CHAPTER ONE

# Introduction

Astronomy is usually said to be the oldest of the sciences, and so it is. Even in the earliest times, when man was just embarking on his pilgrimage towards civilization, his curiosity was aroused by the Sun, Moon and stars. As soon as primitive science was born, the heavens were naturally its first subject. But if astronomy is the oldest science, it has lost nothing of its fascination over the thousands of years since man first began to rationalize the heavens. Today it is still the most dynamic science, forging ahead to the limits of our understanding as it grapples with the problems raised by strange new celestial objects like quasars and black holes. Its scope is vast, covering nearer worlds like the Moon and extending outwards to the very edge of space and time.

Modern astronomy may seem a far cry from the primitive star-lore of our earliest ancestors, yet it rests on the same basic evidence – observation of the night sky. Certainly we no longer seriously believe that the celestial bodies are gods or spirits, and that their appearances spell out death and disaster, or even peace and plenty. We see now that there is no warrant for believing that the heavens can be used for divining the future. But still we observe the skies from Earth or from out in space, to gather our raw material so that we can discover how the physical universe works.

A mere glance at the night sky will show the vastness of the task facing the astronomer. The heavens seem to be crowded with stars – at least this is the appearance they give on a clear night away from city lights. There are simply myriads of them, arranged apparently at random. Yet as familiarity with the night sky grows, certain patterns become evident. First of all, besides the separate stars, we see that a hazy band of pearly coloured light stretches right across the sky, and this is observable wherever we may be. In the northern hemisphere it appears as an uneven band with some black patches in it here and there; in the southern hemisphere it is somewhat the same, although there are more black patches and, in addition, two small pieces of it look as though they have broken off and gone adrift into space. The Greeks named it *galaxias* or Milky Way, which has given us the modern term 'galaxy'.

The second thing we notice is that the stars are not scattered evenly over the sky; they are arranged in groups or patterns, known as constellations. In early civilizations these patterns were recognized and referred to by imagining that they represented familiar objects, animals and characters from myth and legend. For instance, from Sumer we have the bull and the lion, and from ancient China a tortoise, five chariots and the Purple Palace. As each civilization came into being, it took some of the constellations of its predecessors, and added some of its own. Today we use a total of eighty-eight and specify their boundaries by international agreement and with scientific precision.

With the recognition of constellations, it was also noticed that the stars themselves differed in brightness. In a desire to classify them, the brightest stars were given names, but for referring to others a rather cumbersome system was used at first. Then in 1603, when Johann Bayer published his star atlas *Uranometria*, astronomers were at last given a simple method. Bright stars were all referred to by the letters of the Greek alphabet; the brightest star in each constellation was designated alpha (α), the next brightest beta (β), and so on. About 1300 stars were covered in this way; the rest, when there was a need to refer to them, were later designated by numbers, Thus a star may have a name, usually of Greek or Arabic origin – Canopus, Procyon, Algol or Aldebaran, for example – and it will always have a designation. Thus, Sirius, the brightest star in the constellation Canis Major (the Greater Dog), is alpha (α) Canis Majoris, the second brightest star in Canis Major is beta (β) Canis Majoris, and so on. One of the nearer stars to us, however, has no name and is not even bright enough to rate a Greek letter; it is known as 61 Cygni.

The difference in brightness of the stars is due both to their varying distances from us and to their own very real differences in intensity. However, to the astronomers of earlier civilizations, to whom the stars appeared to be fixed either to the inside of the dome of the sky or to the inside of a sphere of the heavens, there was no question of the stars being at different distances; the brightness differences they noticed had, therefore, to be taken as real differences in intensity. The brightest stars were those to which names were given and they clearly seemed to be the most significant. Thus, in the second century BC, when the Greek astronomer Hipparchus compiled a catalogue of stars, he referred to the brightest stars as those of the first magnitude – the first importance – to those less bright as being of the second magnitude, and so on, down to the dimmest he could observe, which he termed the sixth magnitude.

To divide the stars visible with the unaided eye into six brightnesses was no personal idiosyncrasy of Hipparchus. It was due, although he did not realize