Cambridge University Press
978-1-107-69898-7 - A Walk through the Southern Sky: A Guide to Stars and Constellations and their Legends: Third Edition
Milton D. Heifetz & Wil Tirion
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INTRODUCTION

This book is written for those who look at the stars with wonderment and would like to feel more at home with them; to go for a friendly walk with them.

In order to walk through the heavens and to know where you are, you must recognise what your eye sees. To know the names of stars and constellations is to form a friendship with our heavenly neighbours.

As we walk among the constellations, you will feel the immensity and quiet peace of the night sky. Do not ignore the legends about the constellations in Part 3 of the book. These legends will lend greater feeling to your vision of the world above. Friendship with the stars will deepen as we sense the thoughts and dreams of people who imagined people and animals living among the constellations.

Our walk will take us to the brightest stars in the sky. When we become familiar with them they will lead us to the dim stars.

It is not enough simply to find a constellation. Try to see relationships between constellations. This is best done if you know different pathways to the constellations.

From the time of early humans, people have looked at the stars to help them navigate across seas and deserts, know when to plant and to harvest, establish their legends, mark the change of seasons and even align their temples of worship. To aid in recognising specific stars, they placed the brighter ones into star group patterns we now call **constellations**. Constellations were recorded over 5000 years ago and lists of such patterns were written 2400 years ago by the Greek astronomer Eudoxus, who studied under Plato. Ptolemy, who lived 2100 years ago, compiled a list of 48 constellations which has remained relatively standard to this day. Later, Johann Bayer (1572–1625), Johannes Hevelius (1611–87) and Nicolas de Lacaille (1713–62) added more constellations to the list. Professional astronomers now officially recognise 88 constellations which they regard simply as areas of the sky, not as star 'pictures' or patterns. These patterns have never been made 'official', so you should feel free to make any constellation design you wish.

Before we begin our walk through the heavens, we should understand two concepts: how to measure distances in the sky, and the brightness of the stars. Then, follow the instructions on how to use the atlas to best advantage.

In Part 2, 'A walk through the heavens', the design or picture of a group of stars to form a constellation image will usually, but not always, contain stars that are bright enough to be seen easily. Most of the constellation patterns are well recognised images, but some are new.

For convenience, each star in each constellation will be numbered and some will be named so that we can more easily identify specific stars to help us walk around the sky. We will follow several paths to a constellation. By doing this you will have a better sense of star relationships.

Since I have been disturbed by the violence that is part of the commonly used legends associated with the constellations, I have taken the liberty of modifying and abridging them. Legends have been and will continue to be modified with each generation.

This book applies to people living in the Southern Hemisphere, but it is also of value to those living slightly north as well as south of the equator.

Relax and enjoy yourself as you travel across the sky.

PART 1

Measuring Distances in the Sky

HOW DO WE measure the size of Scorpius or the distance between two stars? We cannot measure these distances in inches or millimetres, which are linear measurements (measurements along a line). Instead, we must use a measuring system with angles to determine how far apart one star or constellation may be from another.

To do this in a practical way without fancy instruments we use our eye as the corner of the angle and part of our hand to hide the sky between the stars or constellations of interest. The further apart the stars are, the more of our hand we need to use to cover the space between them. Look at Figure 1.

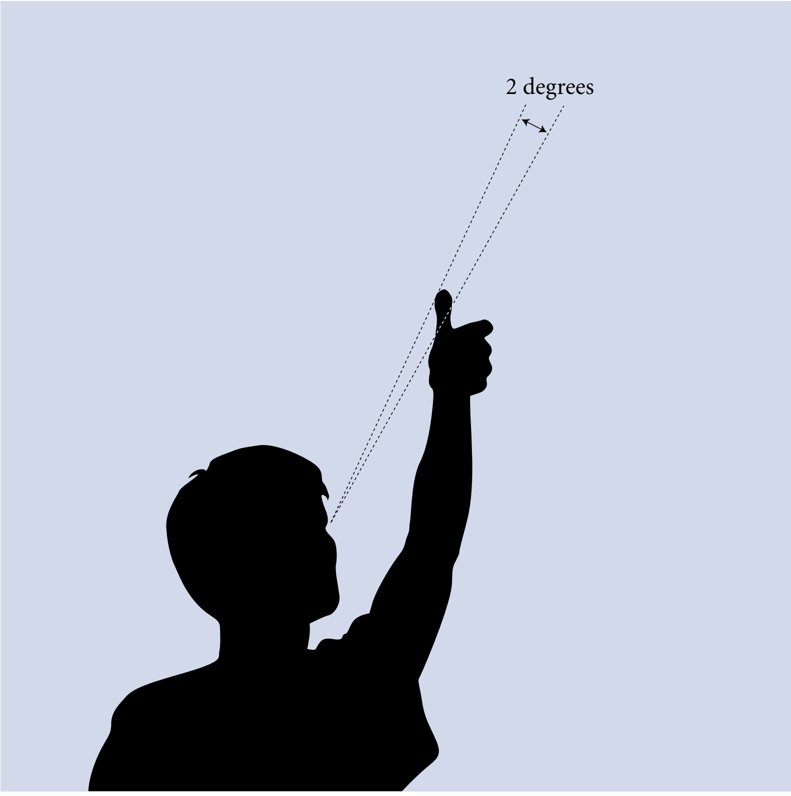

FIGURE 1 With your arm outstretched, your hand will help you determine angular distances. Extend your arm out in front of you and hold your thumb upright. It is now hiding part of what is in front of your vision. The amount of view that is hidden behind your thumb will depend upon how long your arm is and how thick your thumb may be. The shorter the arm, or the thicker the thumb, the more of your view will be hidden.

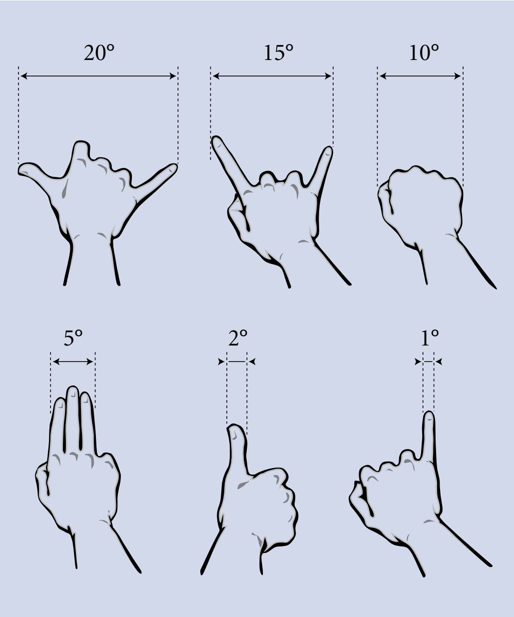

FIGURE 2

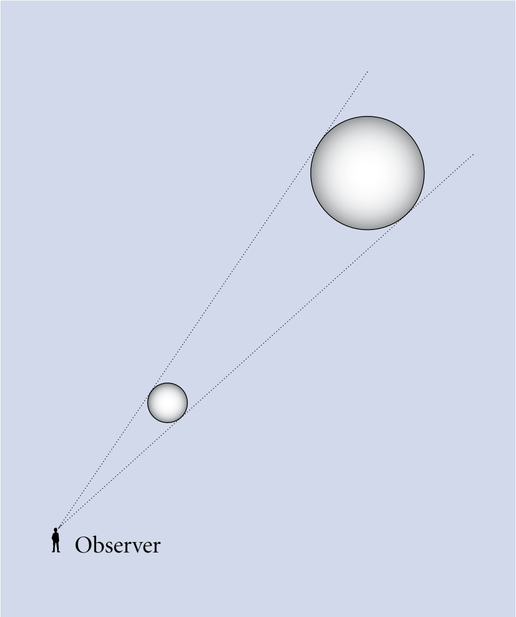

FIGURE 3 Although the Moon is so much larger than the building across the street, it can actually be hidden by a narrow object like a finger. The diameter of the Moon, when measured this way, is seen to be only about half a degree wide. The farther away an object is, the smaller the angle needed to hide it from sight. The Moon looks much bigger than a star because it is so much closer to us.

So our hand becomes an excellent device for measuring distances in degrees in the sky. Different parts of your hand can be used to measure different angles. Look at Figure 2.

The tip of your small finger will cover approximately 1 degree of sky. In a room in your house, look at the door knob or light switch across the room. Your finger can cover it. Now look at a building across the street. The same finger will cover a large part of the building. Now look at the Moon. The same finger can cover the Moon. How can this be since one is so much larger than the other? Look at Figure 3.

MAP OF THE MOON

FIGURE 4 Map of the Moon

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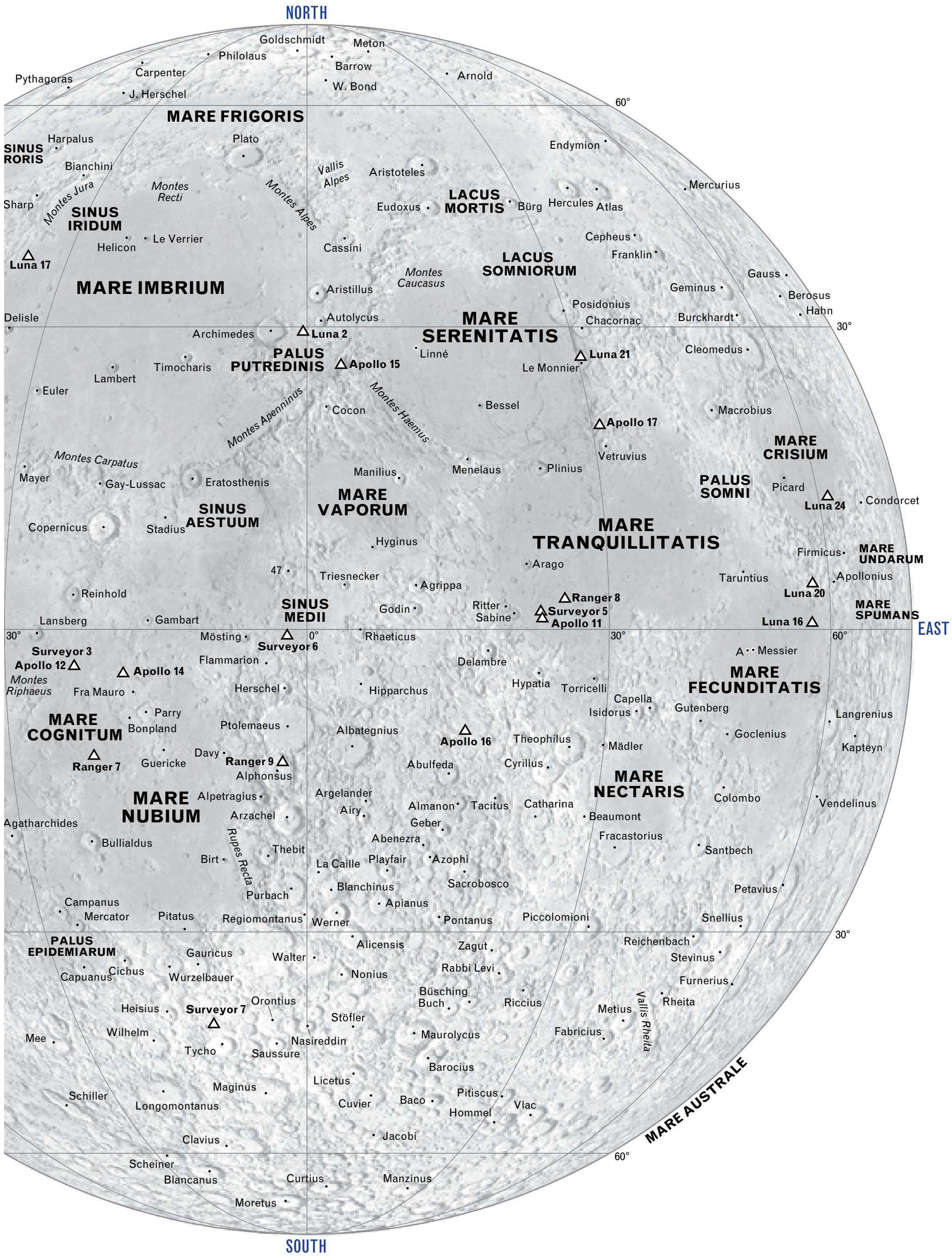

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In 1966 the USSR successfully landed on the moon. This remarkable achievement was repeated soon after by the United States. Figure 4 is a diagram of the moon, showing its craters, mountains and 'seas', and shows the landing sites (small triangles) of some of the missions to the Moon.

There have been four major programs dedicated toward the potential use of the moon.

a. The Surveyor program: a photographic survey of the Moon's surface to identify areas for future soft landings.
b. The Ranger photographic program: a study of the effect of impacts upon the Moon's surface.
c. and d. The Apollo (US) and Luna (USSR) programs: dedicated to landing on the Moon for future exploitation.

Significant Luna missions

Luna 2	12 September 1959	First man-made object to land on the Moon.
Luna 9	31 January 1966	First soft landing.
Luna 13	21 December 1966	Soft landing
Luna 16	12 September 1970	Returned with soil sample
Luna 17	10 November 1970	Lunar rover
Luna 20	9 February 1972	Returned with soil sample
Luna 21	8 January 1973	Lunar rover
Luna 24	9 August 1976	Lunar sample

Significant Apollo missions

Apollo 11	16 July 1969	First manned lunar landing – Neil Armstrong
Apollo 12	19 November 1969	Lunar landing
Apollo 14	31 January 1971	Lunar landing
Apollo 15	26 July 1971	Lunar landing
Apollo 16	16 April 1972	Lunar landing
Apollo 17	7 December 1972	Lunar landing

DISTANCES TO THE STARS

We measure the distance between a star and the Earth, not in miles or kilometres, but in **light years** by using the speed of light. It is important to remember that a light year is a distance, not a measure of time. The distance light travels in one year is a light year. Light travels 299 000 kilometres per second (186 000 miles per second), which is 1 096 000 000 kilometres per hour (680 760 000 miles per hour). Therefore, a light year is a distance of almost 9.6 trillion kilometres, or 6 trillion miles.

It takes more than one second for light from the Moon to reach the Earth and more than 8 minutes for light from the Sun to reach the Earth. Compare this with the 4.3 years that it takes for the light from the nearest star, Rigil of Centaurus, to reach the Earth. Deneb in the Northern Cross is over 1000 light years away. That means the light we now see left the star over 1000 years ago. It is therefore possible that the star may not even be there any more.

THREE-DIMENSIONAL AWARENESS

The stars within each constellation appear as if painted on a flat surface. This is an illusion. As you study the diagram of the constellation Crux (Figure 5) try to imagine the tremendous degree of separation of each star from what would appear to be its close neighbour. This three-dimensional phenomenon holds true for the relationships between all stars in the heavens.

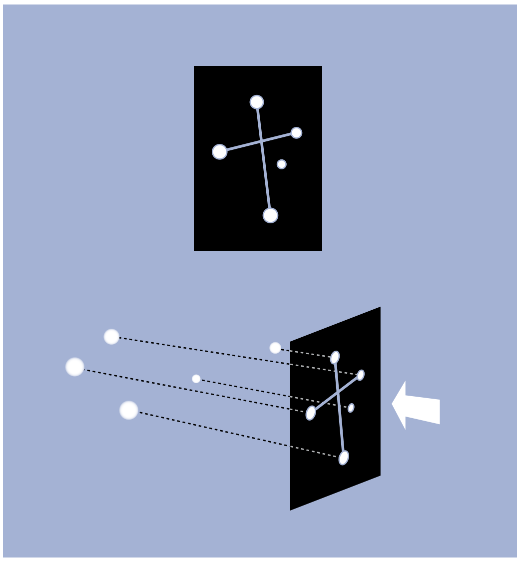

FIGURE 5

THE BRIGHTNESS OF STARS

Some stars appear much brighter than others. This does not necessarily mean that the bright star is bigger or giving off more light than the dimmer star. The **apparent brightness** (how bright it seems to us) depends upon three things: (1) how big it is; (2) how far away it is from Earth; and (3) how much light it actually emanates per diameter of the star. The brightest star to us is our Sun, but it is only an average size star. It seems the brightest because it is the nearest star to us on Earth.

The star Sirius in the constellation of Canis Major appears considerably brighter than Rigel in Orion. However, Rigel is actually thousands of times brighter than Sirius. It appears fainter because it is over a thousand light years away, while Sirius is only 8 ½ light years from us.

We measure the brightness of the stars as seen with the naked eye on a scale called the **magnitude** scale. Hipparchus, a Greek astronomer, rated the importance of stars by their brightness and used the word magnitude to describe their relative brightness. Magnitude relates to size. In ancient times they may have assumed that the brighter star is a bigger star. A very bright star would have a magnitude of 1 or less and a very faint star a magnitude of 6. The smaller the number, the brighter the star. A very powerful telescope can see very faint stars beyond magnitude 20. You may be able to see stars with a magnitude of 6 to 7 with your naked eye under very clear, moonless skies. The very brightest planets have a magnitude of –1 to –4. Unfortunately, light pollution from home and street lamps may prevent you from seeing as many stars as you could if your surroundings were in total darkness. Remember, magnitude is a measure of star brightness, not how much light the star actually produces, nor how big it is. Although there are billions of stars, we can only see approximately 2500 stars with our naked eye at one time under the best of conditions. Read how to test your vision in Part 4.

THE MILKY WAY

The space around us seems to be endless. It is a space occupied by billions upon billions of galaxies, each of which is composed of billions and billions of stars, of which our Sun is an average-sized example. The faint band of stars that arches across the sky was called the Milky Way by the early Greeks. It is our view of the galaxy in which we live from within one of our galaxy's spiral arms. The location of our Sun and Earth in that spiral arm is approximately 30 000 light years from the centre of our galaxy.

What we see with our naked eye is confined to our own galaxy. However, with good eyesight, and if the night is dark enough, you may see a neighbouring galaxy as a faint blur in the constellation Andromeda, or the Small and Large Magellanic Clouds in the region of the constellation Hydrus.

Although our galaxy is whirling in space at tremendous speed it still takes 225 million years to complete one revolution. That time period is called the Galactic Year.

Imagine yourself sitting near the end of a spiral arm of our galaxy. If you look straight up or down you will see neighbouring stars in our spiral arm of our galaxy, but when you look toward Sagittarius you are looking along the flat side of the spiral arm toward the wider and more dense centre bulge of our galaxy. We cannot see the spiral arm opposite us because it is hidden by the billions of stars in the centre of the galaxy.

As you look along the Milky Way you will notice that some areas appear to have dark holes or slots in them. These are not empty spaces, but rather dark masses of dust, star debris and gases that hide the stars behind them. There is a very definite dark slit in the area of Cygnus – sometimes called the Cygnus Rift, or the Northern Coalsack – and a similar dark patch in the Southern Cross, called the Southern Coalsack.