

The Bright Constellations

Produced by the Wynyard Woodland Park

Planetarium and Observatory

The Wynyard Woodland Park Planetarium and Observatory

The Wynyard Woodland Park Planetarium and Observatory are located on the popular Wynyard Woodland Park (formerly the Castle Eden Walkway Country Park) near Thorpe Thewles, Stockton-on-Tees, Teesside in the North-East of England. The park is just outside Stockton on the A177 (Durham Road). These facilities complement and supplement the nature-based educational activities provided by the Woodland Park through the extension of the ideas of conservation on our own planet and setting it and our place in the natural universe, (for more information on Parks & Countryside division).

The planetarium boasts a Goto Eros E5 star projector made in Japan (the main teaching instrument) and a lovingly-restored Spitz A1 projector made in Philadelphia (backup instrument), shining onto a 7-metre dome in a 72-seater auditorium, (with provision for 6 wheelchairs). It links electronically to the nearby observatory so that the planetarium audience can view the splendours of the night sky (as long as the weather is good) from the comfort of former cinema seats!

The planetarium regularly hosts remote observing sessions with telescopes on), Las Campanas, (Chile), the Liverpool Telescope (National Schools Observatory - La Palma) and the new Faulkes Telescopes in Hawaii & Australia.

The facility is open to schools, colleges and the local community and is available during week-days. Evening and weekend bookings can be made by arrangement. Contact Dr Ed Restall on 01740 630544 at the planetarium, or 01740 630011 at the Visitor Centre.

Public shows are every second Friday evening during the month at 7:30p.m. and last for just over an hour. During the winter period (September – April) public viewing sessions take place every Friday evening after 9.00. The viewing sessions will only take place if the night sky is clear.

Bookings for group shows at other times can be made on the number above as long as they don't interfere with the weekday educational programme of the building.

Please see the Planetarium Website www.wynyard-planetarium.net for details of current shows.

Dr Ed Restall, Director, Wynyard Woodland Park Planetarium and Observatory, 2007

The Bright Constellations

by Bob Mullen, Cleveland and Darlington Astronomical Society

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Introduction

If you are lucky enough to live in a very dark location without too many house lights, street lights, factory lights or other bright sources you may see many more stars than we show in this booklet. Unfortunately, many of us live in areas of bright lighting that saturates the night sky, we call this 'light pollution'.

Light pollution has the effect of swamping out the light from the fainter stars and only leaves the very bright stars. All is not bad news, if you wish to see a great deal more stars than are visible in your neighbourhood it is an easy matter to just travel to somewhere in the nearby countryside. In our North East region this could mean travelling south to the Yorkshire Moors, travelling north to the Northumbrian hills or travelling west to the Pennines or the Lake District. On clear cloud-free nights all these wonderful parts of the countryside offer a view of the stars that we in turn present to you in our Planetarium.

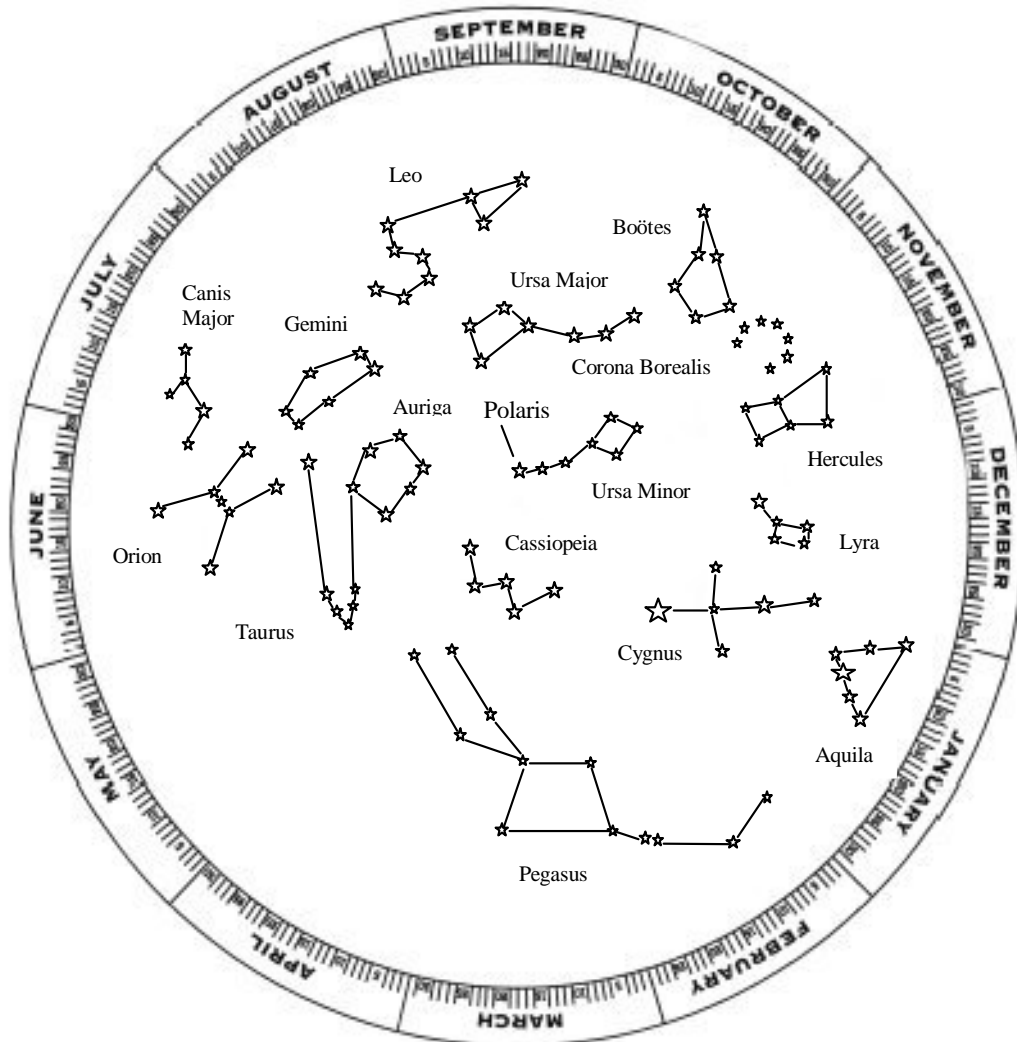
If, on any clear night, you only have the opportunity to look at the stars from your back garden or a nearby playing field don't despair. With the aid of this booklet you will be able to see and eventually recognise all the bright constellations shown in our drawings. In fact, we have found the lack of so many stars in our back-gardens is sometimes an advantage in starting constellation recognition. In the clear skies of the countryside there are often too many stars to make any sense to the beginner, it seems almost impossible to detect the imaginary lines of the constellations and then produce a recognisable shape.

So, for beginners, the back garden is an ideal place to start your journey round the sky. At first it is simple enough to just use your unaided eyes as the bright stars in this booklet's constellations are easily visible, no visual aids such as binoculars or telescopes are really necessary at this stage.

It is possible to obtain specific star maps for the night you are observing. These are available in any of the monthly astronomical magazines on sale at Newsagents. Alternatively call into the WWP Planetarium and pick up a current sky map.

Bob Mullen , 2007

The Bright Constellations



The chart above shows the bright constellations we will discuss in this book that can be seen above the North East region around the year. Because of the Earth's annual orbit round the Sun not all constellations can be seen at the same time, some constellations move into our daytime sky whilst others appear in our night sky. To use the chart - choose the month and day in which you are observing Those constellations nearest this position on the edge of the chart will be due North and above the horizon at late evening. Because of its position directly above the North Pole, the end star of the Ursa Minor constellation, Polaris, stays in exactly the same place every night, all other stars rotate in an anti-clockwise direction.

Constellations and Stars

When viewing in a darkened area such as night-time on the Yorkshire Moors or the forests of Northumbria the sky appears to be full of stars. So many it is sometimes very difficult to make any sense out of them, certainly sensible patterns do not jump out at you. We are lucky in modern days that most of this work has already been done for us, in fact most constellation patterns date back three to four thousand years ago.

Imagine all those thousands of years ago when there was no light pollution in the sky and at the same time very little entertainment during the evenings and nights. The early Babylonians, Greeks, Romans and Arabs turned to the skies for their entertainment. The starlit sky can be regarded as a huge dot-to-dot puzzle where imagination can form shapes of animals and objects that were part of their everyday life as well as the myths and legends centred round their many Gods.

After thousands of years these stories have stayed with us and, as the stars have not moved very far from their original positions, the constellations can still portray their original outline. Only the increased light pollution of modern days has spoiled the view of the fainter stars that completed the shapes as seen by the ancients.

As a result of the history contained in these constellations most of them have difficult to remember names (e.g. Ursa Major and Minor, Cassiopeia, Boötes etc.) originating from the languages of those days. However, it doesn't take too long after a number of nights learning the constellations to find that these names quickly roll off the tongue, impressing both your family and friends. In fact we are very lucky living north of the Equator because the ancient European civilisations lived entirely in this hemisphere and produced stories which we can still relate to today and enjoy .

Unfortunately, because Europeans did not visit below the Equator until more recently the constellations south of the Equator carry few exciting stories with them. In fact most of the southern constellations were named by a very boring Frenchman, Lacaille, just after the French Revolution, who insisted, as was his right as their discoverer, on providing scientific names such as Pyxis the compass, Horologium the clock, Telescopium the telescope and Reticulum the graduated eyepiece - not very exciting subjects to catch your imagination!

Because there arose confusion in the recent world over various versions of constellation patterns, the modern astronomer decided to limit the number of accepted constellations to 88 and laid down accepted outline boundaries of the areas covered and the stars contained within those boundaries. This seems to be a bit of shame for those other ancient cultures that used the same stars in the skies, making up their own dot-to-dot patterns to suit their own myths and legends. The North American Indians, the Chinese, the Indians, the Australian Aborigines and lots of other peoples have their own constellation patterns and still pass on the stories to their children. If you become very interested in the constellations you may want to read these fascinating stories, they are obviously very different from our own but provide a glimpse of their own histories and beliefs.

One thing to remember is that the patterns we see in the sky aren't really placed in this way just for our entertainment. The ancient skywatchers made up their patterns from

the way the stars helpfully formed themselves on the flat two dimensional sky. If looked at in three dimensions you will find most of the stars in the patterns are considerable distances from each other. With time, actually lots of time - probably over millions of years, the stars will eventually drift apart from each other and spoil the pattern and thus the stories.

Talking of stars moving you will notice, when observing the constellations, that the stars move across the sky as the evening progresses. This, of course, is caused by planet Earth rotating on its axis over a 24 hour period. The stars actually stand still in the sky both night and day while we on the surface of planet Earth whizz round our North-South axis at about 1000 kilometers per hour rotating from West to East. This gives the impression to us on Earth that the stars are whizzing past us from East to West. If we stayed out observing all night this would give us a view of many constellations rising in the East and setting in the West, a wonderful experience.

Of course not all constellations you are seeing actually rise and set. If you watch the Ursa Minor (Little Bear) constellation and concentrate on the star at the end of the Bear's tail named Polaris (also called the North Star or Pole Star), you will notice this particular star does not move at all whereas other stars around it appear to rotate in a circle, these are the circum-polar stars. Stars further away from Polaris actually disappear below the west horizon and reappear the following night from the eastern horizon. If you travelled south towards the equator and away from the Pole all the stars seen in the sky would be seen to rise and set so this appearance is dependent on how far north (or south) of the Equator you live.

When out constellation watching you will also discover that over the year different constellations are seen in the sky dependent on the time of year, thus we have our winter constellations and different summer constellations. We have already mentioned that stars rise and set due to the Earth's daily rotation. The Earth also has another motion, it revolves around the sun. The Earth's orbit takes it from one side of the sun to the other. In doing so it means that the constellations we see in winter will be hidden behind the sun during summer and will pop out again when winter eventually arrives. The constellation of Orion is an example of a winter constellation and Aquila is an example of a summer constellation.

Finally there is one feature in the sky you may see if you do travel away from your light polluted back garden. Arching across a dark sky from one horizon to the other is a faint and wispy narrow cloud of light. This is the Milky Way, or the galaxy we live in. If you point a pair of binoculars or a telescope at any part of this cloud you will see hundreds and thousands of stars suddenly pop into view. In fact our galaxy is made up from over two hundred billion stars of which our Sun is only a very small and relatively faint member of this galactic family of stars. It is almost impossible to imagine the shape of our galaxy from inside where we live, after all it is difficult to imagine what your own house looks like from the inside. By observing other distant galaxies we can guess that the Milky Way looks very much like a burning, spinning Catherine Wheel firework, a spiral shape which is almost flat top to bottom. Our Sun lives about a third of the way in from the edge of the spiral and like all the other stars in the galaxy it whizzes round at very high speed around the galactic centre.

Ursa Major – The Great Bear - The Plough

Because most of the constellations were developed and named by civilisations of thousands of years ago they had the benefit of incredibly dark skies, totally without our modern type of light pollution. As a result they were able to see a larger number of fainter stars with which to assemble their animal and object constellations. Today it is almost impossible to see the overall shapes they dreamed up because the fainter stars are just no longer visible in most locations.

Perhaps we have to exercise greater imagination than the ancients to visualise the actual shapes. However, this doesn't prevent our forming a mind association with the name of the constellation and discernable shapes that exist within the constellations.

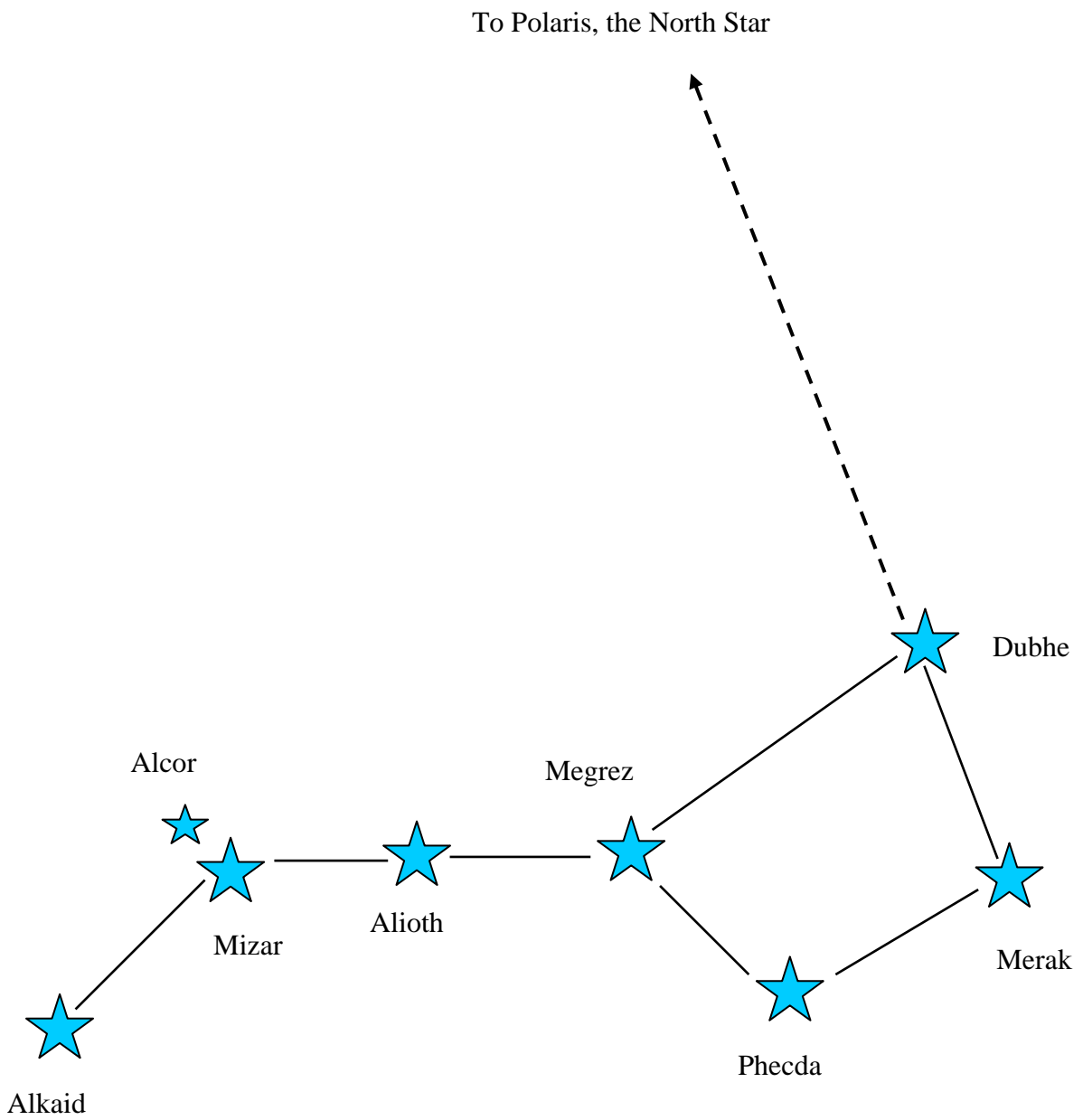
A case in point is Ursa Major, the Great Bear. Some skilled modern-day astronomers can pick out every star that represents the original constellation. In some cases it may be necessary to move from naked eye to binoculars to pinpoint the fainter stars. With the Great Bear it is fortuitous that seven of the original stars actually form a sub-shape within the main constellation. These stars can represent different shapes in different cultures. Keep in mind the night sky we see in the Tees Valley is also visible in all other northern hemisphere countries and has been unchanged in basic constellation shapes for many thousands of years.

In ancient Britain the seven bright stars were recognised as resembling an early plough, the type either pulled originally by man or later on pulled behind oxen or horses, obviously not so well known today. This name has survived into modern day and suits the shape admirably. The handle of the plough can be recognised in the stars of Alkaid and Mizar, the shaft in Alioth and the cutting blade by Megrez, Phecda, Merak and Dubhe.

In America the seven stars represent the "Big Dipper", a cup with a handle used for dipping into water barrels for drinking water. In France they carry the name of the "Saucepan", again easily recognised. Some students visiting our Planetarium have even dubbed the pattern as the "Shopping Trolley". Thankfully, regardless of the name used, the seven stars and their shape is very easily recognised in the northern sky and we always use this as our first constellation shape in learning the constellations.

Another great benefit to easy recognition is that Ursa Major and the Plough sub-pattern contain circumpolar stars, those that never dip below the horizon as they rotate around the stationary Pole Star. So, every clear night the Plough is always visible in the night sky although not always in the same orientation, sometimes upside down, sometimes the right way up.

Thanks to a wonderful coincidence, the two stars Merak and Dubhe, point directly to the North Star, Polaris. This is the first step we take to finding and recognising more constellations.



Ursa Major – The Great Bear – The Plough

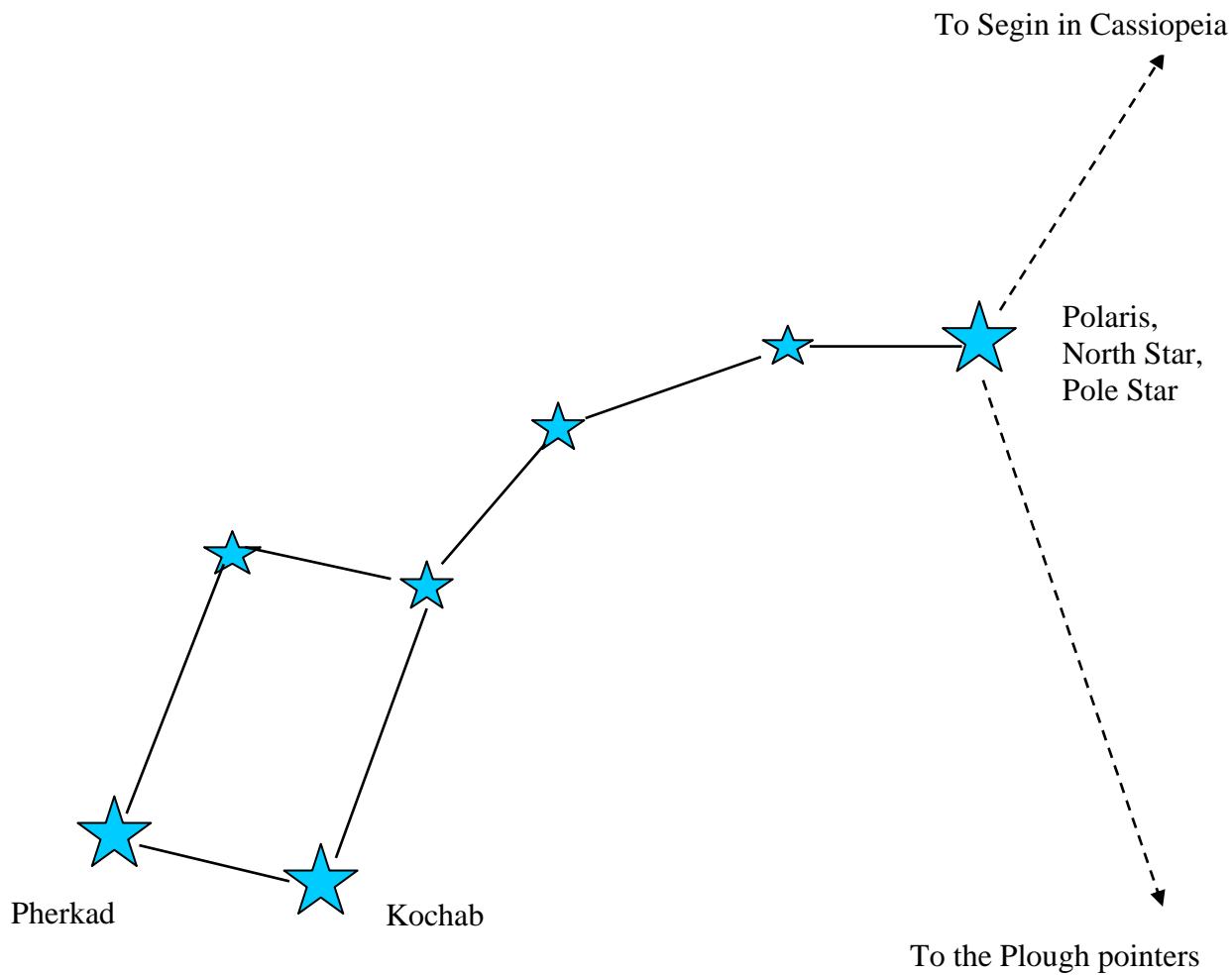
Ursa Minor – The Small Bear

By extending the northward line of the two stars in the Plough, Merak and Dubhe, we eventually reach the North Star in the constellation Ursa Minor, the Small Bear. This star is fortuitously placed in exactly the right position to actually sit at the northern tip of the imaginary spike that passes through the Earth's axis (the North Celestial Pole). As the Earth itself rotates around this axis so do all other stars in the night sky rotate around the stationary North Star.

Another benefit of this stationary star is that it can be used in navigation. Early explorers found they could relate their position on the Earth's surface by measuring the altitude, or height in the sky, of the North Star. This led to the use of Latitude which divides the curve of the Earth running from the Equator to the North Pole into a 90 degree arc. By measuring the angle of the North Star with respect to your horizon with a device such as a quadrant, sextant or octant you can find your latitude. In the case of the Tees Valley we are at latitude of 54 degrees North. If we used a sextant from the Planetarium we would find the North Star sitting at this latitude.

Inhabitants of the Southern Hemisphere are not so lucky as to have such a convenient bright star sitting on the tip of the southern axis. Navigators have to use the nearest constellation such as Crux - The Southern Cross and use cross-reference tables that show their latitude position on the ground relative to stars within this and other southern constellations.

Ursa Major has seven bright stars which look very much like the Plough in Ursa Major but obviously smaller. In America it is very suitably named the "Small Dipper". Again, like the Plough, every star with the exception of the North Star is circumpolar and rotate around the North Star resulting in the shape of the Small Bear completing a complete circle every 24 hours.



Ursa Minor – The Small Bear

Cassiopeia – Queen of Ethiopia

Again the relative placement of the constellations and their component stars can help in easily locating the next constellation Cassiopeia, Queen of Ethiopia.

If a line is drawn northwards from the tail end star of the Great Bear, Alkaid, and through the North Star it will meet the star Segin in the W- shaped constellation of Cassiopeia. As this constellation contains circumpolar stars the whole constellation rotates around the sky every 24 hours, as a result the W-shape could become an M-shape depending on your viewing time during the night.

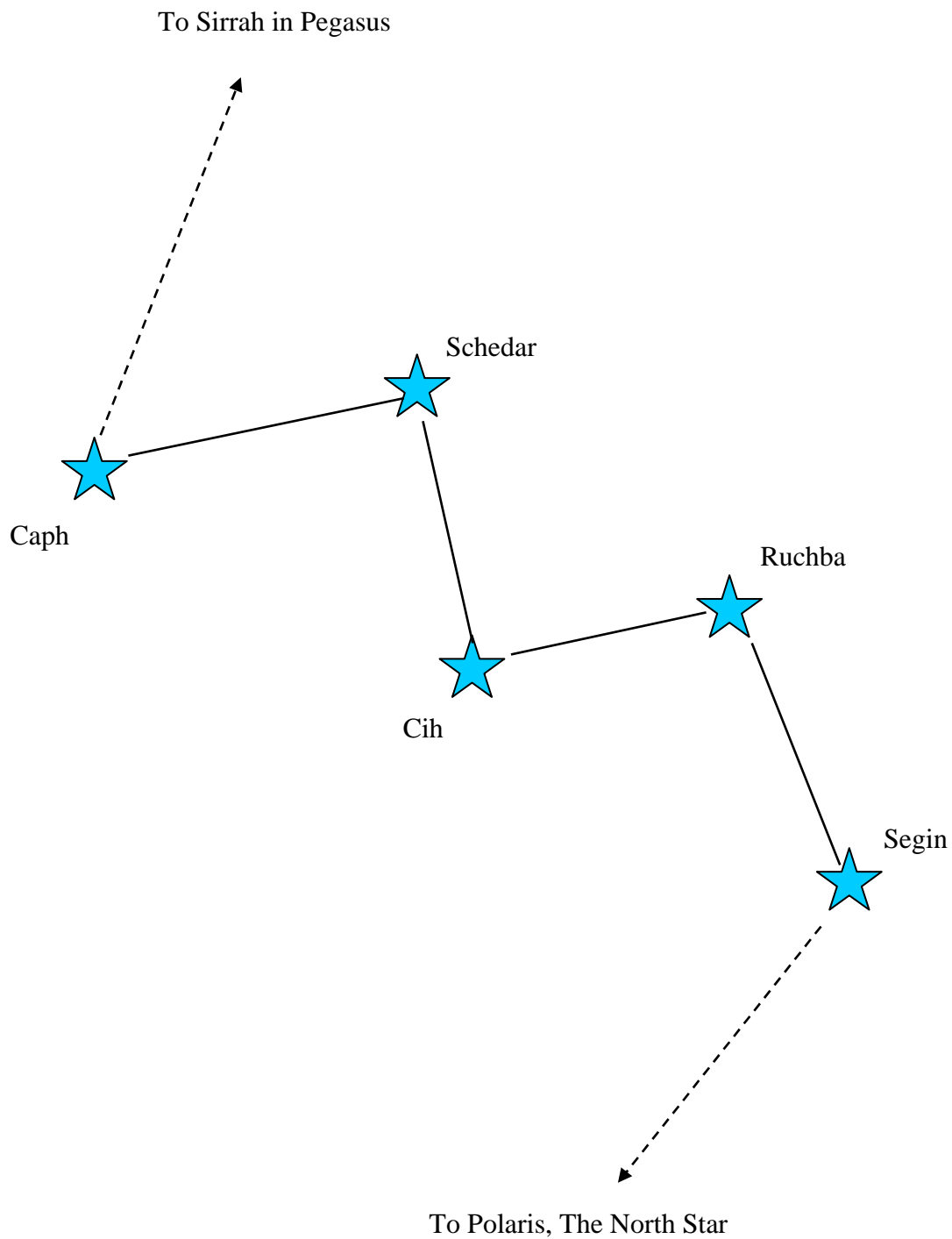
The W-shape of Cassiopeia is meant to represent the chair in which the Queen was cast into the sky by the Gods. A further punishment for her bragging was to hang upside down in the sky for most of the night.

When you travel to darker skies in the country you will find that Cassiopeia lies very close to the Milky Way. It is worthwhile knowing that if you are garden-bound at home you can still see the Milky Way by using a pair of binoculars by pointing them towards Cassiopeia and discovering the hundreds and thousands of stars in the nearby star-stream of the Milky Way.

Constellation stories

This a good place to mention the stories behind the constellation shapes. Cassiopeia was the Queen of Joppa who upset the Gods on Mount Olympus by proclaiming both the beauty of herself and her daughter Andromeda, even more beautiful than the nymphs of the Gods. This boasting led to all sorts of problems for Andromeda and her family, with an eventual rescue from a sea monster by a hero, Perseus, on a winged horse, Pegasus. All the stories of the various constellations handed down from the Greeks and Romans contain this perpetual conflict between the Gods and those living on Earth and provide entertainment even today.

A further book is to be issued by the Wynyard Woodland Park Planetarium and Observatory relating these wonderful stories, “Tales of the Constellations”.



Cassiopeia – Queen of Ethiopia

Pegasus – The Flying Horse

Pegasus can be found by taking a line from the North Star in Ursa Minor through the star Caph in Cassiopeia. This will bring you to the star Sirrah in Pegasus.

Sirrah forms one corner of the Great Square of Pegasus, the other corner stars are Scheat, Markab and Algenib. Sirrah is unusual in that it is shared by two constellations, Pegasus and Andromeda, it officially now belongs to Andromeda. Sirrah also has the alternative name of Alpheratz.

Pegasus is one of the largest constellations and inside The Great Square is one of the darkest areas in the sky for naked eye stars. This large dark area helps in finding the constellation in an otherwise star-studded part of the sky. Also of interest is that some of the fainter stars found inside the square are amongst the most remote objects known.

Star names

It is interesting to note that all four stars of the Great Square of Pegasus have Arabic names, a fashion in contradiction to the mainly Greek and Roman constellation names.

Sirrah means “navel of the horse”.

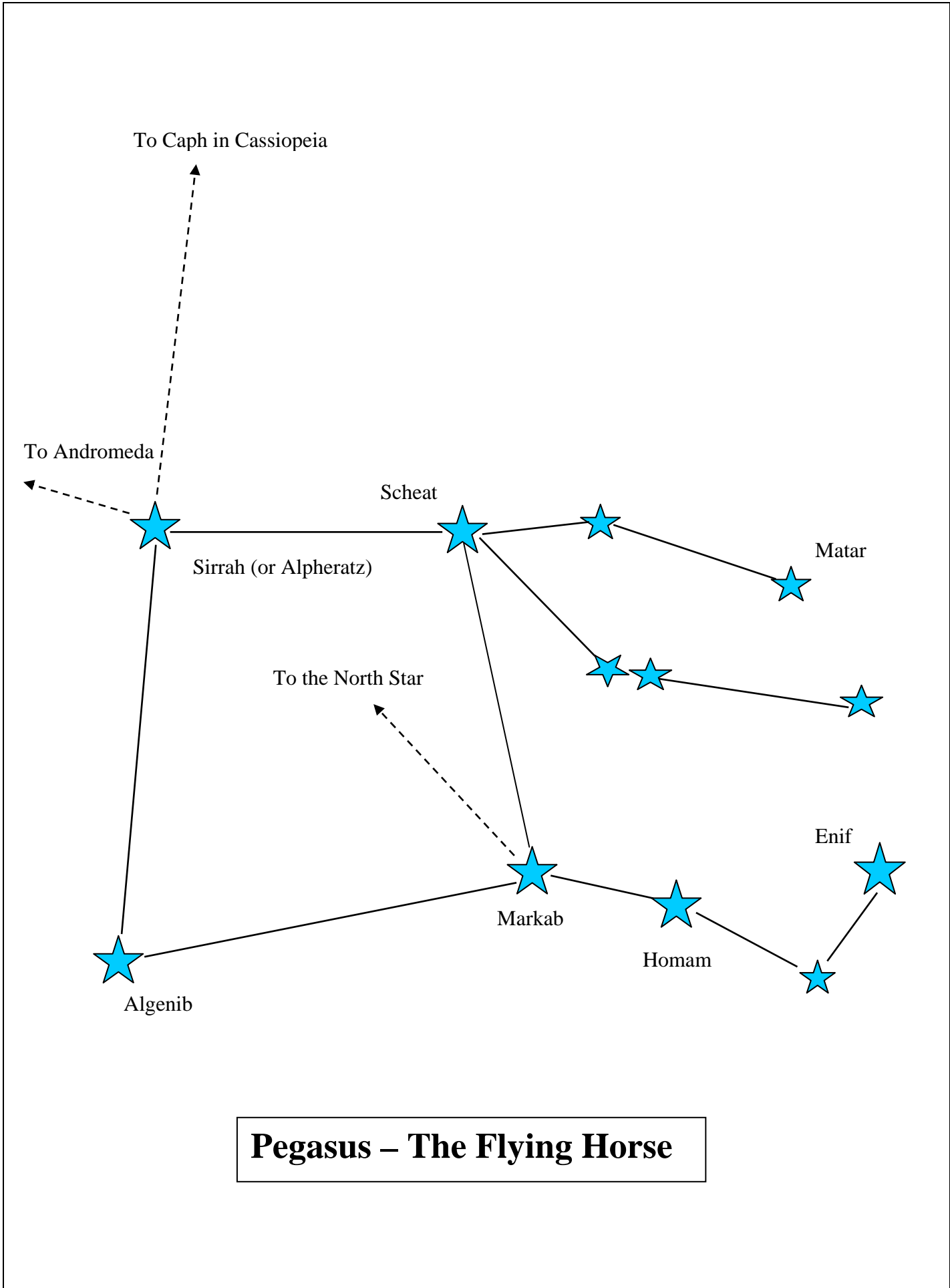
(Alpheratz means “the Princesses Head when used in Andromeda).

Scheat means “the horses shoulder”.

Markab means “the saddle”.

and Algenib means “the wing” or “the side”.

Most Northern Hemisphere names are Arabic, Greek or Roman (Latin).



Taurus – The Bull

Taurus is a non-circumpolar constellation. It disappears from the night sky when it dips below the horizon and reappears above the horizon hours later.

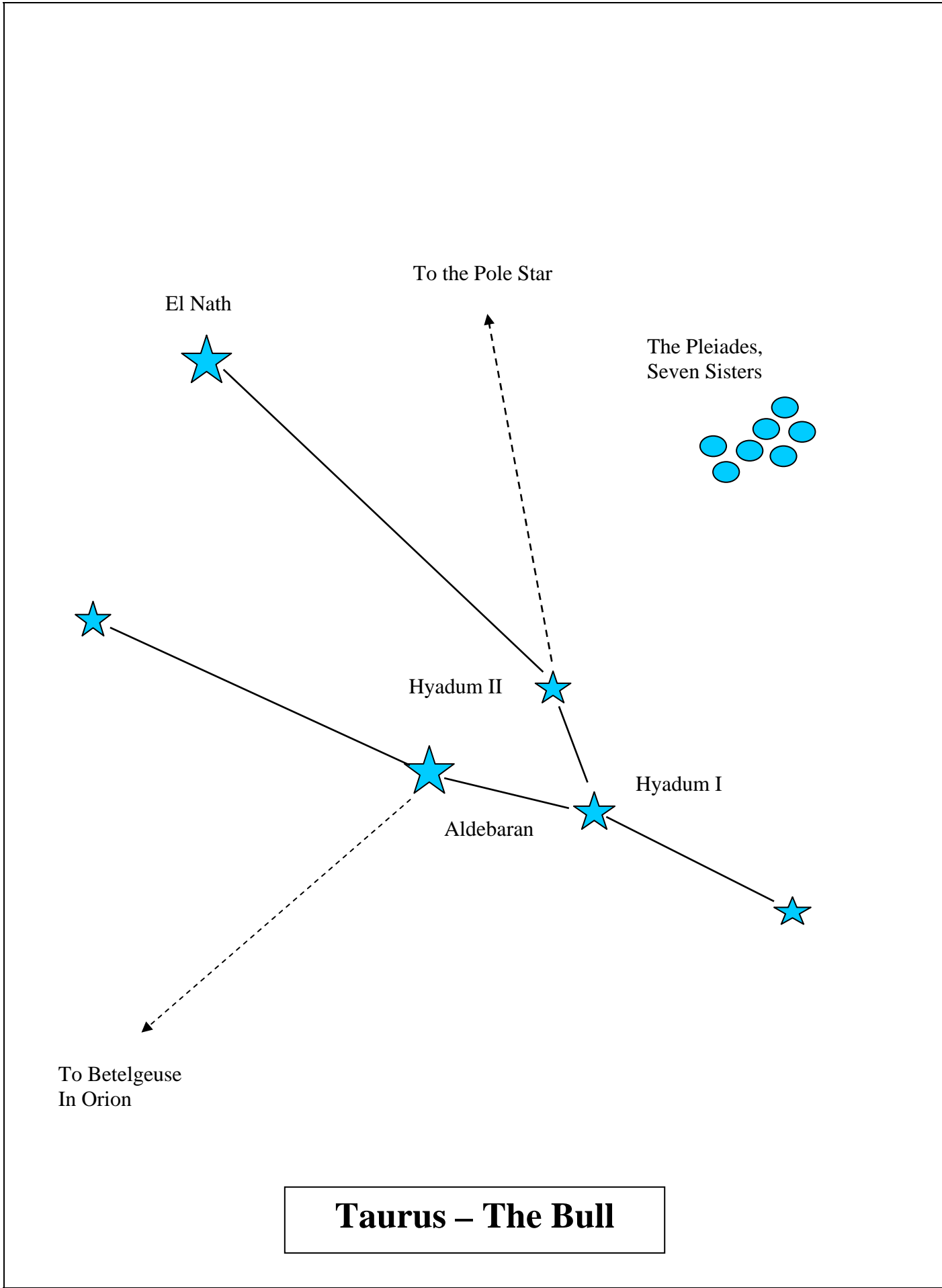
Taurus contains a magnificent red star called Aldebaran , this resembles the glinting red eye of the bull. The stars representing the horns do not strain your imagination too much and the overall star pattern actually looks like the animal it is meant to represent.

Stars themselves come in very many different sizes and brightness. Taurus displays very well the difference between the brightness and size of visible stars. Aldebaran is a very large red giant star relatively close to the Earth at 68 light years distant and thus appears much larger and brighter than the other stars in the constellation. The remaining stars in the constellation may in fact be bigger and brighter than Aldebaran but they are much further away and consequently look smaller and fainter. These differences also remind us how the patterns we see are mainly composed from stars that may not be anywhere close to each other in the sky, often being separated by many hundreds of light years.

Within the Taurus constellation boundaries is a famous cluster of bright stars, the Pleiades, popularly known as the Seven Sisters, representing a group of mythological nymphs, daughters of Atlas, the supporter of the Earth on his shoulders. There are about 100 stars in the cluster, all formed at the same time about 50 million years ago and travel the sky as a close-knit group. Only seven of the stars are usually visible with the naked eye but binoculars bring up the beauty of the remaining star cluster.

Star distances

It is worth noting a light year is a measure of astronomical distances. Using miles or kilometres to show the distance from the Earth would run into a considerable number of zeros. Astronomers prefer to keep to a numerical measure that is simpler to comprehend. A light year represents the distance that light travels in one year. Light travels at a speed of 299,792.5 km per second therefore a light year is equivalent to 9.46 million, million kilometres – certainly too many zeros to manipulate in calculations. On average stars are several light years apart, our nearest star in the constellation Centaurus is a red dwarf star, Proxima Centauri, and is 4.2 light years away.

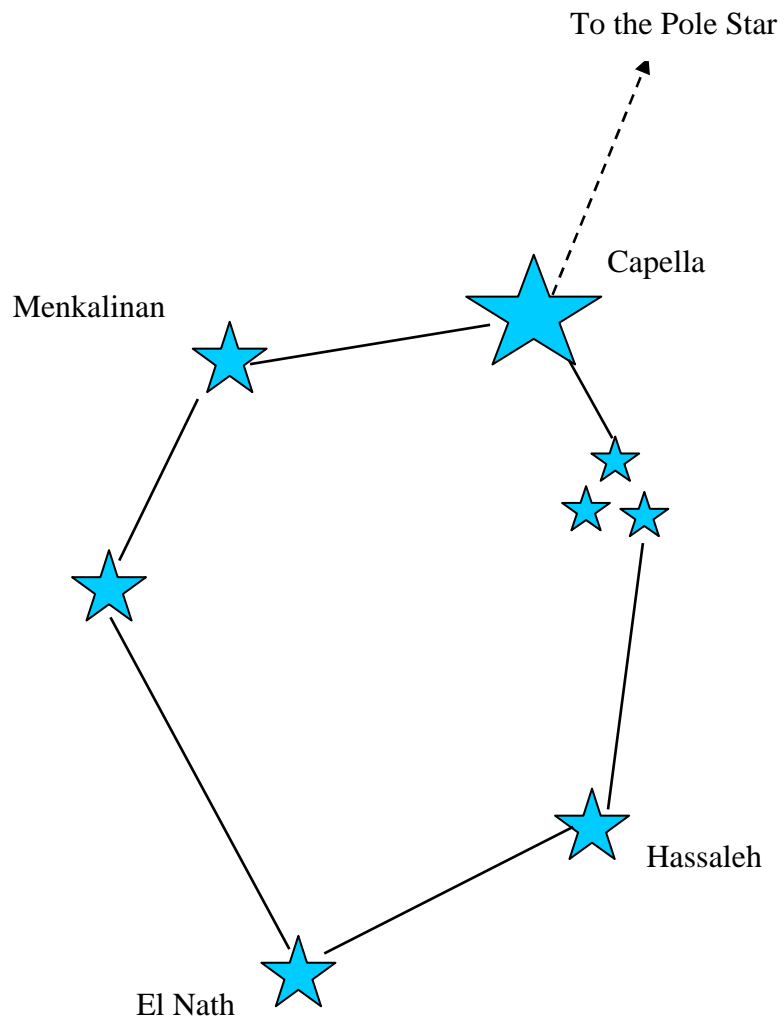


Auriga – The Charioteer

Auriga is a large and prominent winter constellation, being almost overhead in January and February. Like Cassiopeia it is a constellation that lies in the Milky Way. This is another constellation that benefits from a binocular view, showing the hundreds and thousands of stars of the Milky Way in the background of the constellation.

There are lots of different myths associated with Auriga involving Goatherders, Kings of Athens, the Gods Poseidon and Neptune, plus many others but all apparently involving a chariot pulled by either four horses or four seahorses.

The main star, Capella, is the sixth brightest star in the sky being a yellow giant star 45 light years distant and is 120 times more luminous than the Sun. In the distant past it has been regarded as a very religious object in the sky. Capella is Italian for the little goat so goats must be involved somewhere in the story.



Auriga – The Charioteer

Orion – The Hunter

Orion is the wild hunter of the sky. He appears to be the most popular and probably the easiest constellation to recognise in the sky. Orion becomes visible during winter nights rising high in the sky. The shape of the constellation shows the body of a man with a belted waist and hanging from his waist a group of hazy stars resembling a sword. This area is called a nebula, where young stars are being made from collapsing gas and dust clouds. The area is so beautiful that this is invariably where new telescope owners practise their skills and are amply rewarded with views of the stars within in the nebula.

In our next book on constellation myths and legends we will discuss Orion's prowess in hunting and his fear of another constellation in the sky, Scorpius the Scorpion. Orion is so afraid of this small creature that they are never seen in the sky together, Scorpius is always rising when Orion is setting.

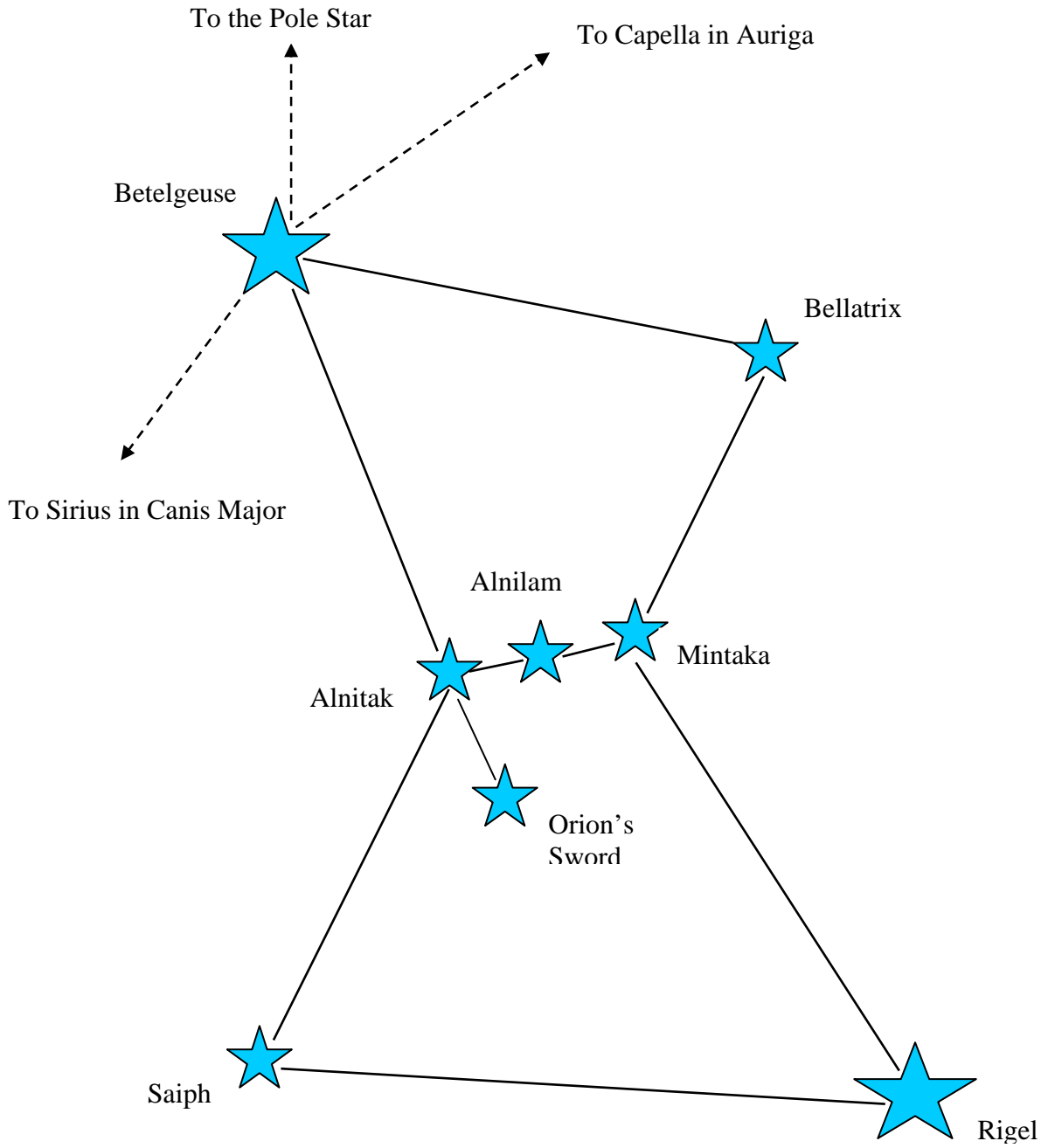
Because of his hunting skills Orion is surrounded in the sky by his prey including Taurus the Bull and Lepus the Hare, he is also accompanied by his hunting companions Canis Major the Great Dog and Canis Minor the Small Dog.

Orion contains two beautiful large stars. Betelgeuse (Beetlejuice) is a huge red supergiant star, so unstable it may just be ready to explode in the sky. It is about 400 times the Sun's diameter and luckily over 400 light years away so the explosion will be visible to us on Earth but hopefully will be too far away to affect us. The second bright star is Rigel (Rye-jell), a blue-white supergiant star over 1000 light years way.

Different coloured stars.

These two stars demonstrate the colour difference we often see in stars. Consider placing a metal poker in a very fierce fire. If you leave it in for a long time and then you pull it out it will be almost white hot, even blue-white hot, depending on the metal used. After a while it will start to lose its white colour and fade to a bright yellow as it cools then a dull yellow, then orange then red and finally cooling down to a dark metal colour. Stars are the same depending on their temperature and size. A new very large stars appears to be blue-white or white because they are very hot. Smaller and older stars can vary from yellow to orange depending on their temperature. Very old stars losing their heat turn to red and over a very long time turn into dark stars – invisible to us as they are also far away as well as no longer producing any heat or light.

Our own Sun has been an yellow star for 5 billion years and will remain so for another 5 billion years when it will expand into a very large red cool star, much like Betelgeuse but not as large – throwing off large quantities of gas in the form of a nebula as it runs out of fuel, with the left-over core eventually shrinking to a very small white star the size of the Earth and then turning into a brown dead star with no heat in it at all. This process is happening to stars of different masses all over the Universe, allowing us to use our telescopes to see these stars in their various stages of life and death. A glorious ending for a star is the Supernova, when a large star reaches the end of its life it massively explodes. The last Supernova seen from Earth was in 1987 but was only seen in the Southern hemisphere at the time.



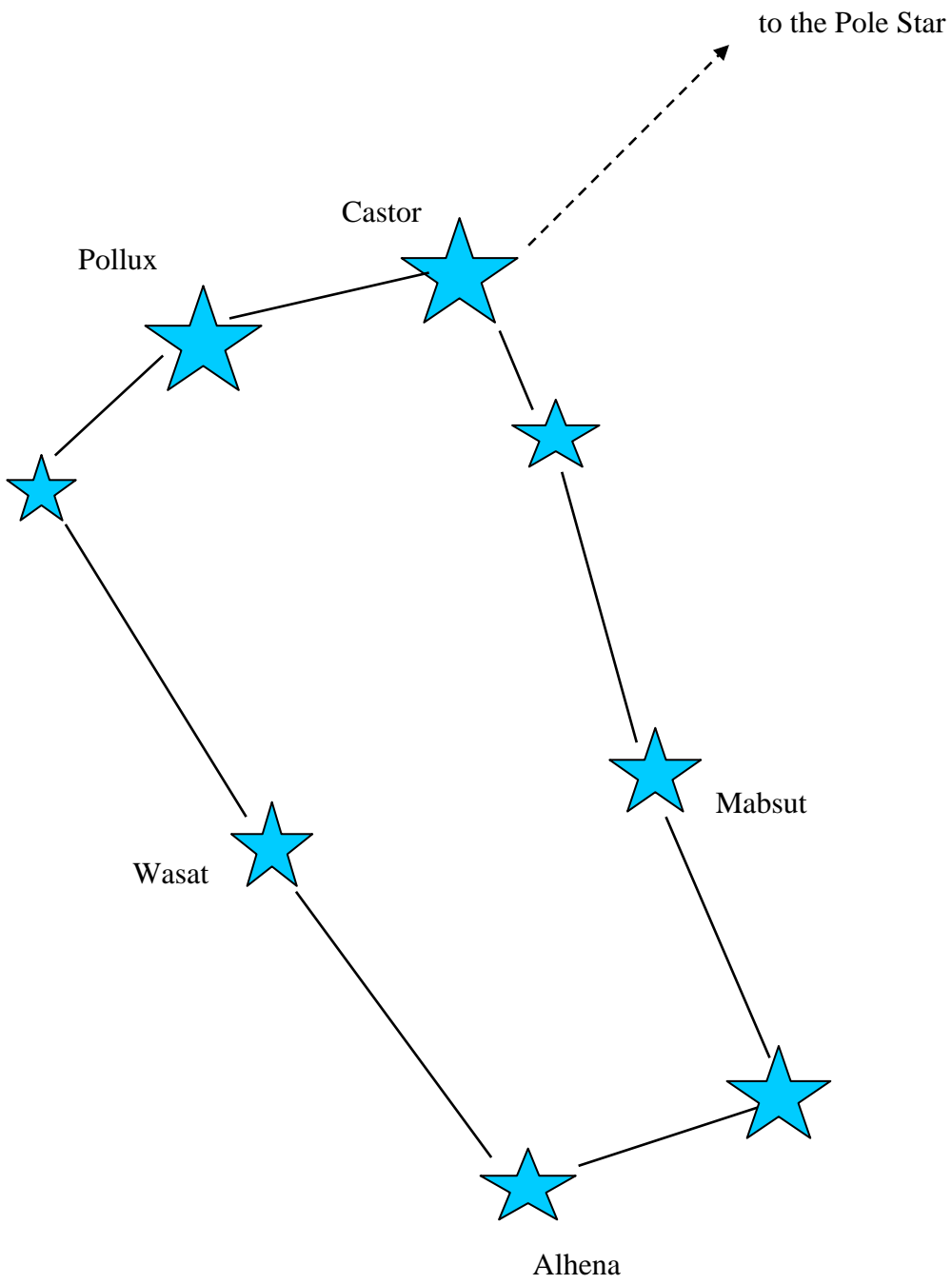
Orion – The Hunter

Gemini – The Twins

Gemini The Twins are named Pollux and Castor. In ancient stories they are twins but not from the same father. Castor's father was only a mortal king but Pollux's father was a God. Both were skilled navigators in life and became guardian angels for all sailors, being cast up into the sky after their deaths by the Gods to help guide sailors navigate the seas safely. Their two bright stars are easily visible and in fact are used in conjunction with navigation tables to allow present day navigators in either ships or aeroplanes to find their way.

Meteor Showers.

The constellation Gemini lends its name to a phenomenon that happens every year around the 13th and 14th December. A meteor shower, one of the richest and brightest, appears to originate, or radiate, from the constellation of Gemini. This meteor shower is therefore known as the Geminids after the constellation. Meteors are loose sand-sized pieces of dust and rock left in a trail behind comets that fly around the Sun on a regular but sometimes very long period of orbit. The dust trail remains on the orbital path of the comet and every year in December the Earth's own orbit causes it to pass through this trail. The Earth spins on its axis whilst travelling in its orbit round the Sun, causing the dust to apparently race through the sky at great speed and eventually burn up in the high atmosphere, they are often called shooting stars. The dust trails from the Geminids produce up to 90 meteors an hour, most of which occur in the early hours of the morning, displaying superb colours and bright trails. The WWP Planetarium and Observatory usually has a group of Astronomers present during meteor showers to help guide the public. There are a number of different meteor showers during the year, information on them is available in the Planetarium.



Gemini – The Twins

Canis Major – The Great Dog

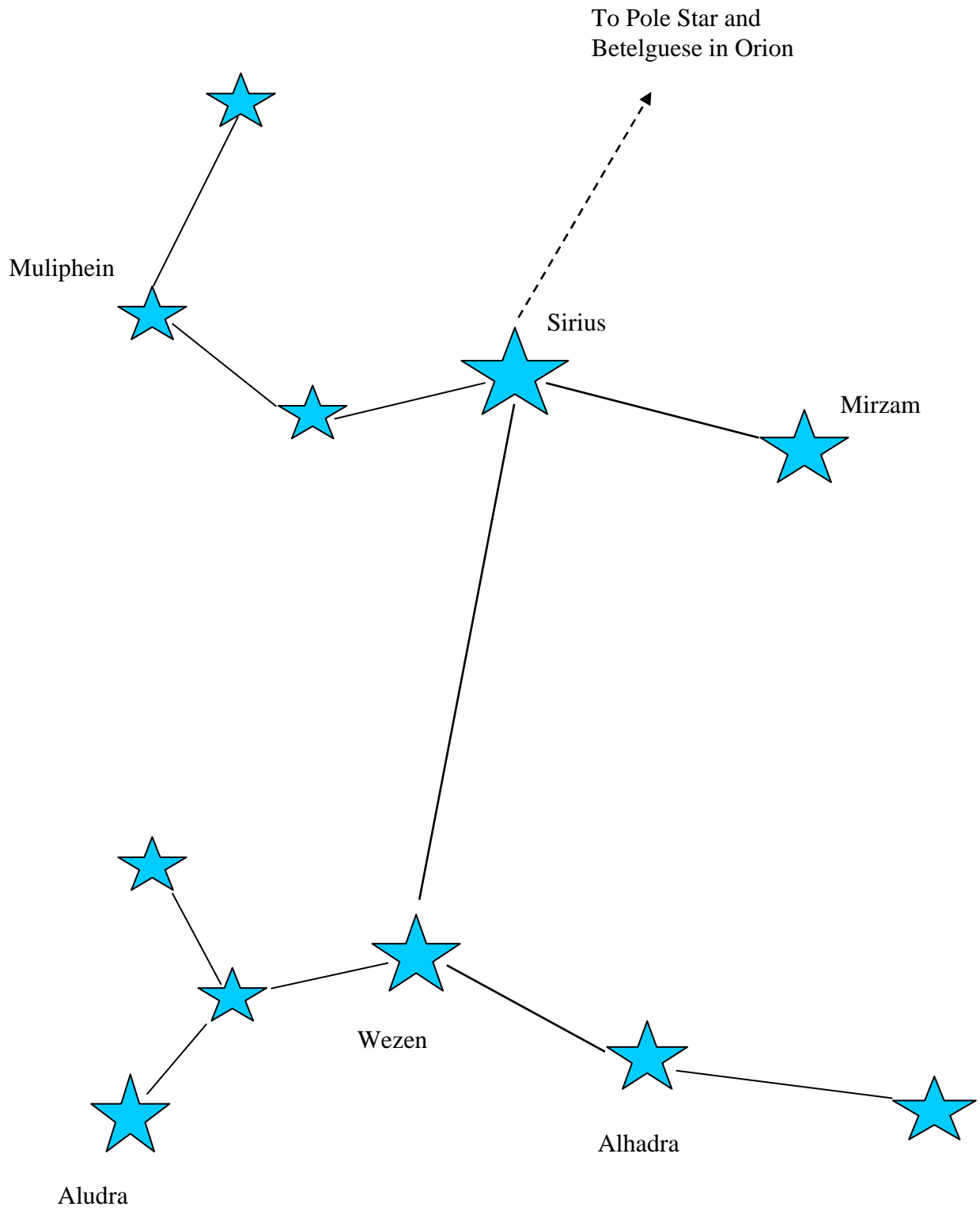
Canis Major contains the brightest star in the sky, Sirius. It can be found by looking along the belt of Orion towards the East. Canis Major is a Southern Hemisphere constellation but can be easily seen in winter just above the horizon just below Orion.

Canis Major was the senior dog of Orion the Hunter therefore Sirius is often known as the Dog Star. Orion had a second dog which has its own smaller constellation called Canis Minor, the small dog, which lies just above the head of Canis Major in the sky.

Sirius appears very bright to us on Earth, not because it is very powerful but because it is very close to us, being only about 8 light years distant or 80 trillion kilometres. Even so it is still 26 times brighter than our Sun but still relatively small compared with the blue supergiant Rigel in Orion.

Twinkling stars

We already know the main difference between a planet and a star is that stars twinkle but planets do not. From the high latitude of the UK Sirius is a great twinkler, often seen flashing in different and beautiful colours. This is because Sirius is always quite low down towards the horizon where the Earth's atmosphere is thicker and disturbed by heat sources travelling up through the air. This movement shakes the air and disturbs the faint light coming from the distant star (the planets are much closer and do not have their much stronger light disturbed this way in our atmosphere).



Canis Major – The Great Dog

Leo – The Lion

Happily, the constellation of Leo The Lion does actually look like the animal it is meant to represent, a crouching lion. The heart of the lion is the very bright star Regulus (the Little King) and the tail star is called Denebola.

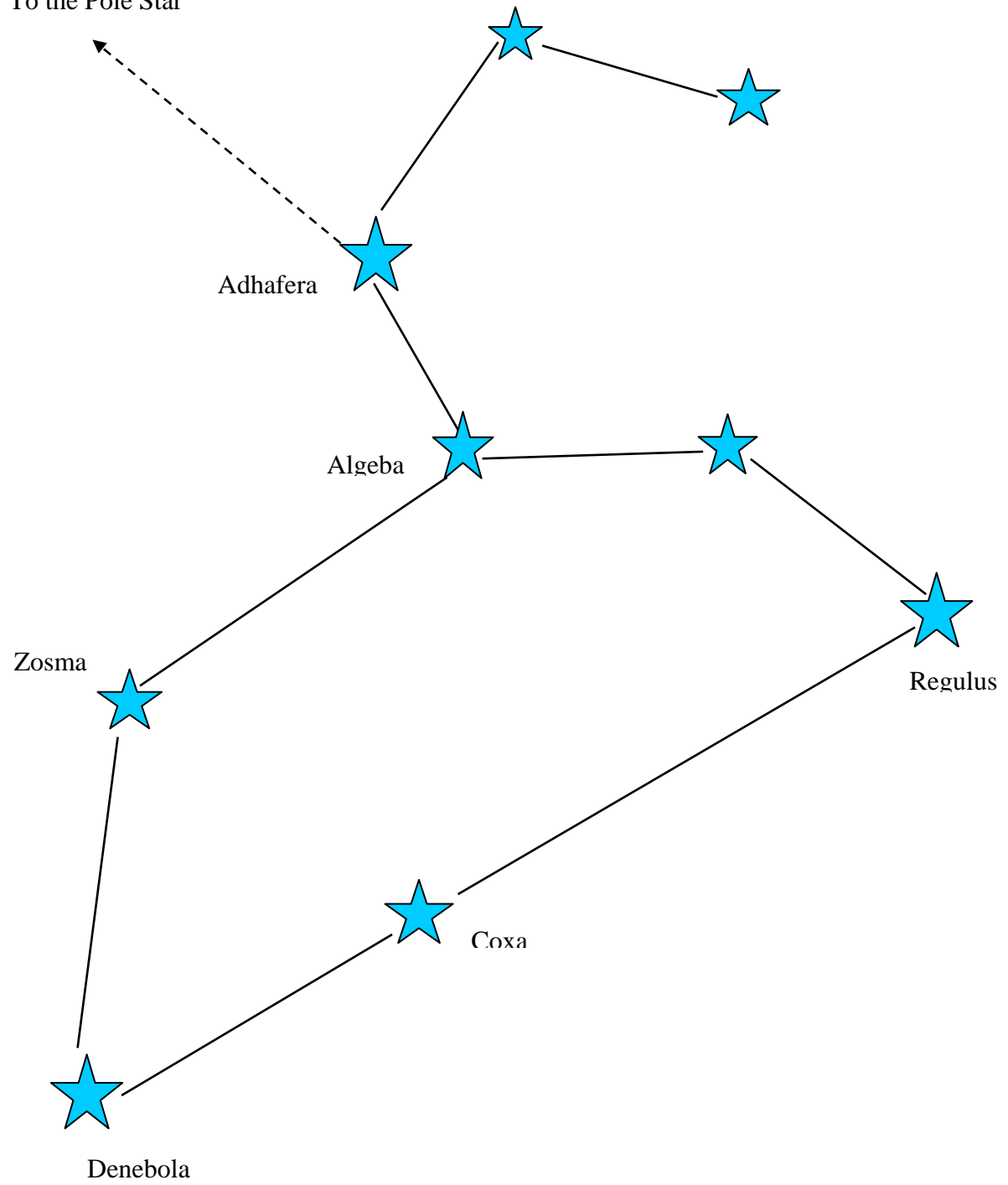
Every November another meteor shower originates from Leo. They are known as Leonids. The shower normally produces 30 meteors an hour but every 33 years or so the shower increases to a storm when thousands of meteors an hours can be seen just before dawn of November 18. The last storm was seen in 1999. Storms occur when the Earth passes through a point in the Comet's orbit where there is a manyfold increase in the dust trail caused by many previous orbits overlapping each other.

Zodiacal constellations

Leo is one of the constellations known as the Zodiac. The Zodiacal constellations all lie very close to the celestial equator along a line called the Ecliptic. The Sun, Moon and planets roughly follow this same line as they wander through the sky. It is this relationship between planets and the 12 zodiacal constellations that led to the study Astrology and the casting of horoscopes. In fact the study of Astrology came a long time before the true study of astronomy with the non-science based study of astrology in ancient times leading to the entirely science-based study of astronomy of today.

The Zodiacal constellations are Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpius, Sagittarius, Capricornus, Aquarius and Pisces.

To the Pole Star



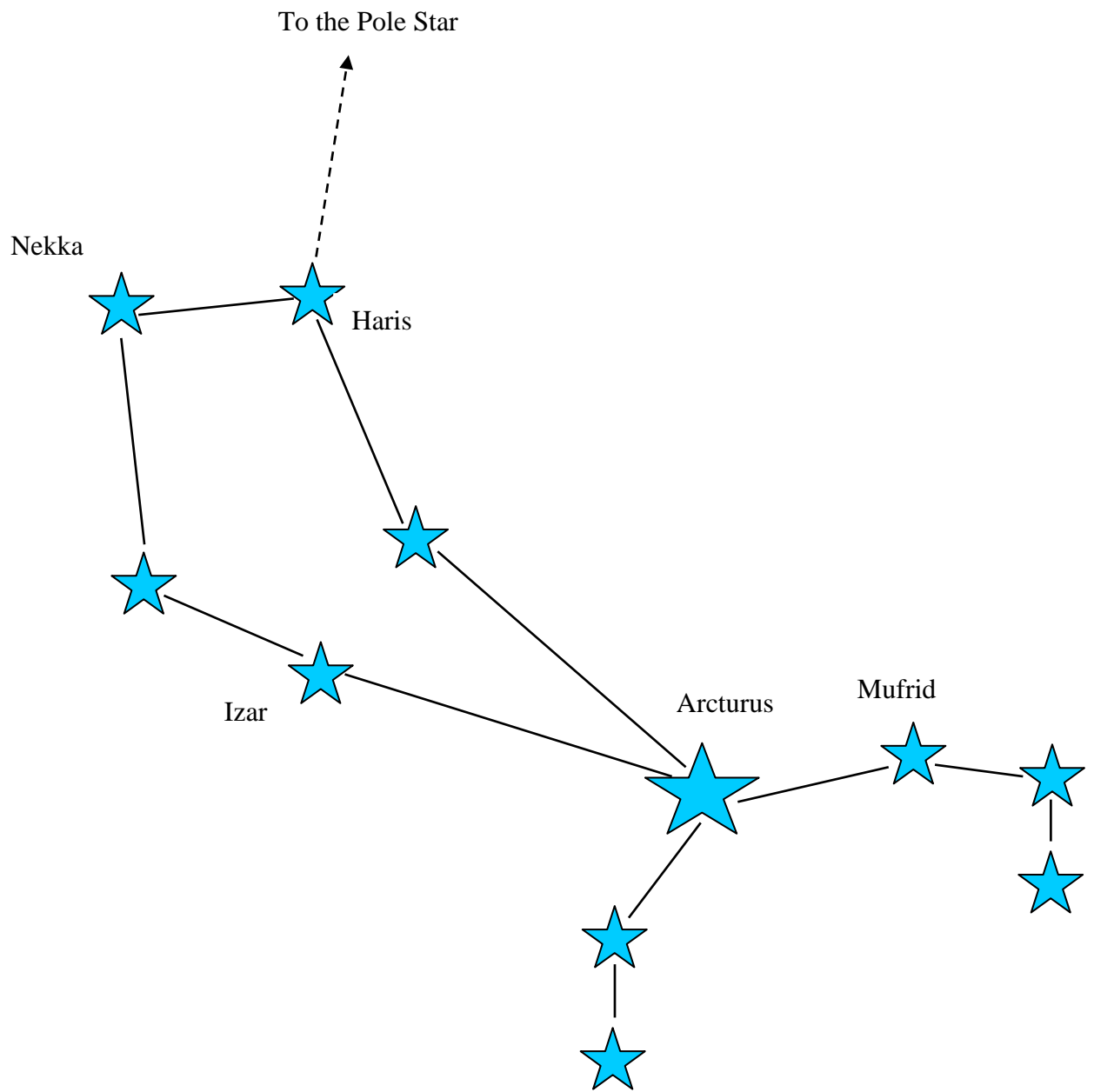
Leo – The Lion

Boötes – The Herdsman

Boötes is an ancient constellation representing a herdsman driving the Great Bear (Ursa Major) around the sky. The full shape of the constellation, like Orion, shows the body of a man.

The main star is Arcturus, the fourth brightest star in the sky and is an orange/red giant about 27 times larger than the Sun. In fact Arcturus is presently in the state our own Sun will be in around 5 billion years time, swollen up to almost bursting point but will not actually explode, instead it will run out of hydrogen fuel and just quietly decline in size, brightening up a bit as it becomes smaller to transform into a white dwarf and then at a very long time in the future completely lose its warmth and become a dark cinder. It is thought the universe already has a considerable number of these cinder ex-stars but obviously undetectable at the moment with our telescopes.

The remaining stars in Boötes are rather faint but Arcturus itself is a beautiful sight. The constellation is easily seen in spring and early summer.



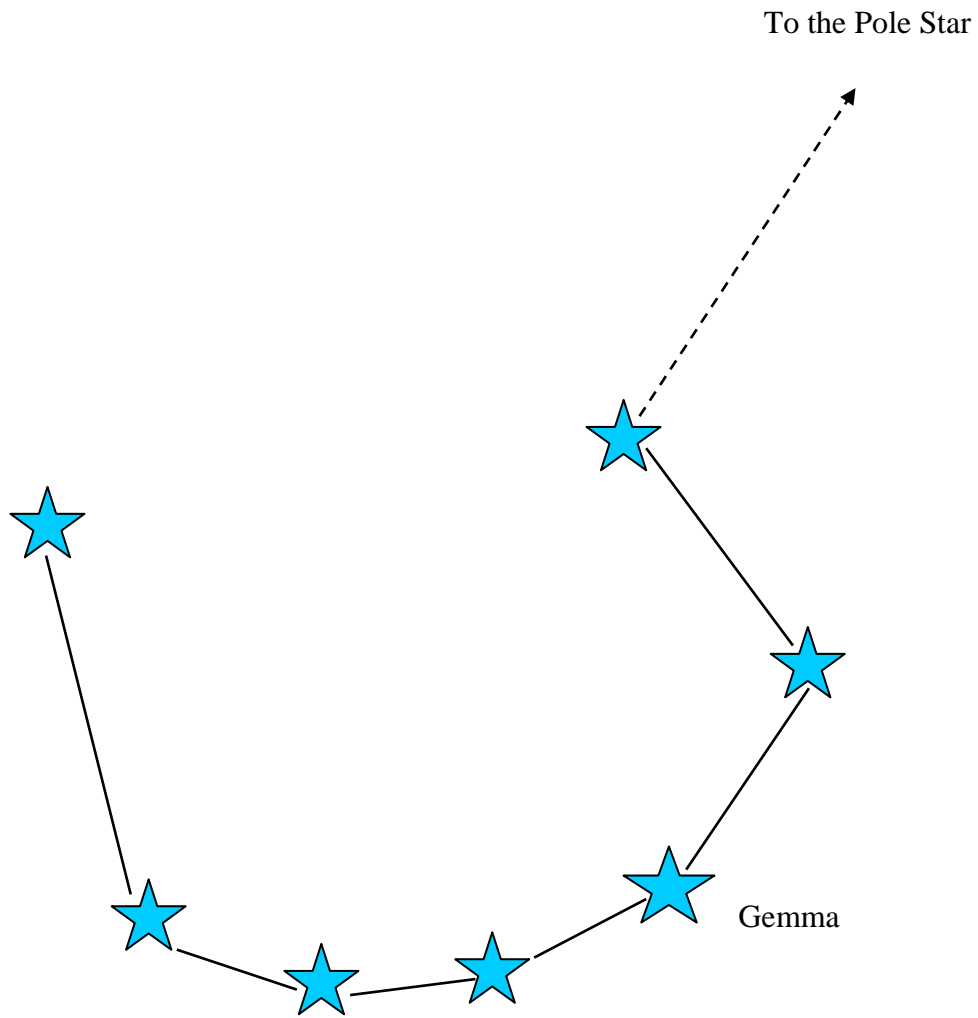
Bootes – The Herdsman

Corona Borealis – The Northern Crown

Not a very bright constellation in itself but it is a very easy shape to recognise in the sky. It is encouraging for beginners to find a constellation shape that doesn't stretch the imagination too much and as such Corona Borealis easily catches the eye and helps to find other less realistic constellations around it such as Hercules and Boötes.

The brightest star in the constellation is Gemma, named after a central gem in the crown.

An almost identical crown appears in the Southern hemisphere and is named Corona Australis – The Southern Crown.

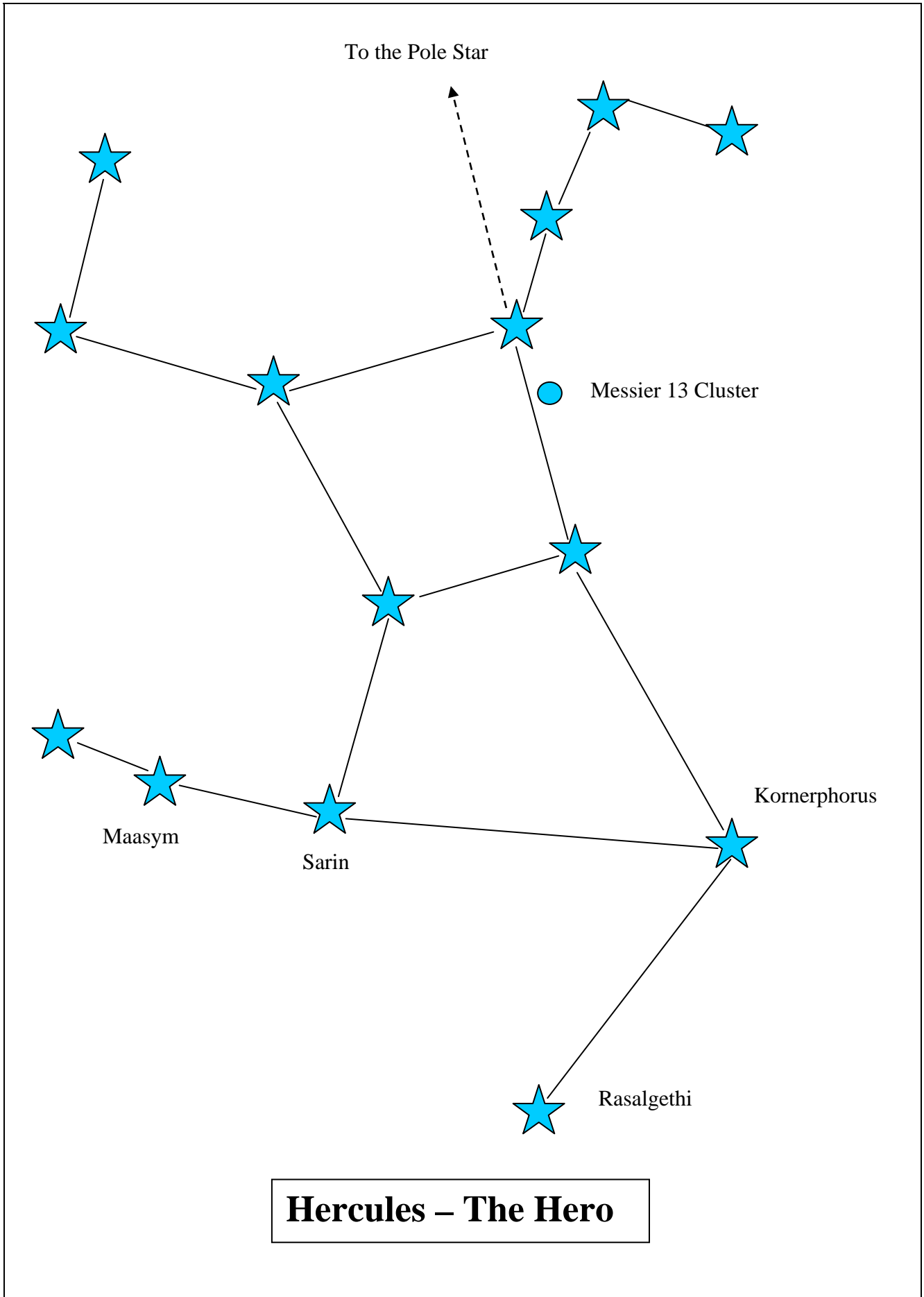


Corona Borealis – The Northern Crown

Hercules – The Hero

Although Hercules is the fifth largest constellation it is not the most prominent in the sky. However the story of Hercules is very popular due to the well-watched television series. The hero appears to be kneeling on the head of Draco the Dragon, the adjacent constellation. The killing of the dragon was one of the twelve labours, or tasks, set by the Gods for Hercules.

When the observer moves from naked eye watching to binocular viewing there is a wonderful object in Hercules just above his waistline on right-hand side. This object has been named Messier 13 (M13) and is a wonderful tight cluster of 300,000 stars called a globular cluster, the brightest cluster in the Northern hemisphere. It occupies the same amount of sky as the full moon even though it is 25,000 light years distant and is 125 light years in diameter.



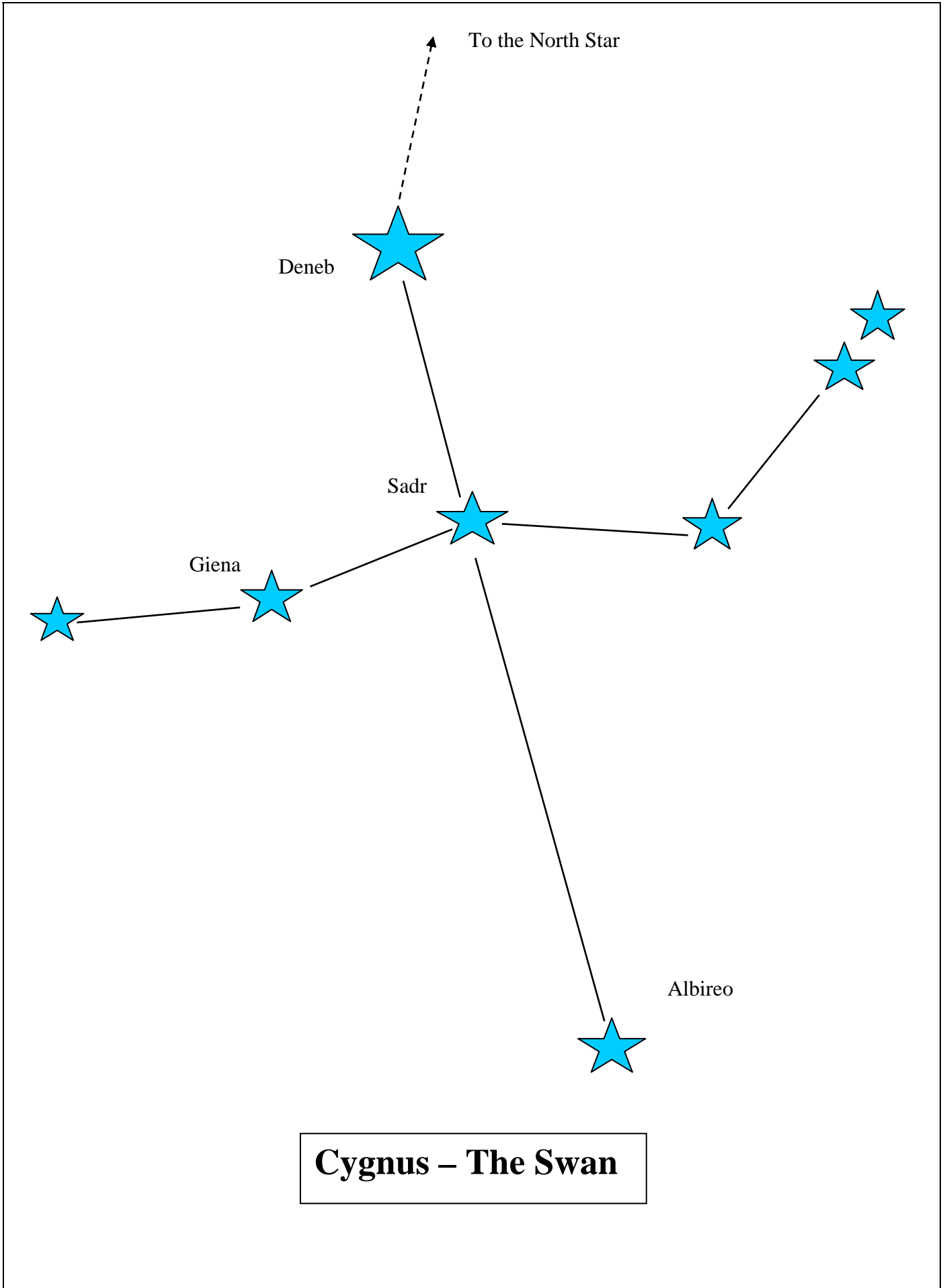
Cygnus – The Swan

The constellation of Cygnus The Swan is seen flying directly down the Milky Way. This majestic constellation is the subject of many different stories including the swan being a disguise for a God to visit his lover and also has been described as the musician Orpheus, turned into a swan by the Gods in memory of his fabulous musical talents.

This is a very distinctive cross-shaped constellation and is often called the Northern Cross. It lives in the middle of the Milky Way but most of its body lies in a lane of dark dust that splits the immense river of stars, this is called the Cygnus Rift or the Northern Coalsack and can be seen in binoculars as a long dark gap in the Milky Way.

The Summer Triangle.

Cygnus is mainly a summer night constellation being very bright and high above the observer most of the night as are the constellations quite close to it. These constellations include both Lyra the Harp and Aquila the Eagle. The brightest star in Cygnus is Deneb, which in Arabic means “tail of the hen” – the earliest stories of this constellation actually involved a mythological hen - not as attractive as the eventual swan. The two other constellations have bright stars named Vega in Lyra and Altair in Aquila. The famous British astronomer Sir Patrick Moore first called these three stars the Summer Triangle, made by joining the three stars in the sky. The Summer Triangle has been found to be an excellent learning aid when first studying the constellations.



Lyra – The Harp

The harp referred to in the name Lyra is an ancient musical instrument often referred to as a lyre, used in both ancient Greece and Rome. The story involving this harp is that it belonged to Orpheus and when he was placed in the heavens as the constellation Cygnus, the Gods placed his harp beside him to produce heavenly music. Orpheus is said to have been such a remarkable musician his music not only charmed his audience but also the animals, the plants and even the rocks, the first rock musician?

The brightest star in Lyra is Vega (which actually means “the swooping Eagle” , perhaps there were more stories surrounding this constellation). Vega is the 5th brightest star in the sky but is actually very prominent and easily found at the edge of the Milky Way just next to Cygnus. This star is part of Sir Patrick Moore’s Summer Triangle with Deneb and Altair.

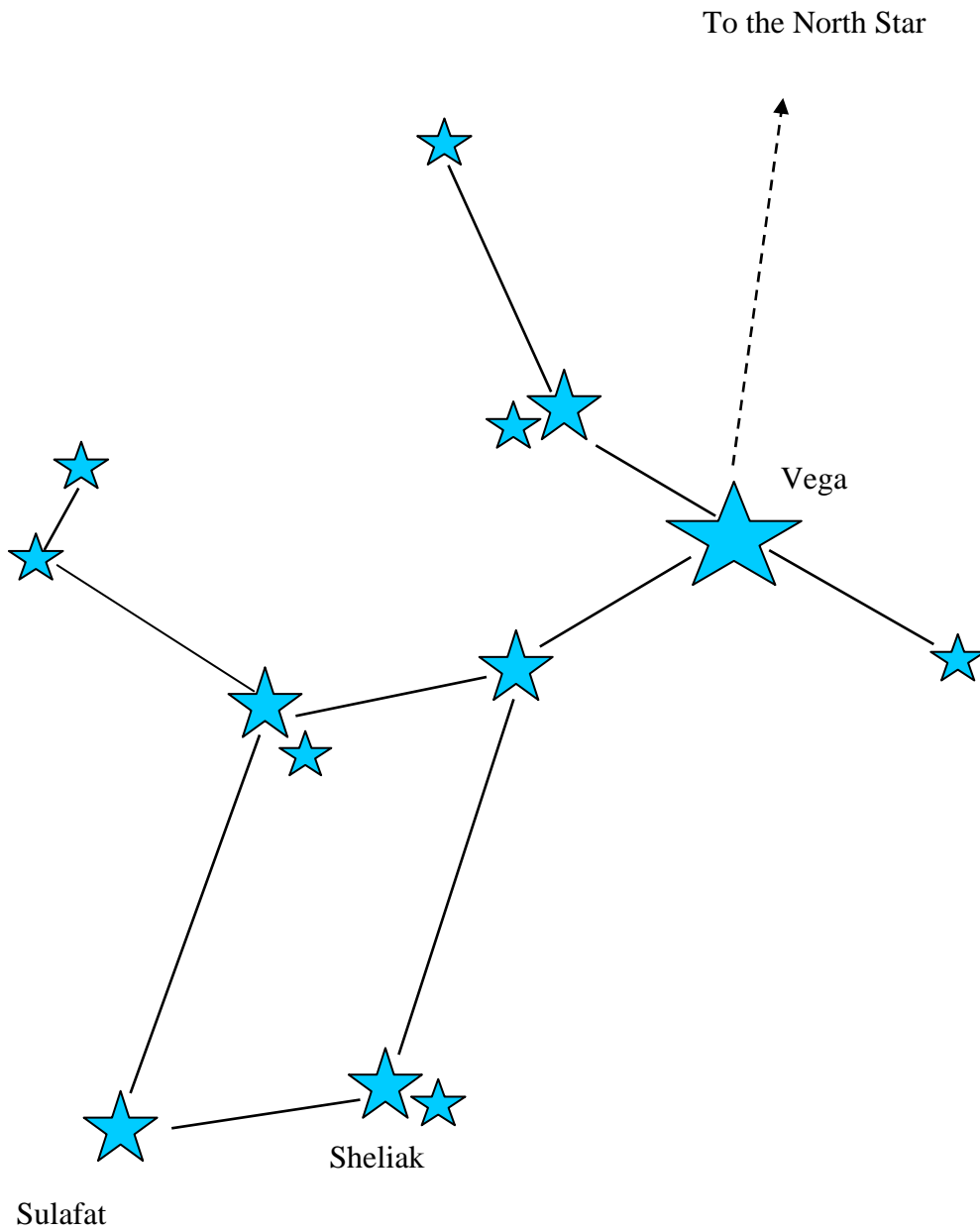
Another interesting fact is that the Sun is actually being carried by the Milky Way’s rotation directly towards Vega at a speed of 20 km per second relative to the surrounding stars. No one appears to have worked out when eventually collide, if ever.

Because the Earth has a slight wobble around its axis, called precession, Vega will eventually replace the present Pole Star Polaris as the future Pole Star, this will happen about AD14000.

Multiple Stars

Lyra has a number of double and multiple stars. Astronomers, in searching for stars in their telescopes, have discovered that the majority of stars in the Universe are in pairs or higher multiples. It is possible when stars are formed by the collapsing clouds of hydrogen gas that it is more likely to produce a number of stars together than a single star like our Sun. Over the early growing period of these star groups it is possible that the multiple, and possibly conflicting, energy sources will force the multiple stars to migrate apart from each other but a comfortable situation may develop between two or even three stars which are happy to just orbit each other. It was thought our own Sun started off as a double star or part of a multiple star system but a massive nearby disturbance early on drove the Sun to become a singleton whilst the other star or stars rapidly moved off elsewhere.

Double or multiple star systems can be seen by astronomers when they observe the brightness of a star vary on a repetitive basis. By timing the variations they can discover the size of both stars.



Lyra – The Harp

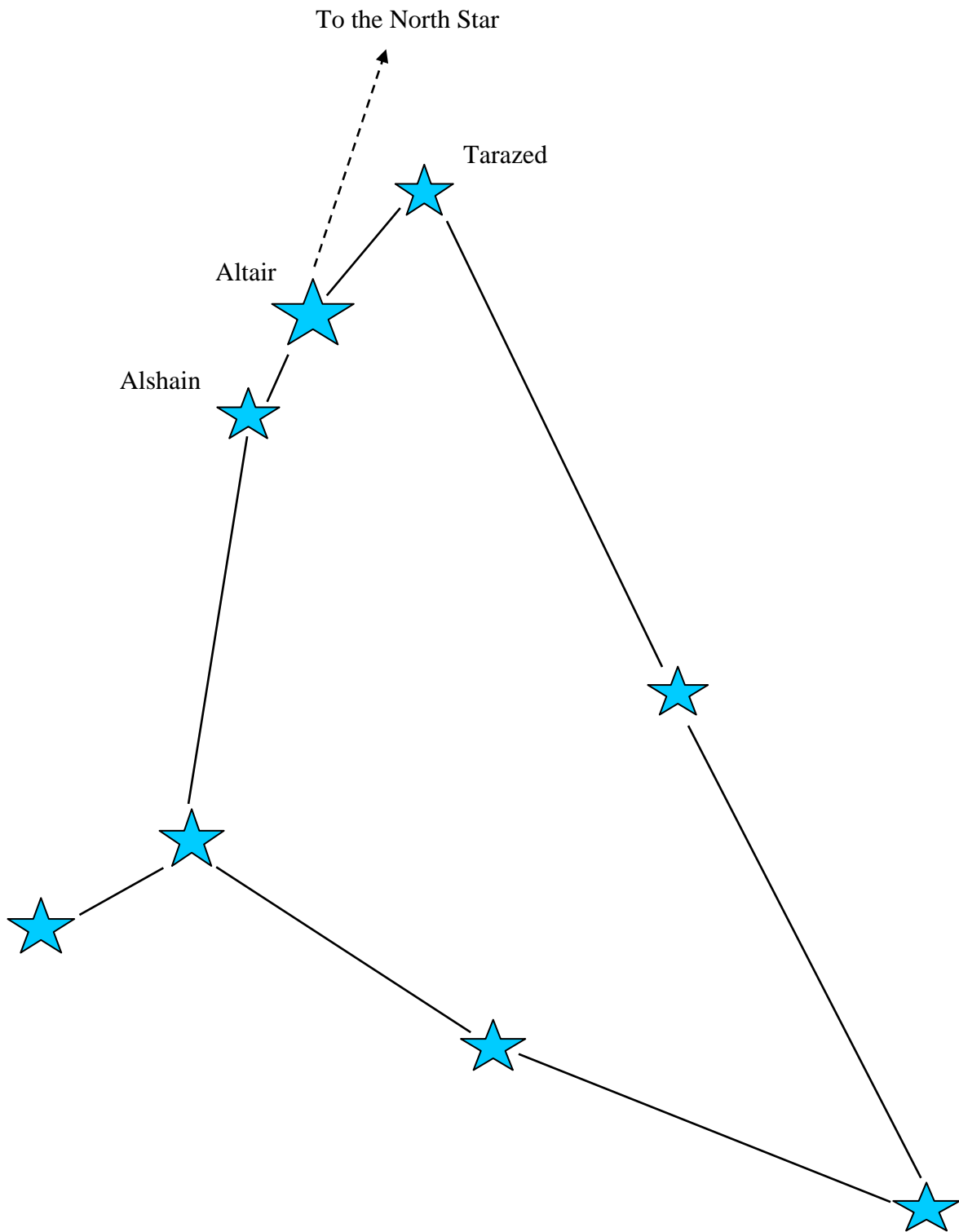
Aquila – The Eagle

Aquila The Eagle represents the bird that carried the thunderbolts of Zeus. When annoyed with someone on Earth Zeus would send Aquila down to strike them with a thunderbolt. Again, there are many different stories about this constellation from the ancients.

The constellation shape depicts an eagle with its wings spread. The brightest star is Altair, described in Arabic as “the flying eagle” and is found on the forewing of the eagle. Some drawings show Altair as the eye of the eagle.

Aquila lives inside the Milky Way, this often simplifies the finding of it as just below and to the side of the beak of Cygnus.

The star Altair forms part of Sir Patrick Moore’s Summer Triangle



Aquila – The Eagle

Further Study

Astronomy has become a very popular amateur pastime. As a result there are a large number of books and magazines, some aimed at the basic star and planet watcher and others, which increase in complexity, for the serious amateur who is able to spend sometimes considerable amounts of money on bigger and better equipment.

Our recommendation for the beginner is to visit the local Planetarium and attend a “Sky at Night” show that introduces them to a sky not overfilled with too many confusing stars and be guided by the presenter through a few constellations at a time. It is very surprising that such a visit fills the observer with sufficient confidence and ability to go out and spot similar constellations in the real night sky. The Planetarium can supply a simple chart for the night sky in the local region. With the luck of clear skies and the occasional help of a friendly astronomer it is possible to quite quickly accumulate the knowledge of constellation locations and their component stars even as the whole pattern changes through the night and through the seasons.

It won't be long before the beginner wants more information and better sky charts. As mentioned there are a number of excellent monthly magazines available either from the local bookshop or through postal delivery. The most popular magazine aimed at UK astronomers is “Astronomy Now”, their star charts cover UK observing locations as well as offering equipment for sale from UK suppliers with costs in Pounds and Pence. Two other excellent magazines are aimed at mainly American customers but often contain excellent up to date astronomical articles relevant to all amateurs, these are “Sky and Telescope” and “Astronomy”. As far as books are concerned you can't go wrong with any astronomy books written or co-written by our own Sir Patrick Moore.

Television has now recognised the interest of UK amateur astronomers and has been steadily increasing the number of programmes covering both astronomy and the associated interests of space and space travel. A firm favourite with UK astronomers is Sir Patrick Moore's programme, “The Sky at Night” on the BBC.

The Internet and computers offer another choice of accessing the latest information as well as offering a number of distance learning study courses in all areas of astronomy. Software can be purchased to run on your computer showing you the sky in your own area for that particular night or any other night or observing site you choose.

Of especial interest to the beginner is the local Astronomy Society, such an organisation is usually full of amazingly experienced amateurs who have no objection to sharing their knowledge or their equipment. The Societies also run monthly meetings with guest speakers to further increase your interest.

The most exciting thing about astronomy of course is to just go outside on a crisp clear night and use your eyes to experience the grandeur of the night skies. Soon everything will start to make sense as constellations fall into recognisable patterns, you will soon be naming the brighter stars and then the fainter ones. You will begin to recognise the

planets as they rise and set, give names to the seas and craters of the moon and, with the eventual use of binoculars and a telescope, find and recognise some of the fainter deep sky objects such as galaxies and nebulae.

Astronomy is a fascinating hobby and has so many different areas to study and perhaps specialise in. There are many other amateurs out there willing to help you develop your interest and perhaps share their equipment before you decide to buy your own. One thing to bear in mind is never to rush out and buy any piece of optical equipment before discussing it with someone who has a lot more experience.

The Wynyard Woodland Park Planetarium and Observatory runs a Telescope Club to help beginners either use equipment already bought for them or to guide them into a sensible purchase suitable for their own use. Also bear in mind the Planetarium has a number of binoculars and telescopes that can be borrowed for use at its observing site under supervision, meaning you don't have to rush out and buy something straight away. Firstly use your eyes to learn your way around the sky, it doesn't take long, then possibly obtain a pair of binoculars to delve just that little deeper into the sky and learn a bit more. Finally, only make the large purchase of a suitable telescope when you feel ready and confident enough to find your way round the sky without actually losing yourself. Doing it all the wrong way round can lead to disappointment and the inevitable loss of interest caused by frustration.

Astronomy is a fascinating and fulfilling hobby and we are here to help you as much as possible to enjoy it.

Notes and Sketches

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Planetarium and Observatory

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