

CONSTELLATIONS

Patterns in the sky

It has always been very seductive to think that the stars are positioned in such an order that a relationship between them might be established. By linking particular patterns or groups of stars many ancient civilizations used them for understanding the universe through the creation of mythology.



The constellations Boötes, Canes Venatici and Coma Berenices, from a set of constellation playing cards
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The patterns of the constellations, then, were invented not discovered. They are simply distinctive, easy-to-remember patterns of stars as seem from Earth and in scientific terms they provide a system that allows the easy location and identification of individual stars.

Although the constellations have changed over the years defined boundaries were laid down by the International Astronomical Union (IAU). During the Astronomical Congress of 1928, it was decided to recognize 88 constellations. A description of their agreed-upon boundaries was published at Cambridge, England, in 1930, under the title *Atlas Céleste*.

Today, we know any relationship to be purely superficial since their positions are only relative to the position from which they are viewed from Earth. There are some exceptions however; for example most of the bright stars of the Big Dipper travel together forming an open cluster. Although the constellations have no scientific significance, astronomers have retained them as convenient visual reference points; it is much easier to speak of a star in Orion than to give its geometrical position in the sky.

Origins

The origins of the patterns is not know for certain though the ancient Chinese and Egyptians are known to have applied symbolic sky maps. The basic pattern followed today is that of the ancient Greeks and all of those given in Ptolemy's *Almagest* (dating from c.150 AD) are still in use. When Ptolemy conceived their patterns the stars were thought to be equi-distant from the Earth; this model was developed from Aristotle's conception of crystalline spheres on which the stars (and planets) rotated around a central Earth. Thus, the idea of a relationship between groups of stars would have been a realistic assumption.

Early cultures

Dependence on the sky became an essential part of many early cultures (and to agricultural cultures today). Around the world there are many examples of ancient civilisations independently constructing sites which demonstrated a precise knowledge of the motions of the heavens. For example, Stonehenge in England or the pyramids in Chichen Itza, Mexico both provide an accurate system for determining celestial events.

Some historians argue that many of the myths associated with the constellations were invented specifically to help farmers construct an accurate understanding of the sky. From ancient times farmers knew that for most crops, you plant in the spring and harvest in the autumn. Therefore, by ensuring the planting took place at the correct time the risk of a failed harvest was kept to a minimum, particularly in regions where the differentiation between the seasons was slight. Since different constellations are visible at different times of the year, farmers were able to use them to tell what month it was. The importance, to these early civilizations, of knowing the time of year calendar cannot be underestimated. As a result, accurate calendar prediction was an essential skill and was a central aspect of astronomy up to at least the 16th century.

Views around the world

It is convenient to divide the constellations into two groups. Those that never set below or rise above the horizon are called 'circumpolar' constellations; the rest are divided into 'seasonal' constellations which periodically come into view through the year. As the relative position of the Sun alters as Earth revolves around the Sun, so different constellations become visible in different parts of the night sky. For example, Scorpius is only visible in the northern hemisphere's evening sky during the summer. Which constellations are circumpolar and which are seasonal depends on your latitude and will change from place to place around the world. From the Earth's extremities the visible sky is fixed. At the Poles all constellations are circumpolar; at the Equator all are seasonal. From the UK, then, most of the Southern Constellations, a large group of 32 constellations, are always invisible and can only be viewed by traveling south of the equator. Many of them named by European scientists, however, when exploring the southern hemisphere for the first time.

The Zodiac

The most famous of all the constellations are the 12 that make up the Zodiac. All planets (with the exception of Pluto at certain times) can be observed only in these

12 constellations as they pass across the sky during the course of their year. This is due to the fact that the orbits of all the planets (again except Pluto) lie within $\pm 8^\circ$ of the ecliptic. That is, within a similar plane in the solar system defined by the inclination of the Earth's orbit. The Sun also moves through the Zodiac, though its apparent motion (diurnal motion) is actually caused by the movement of Earth. It is worth noting here that as a result of precession the constellations have moved over 30° eastwards. This means that they no longer correspond with the Zodiacal signs.

Naming the skies

Most of the brighter stars in the sky have common names that are of historical and mythological significance. For example, the bright red star in the shoulder region of the constellation Orion is called Betelgeuse, which comes from Arabic and roughly translated means 'the armpit of the mighty one'; the brightest star in the constellation Cygnus (the Swan) is situated near the rear portion of the beast and is called Deneb, also Arabic in origin meaning 'the tail of the hen'.

Common names are fine for a few bright stars, but to name all the stars that we see a more systematic system was necessary. One such method is the Bayer system, after the German astronomer Johann Bayer, which names the brighter stars by assigning a constellation (using the Latin possessive of the name) and a Greek letter (Alpha, Beta, Gamma, Delta, Epsilon...) in an approximate order of decreasing brightness for stars in the constellation. The adjacent figure illustrates for Orion. Betelgeuse is also called Alpha-Orionis and Rigel is called Beta Orionis in the Bayer system.

Useful links

- [Stories of the skies](#) - Greek legends, star maps and celestial globes
- [South African star myths](#) - an online feature
- [Tycho's Brahe's star maps](#) - celestial globes from the Museum's astronomy collections
- [International Astronomical Union](#)