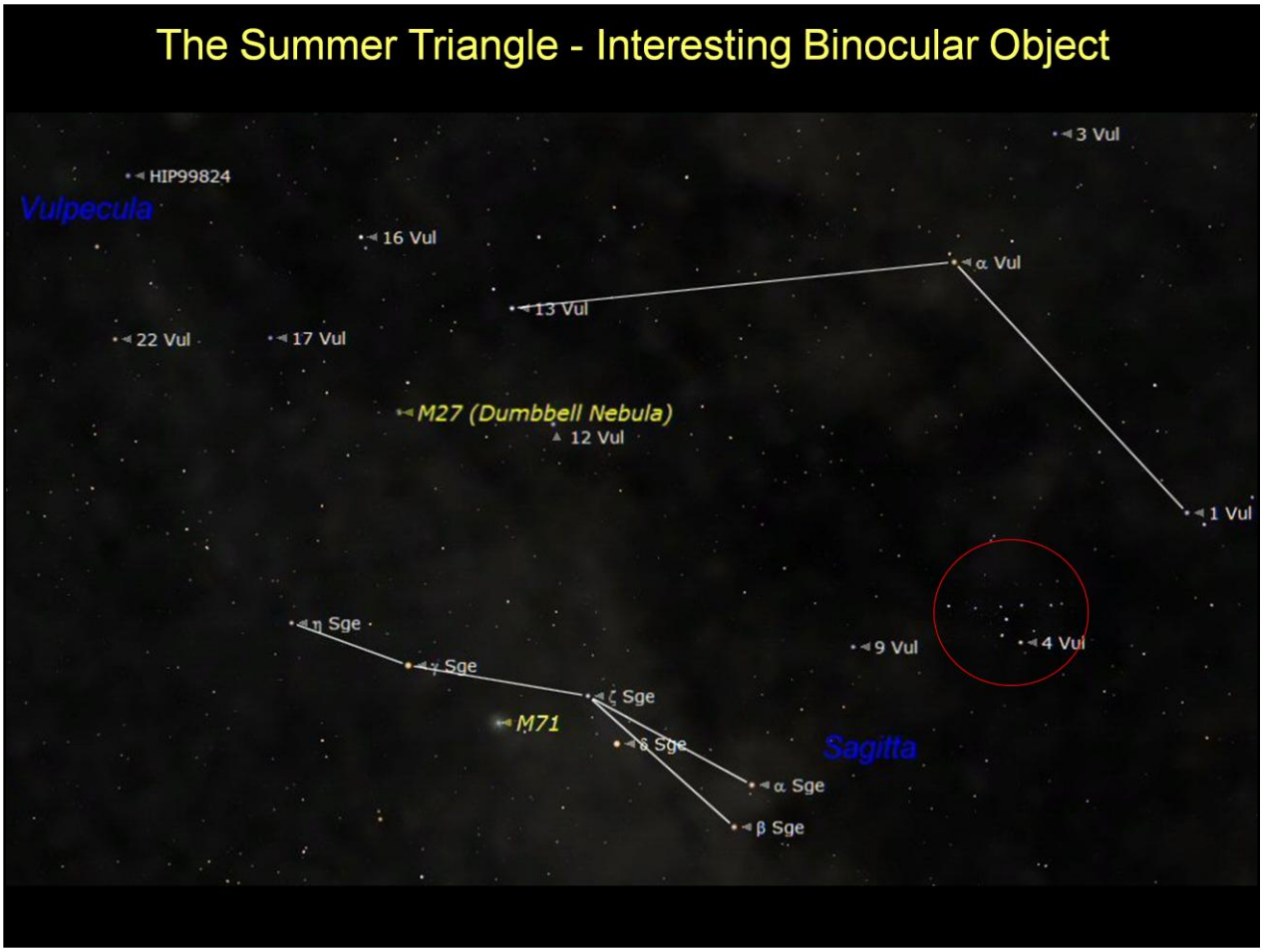


There are also some interesting small constellations in and around the Summer Triangle.

These small constellations are Vulpecula (the Fox), Sagitta (the Arrow), Delphinus (the Dolphin) and Equuleus (the Foal).

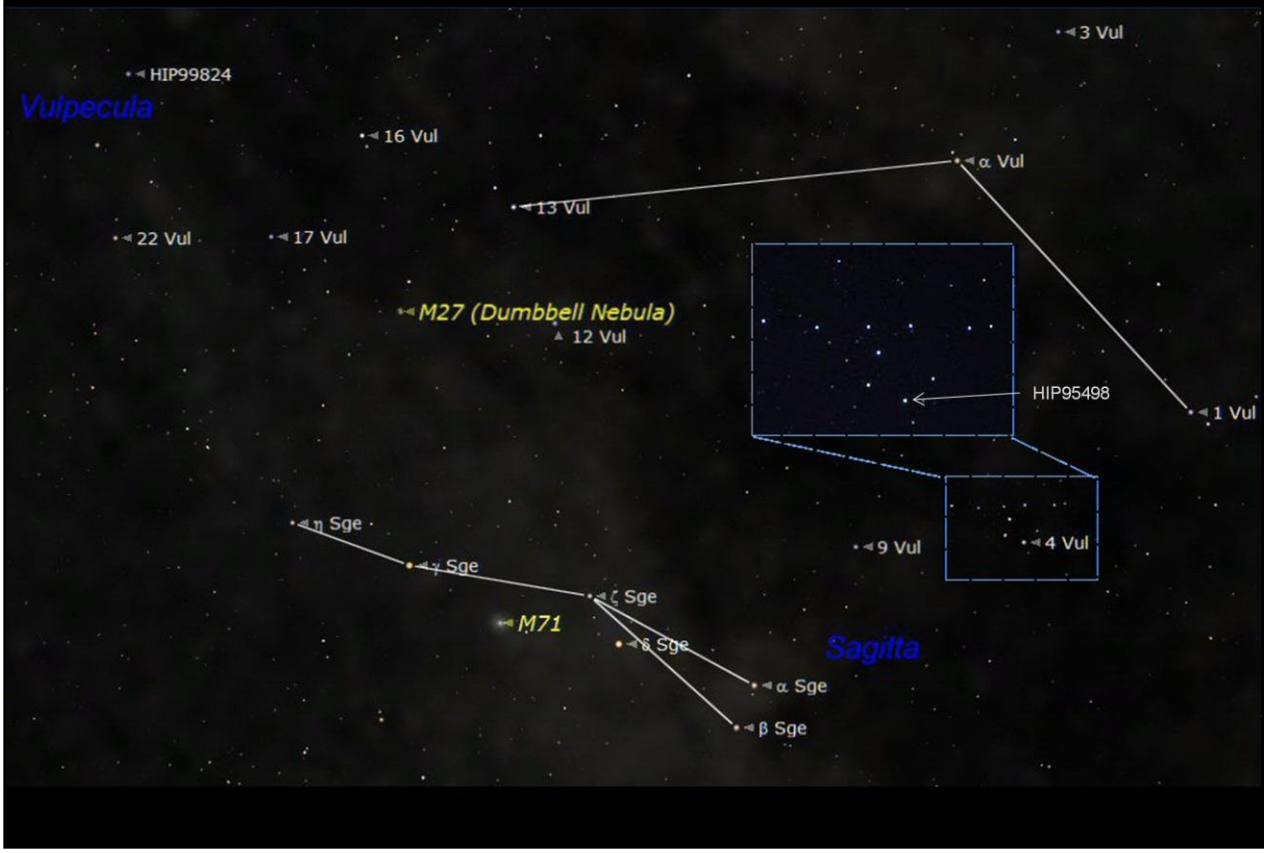
These can be found in the bottom half of the Summer Triangle on the chart above and to the lower east (left).

Sagitta (the Arrow) can be used to find a rather strange but interesting Asterism (pattern of stars).



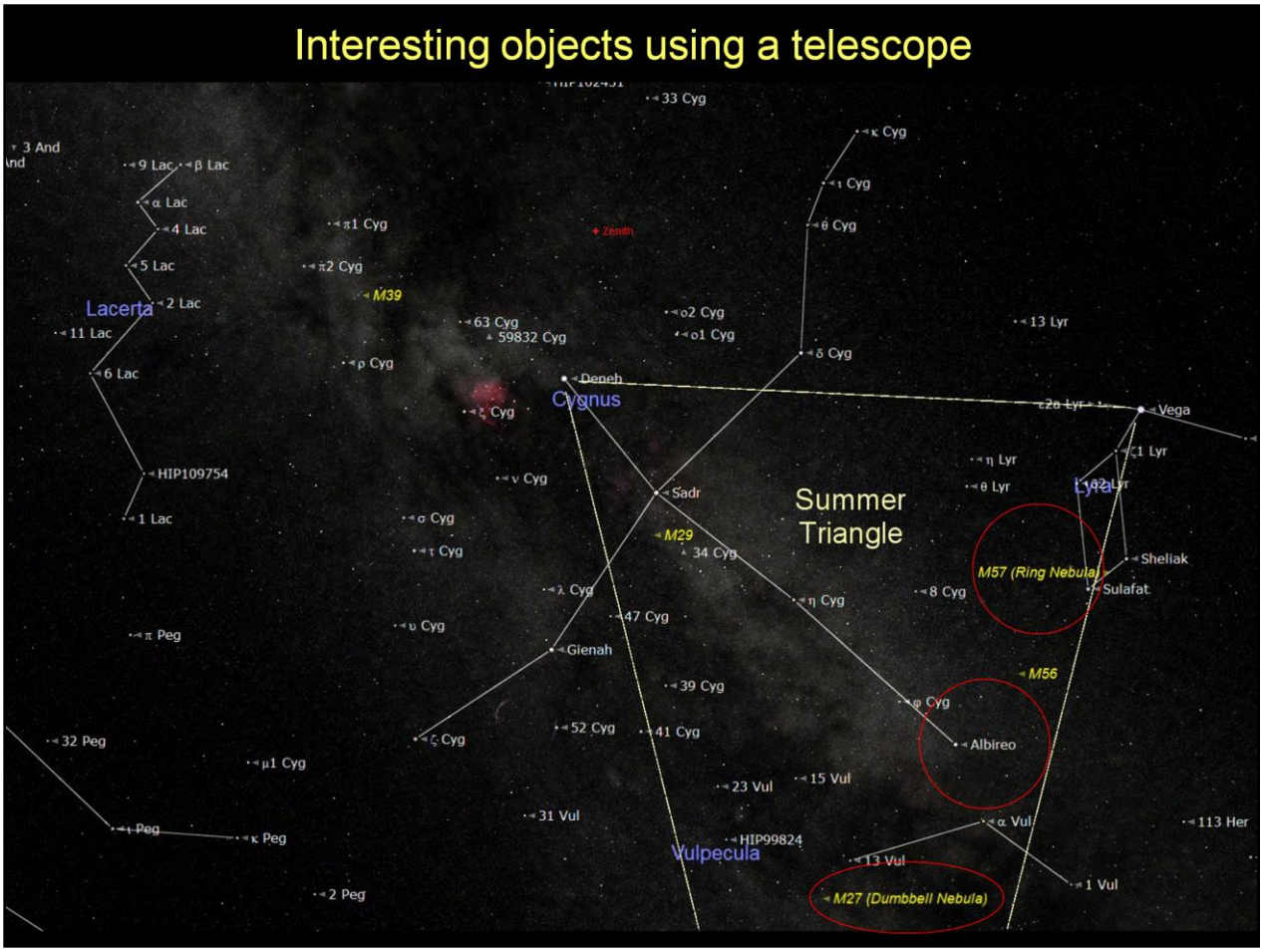
Sagitta (the Arrow) is one of the few constellations that does actually look like what it is named after, it looks remarkably like an arrow. The arrow can be seen just using our eyes (naked eyes) on a clear night and away from the street lights. Those with keen eyesight may see a small patch of light about half way between the 'flight feathers' of Sagitta and the rather faint westerly star 1 Vulpecula. A pair of binoculars (even a small one) will reveal a group of stars.

The Summer Triangle - Interesting Binocular Object



This is a small asterism (group of stars) that looks remarkably like an up-side-down coat hanger.

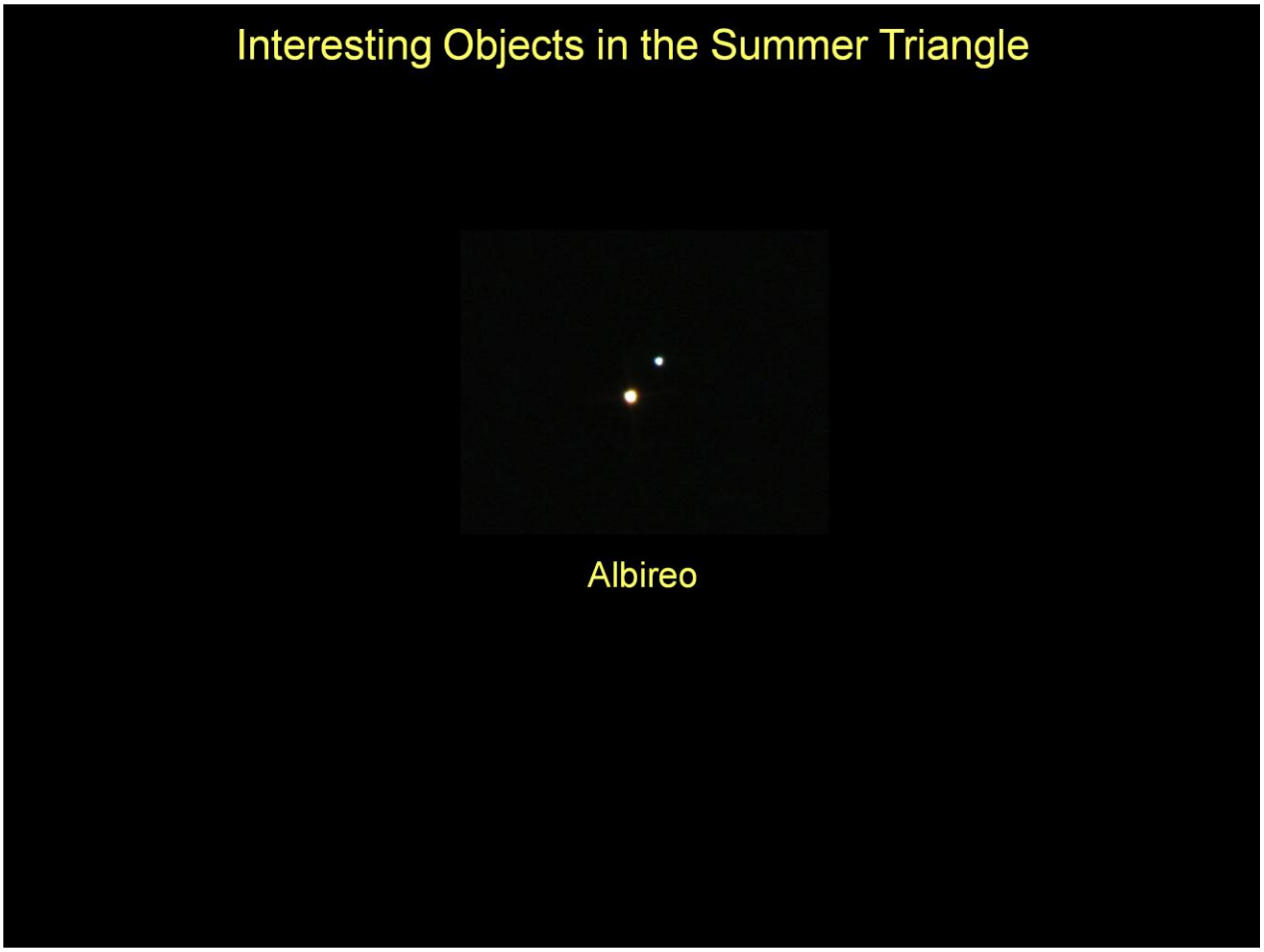
To find the Coat Hanger first find the arrow flight feathers using binoculars then sweep up (north) and to the right (west) to see the amazing shape that should come into view.



The chart above identifies three objects in the upper part of the Summer Triangle that are well worth looking for.

These are the star Albireo in the ‘head’ of Cygnus the Swan.

Messier 57 (M57) in Lyra and Messier 27 (M27) in the constellation Vulpecula (the Fox) a small constellation within the Summer Triangle.

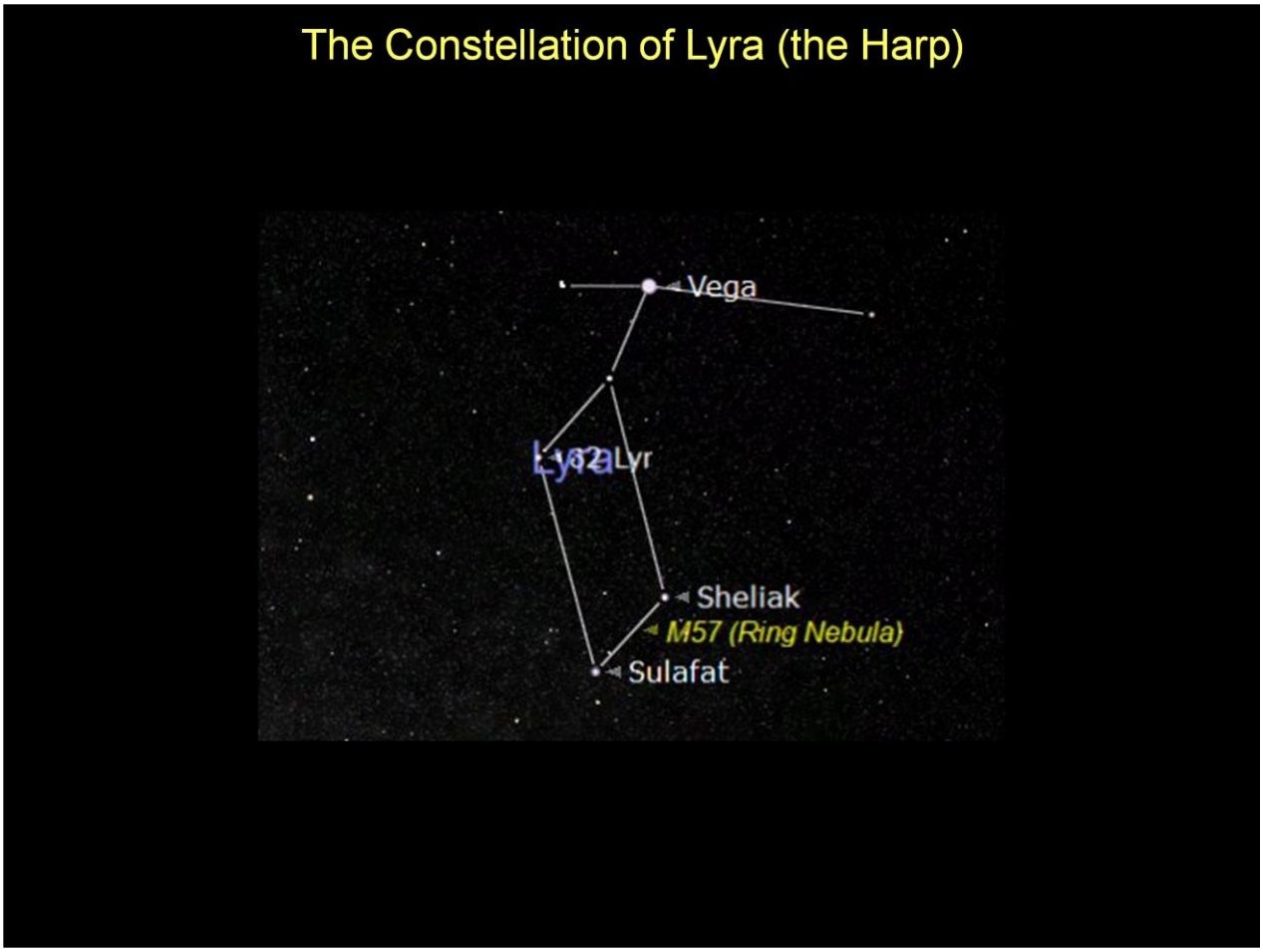


Albireo is the fainter star that denotes the head of the Swan in the constellation of Cygnus. When viewed with the 'naked eye' it appears like any other star but when viewed using a telescope it is seen as a beautiful 'Double Star'. The majority of stars (about 60%) are thought to be double or multiple star systems.

There are two types of double star. The first is a true Binary Star System where the pair (or less common triple or more) are gravitationally associated. This means the stars orbit each other or more precisely orbit a point in space between them called the Common Centre of Gravity. This is rather like a pair of skaters holding hands and spinning around a point that is located at or near their clasped hands.

The second type of binary star is much less common. This is where two stars appear very close together but are in fact just located in the same place in the sky. We call this a 'Line of Sight Double'. Albireo is this type of double star and appearance is quite deceptive. One star is brighter and golden yellow in colour while the other is fainter and distinctively blue in colour.

We know that blue stars are very large and extremely hot but yellow or orange stars are much cooler. Therefore we can tell the fainter looking blue star is much further away and the smaller yellow star is closer so it is a 'Line of Sight' double star.



The chart shown above is the ‘stick figure’ representing the constellation of Lyra (the Lyre or small harp).

The diamond or parallelogram shape of the four stars below Vega are called ‘the Lozenge’ and can be found easily with the naked eye in a dark sky.

About 2/3 of the way along the imaginary line between the stars Sulafat and Sheliak a deep space object can be found this called Messier 57 (M57) the Ring Nebula.

Interesting Objects using a telescope

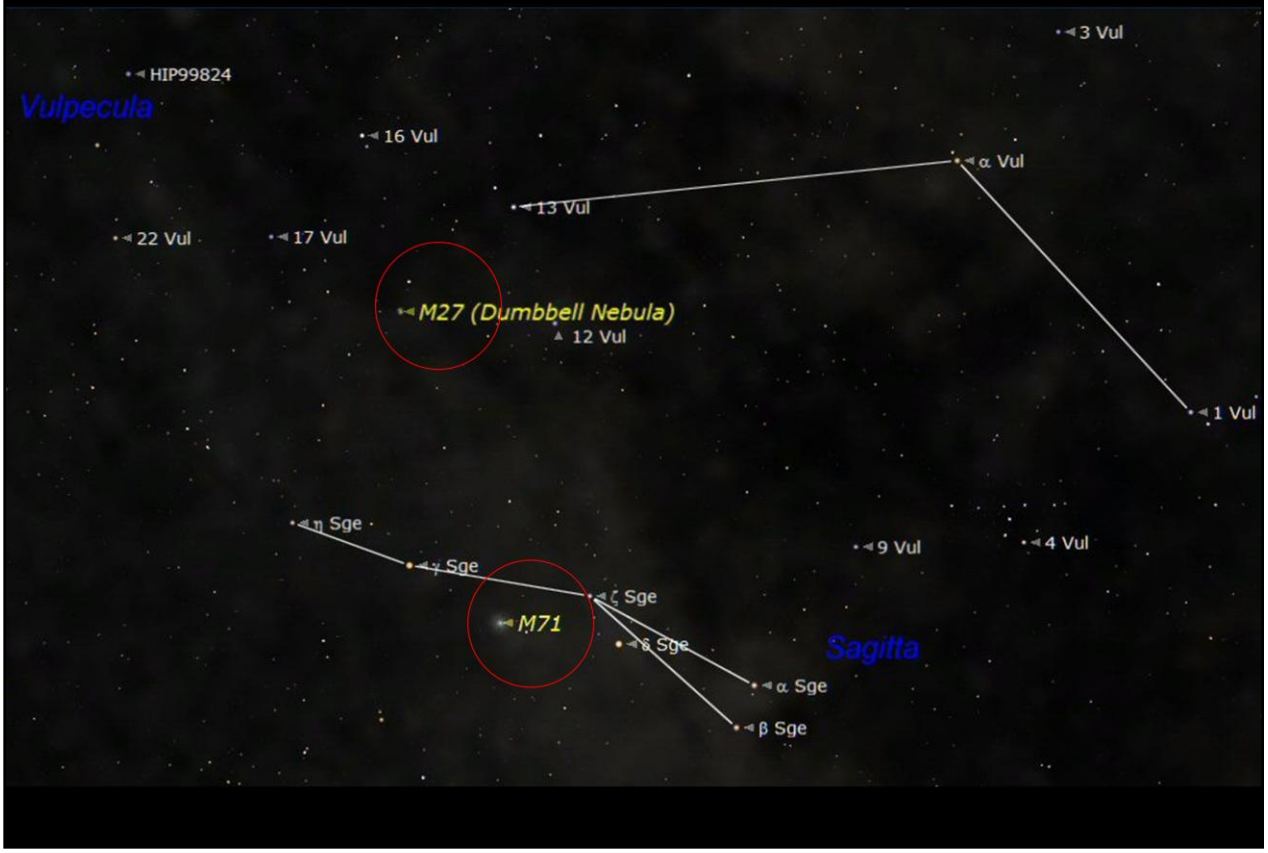
Messier 57 (M57) The Ring Nebula

Messier Objects are Deep Sky Objects that are located far outside our Solar System. There are 110 deep sky objects listed in the Messier Catalogue produced by Charles Messier in the 18th century. Messier was a comet hunter who also found comet like objects that proved not to be comets so he listed these as objects to be ignored. These are now the objects that beginners to astronomy seek out.

Number 57 (M57) in Messier's Catalogue is a object known as a Planetary Nebula. This is nothing to do with a planet, it just looked like a planet when viewed through the relatively primitive telescopes in the time of Messier. We now know it is a star much like our Sun that has exhausted its fuel supply. As its fuel began to run out it expanded to become a Red Giant Star. When its fuel was completely exhausted it could no longer produce the energy to push out against the inward force of its own gravity. The star slowly collapsed under its gravity and became compressed into a tiny White Dwarf Star. The outer layers of the Red Giant were left behind to drift away and produce a giant bubble surrounding the remains of the dying star.

We see the bubble of gas surrounding M57 as a ring because we see more material through the outer part of the bubble and see less material when we look straight through the side of the bubble. M27 is similar but something has distorted the bubble to produce denser lobes. M27 can be seen using binoculars but M57 cannot.

The Summer Triangle - Interesting Binocular Object



There are also some interesting small constellations in and around the Summer Triangle.

These small constellations are Vulpecula (the Fox), Sagitta (the Arrow) and Delphinus (the Dolphin).

These can be found in the bottom half of the Summer Triangle on the chart above and to the lower east (left).

Vulpecula (the Fox) has been discussed in the previous slides but the constellation shape is uninteresting

However Messier 27 is just visible using binoculars on a clear dark night.

A telescope is needed to see the small and faint star cluster M71.

Interesting Objects in the Summer Triangle

Messier 27 (M27) The Dumbbell Nebula

Messier object Number 27 (M27) in Messier's Catalogue is a object known as a Planetary Nebular.

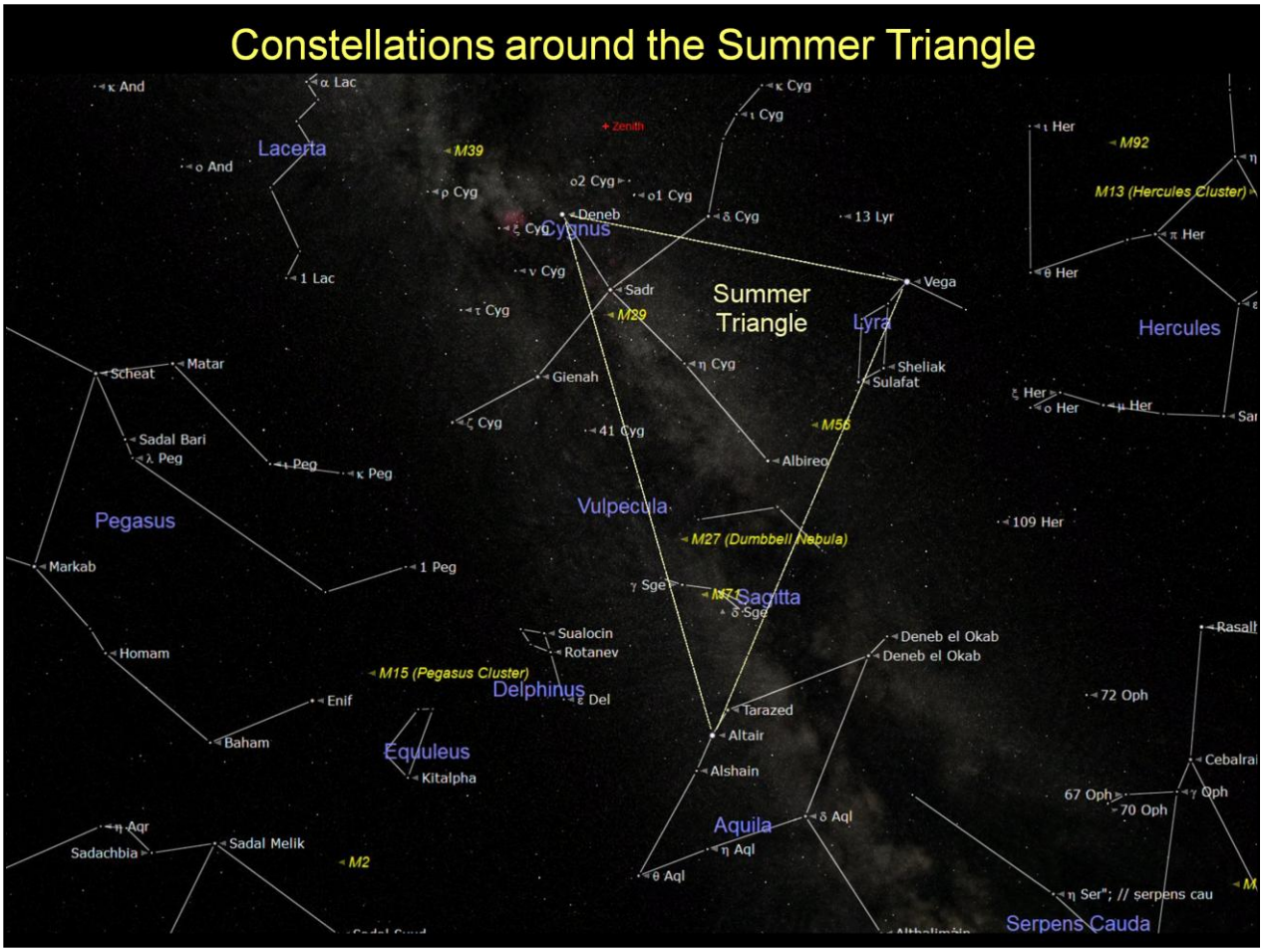
This is nothing to do with a planet, it just looked like a planet when viewed through the relatively primitive telescopes in the time of Messier.

We now know it is a star much like our Sun that has exhausted its fuel supply and collapsed to form a White Dwarf Star.

M27 is similar to M57 in Lyra but something perhaps the presence of planets or a very strong magnetic field has distorted the bubble of gas to produce two lobes.

M27 appears larger and can just about be seen using binoculars in the clearest and darkest skies but M57 cannot.

M27 is best seen using a telescope and fitted with a low power eyepiece. It appears as a hazy patch of light that is shaped like a butterfly when seen using a larger telescope.



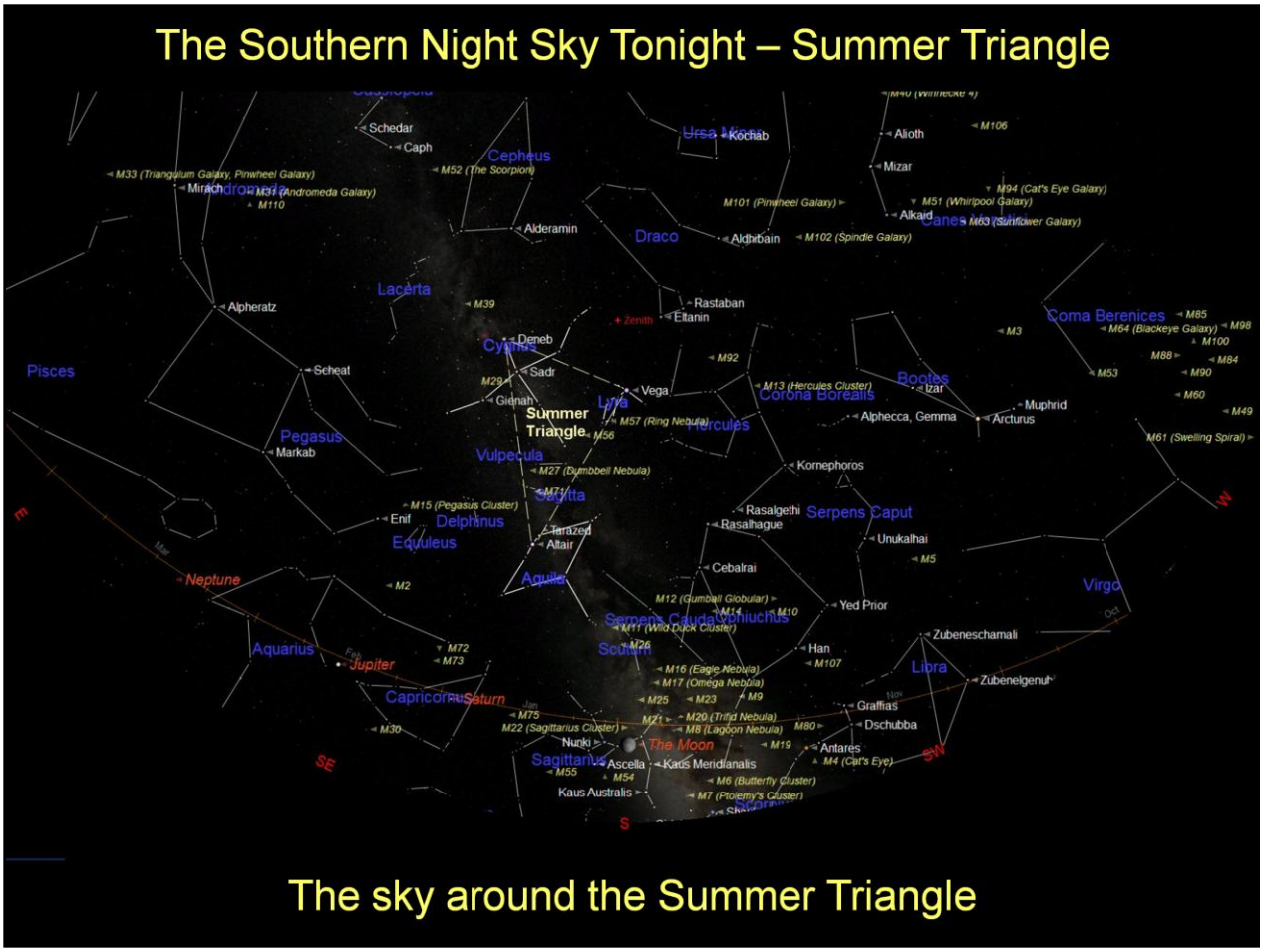
There are also some interesting small constellations in and around the Summer Triangle.

These small constellations are Vulpecula (the Fox), Sagitta (the Arrow) and Delphinus (the Dolphin).

These can be found in the bottom half of the Summer Triangle on the chart above and to the lower east (left).

Vulpecula (the Fox) is indistinct and uninteresting however it hosts Messier 27 (M27) a Planetary Nebula that is just visible using binoculars on a clear dark night.

Delphinus (the Dolphin) is a small asterism (pattern) of four stars arranged in a ‘diamond’ shape that represents the dolphin’s body and a further star looking like its tail as it leaps out of the water. It is best seen with the naked eyes because it may be too large to fit into the field of view of some binoculars.



Once we have identified the Summer Triangle and become familiar with its shape and position in the sky we can use it as a signpost to other (less obvious) constellations.

To the East is the Great Square of Pegasus with the constellation of Andromeda joined to the star Alpheratz at the North (top) east (left) of Pegasus.

To the west (right) of the Summer Triangle is the constellation of Hercules (the Strong Man) and Boötes (the Herdsman) with its bright red star Arcturus.

The objects marked in yellow on the chart above are the interesting Deep Sky Objects that new astronomers should search out with their telescope if they are fortunate enough to have one.

This presentation (with notes is on the)

Beginner's Website:

www.naasbeginners.co.uk