

# **Constellations, Fixed Stars and the Zodiac in Islamic Astronomy**

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## CONSTELLATIONS, FIXED STARS AND THE ZODIAC IN THE ISLAMIC ASTRONOMY

The earliest, somewhat enigmatic, references to the zodiac are found in ancient Sumerian texts. These are followed by far more systematic accounts in Akkadian, Elamian and Hittite from the second millennium BC onwards. In later centuries we find the signs of the zodiac being named and subdivisions begin to appear.



**Figure 1** - Cevzâ (Gemini).

Astronomers in the Mesopotamian region regarded the celestial bodies as divinities that influenced events on earth, and believed that each zodiacal constellation was ruled by a god. From this it was concluded that the gods under whose signs they were born and shared their characteristics influenced people. The most specific information about the supposed influence of the signs of the zodiac on people is found in Jewish Hebrew literature, whose roots lay in Mesopotamia and in particular in the traditions of Assyria. In these cultures the zodiacal constellations were called by various names and depicted in various ways over the centuries. It is thought that the imaginary figures associated with the fixed stars, and particularly the constellations, had been known from the third millennium BC. Homer is the first author to mention the zodiac in the Greek world. While the fourth century BC Greek mathematician Eudoxus gives the names of 44 zodiacal signs, Ptolemy (ca. 100-ca. 178) mentions 48 fixed constellations and zodiacal signs in his work translated into Arabic as the *Almagest*. Almost all the signs of the zodiac—most of which symbolised animals—used in Hellenistic civilization are recorded by Hipparchus (first century CE). The names and forms of the fixed stars and zodiacal constellations were largely defined in the pre-Islamic period, although Muslim astronomers occasionally modified these names and forms in accordance with their own ideas and beliefs.

The names of the twelve signs of the zodiac used today first appear in Latin literature. According to Graeco-Roman astrology, these twelve signs, or twelve 'houses,' each represent a specific human character.

Magic can be defined as all actions carried out in order to achieve certain results, whether harmful, beneficial or defensive, which it is claimed is achieved through contact with supernatural forces or by using natural objects which it is claimed possess secret supernatural powers.

Such claims are regarded in Islam as contrary to monotheistic beliefs. In Islam to claim something happens supernaturally implies that God is not in control. Nature is God's creation. There is only one cause that is superior to nature and that is God. For this reason the practice of any act of magic, is considered one of the gravest sins.

The ability to predict the future is the core benefit of the careful study of nature which we call science, but the separation of astronomy, the predictive science of nature based on monotheism, from astrology, the speculative science of the supernatural, took a long time to complete.

Throughout history priests, oracles and astrologers have made use of very diverse information in their attempts to predict the future. There is a massive volume of documentation about fortune telling and prophecy in Egypt, China, Babylonia and Chaldea in the fourth millennium BC. Mesopotamia is probably the oldest source of such activity. According to the Mesopotamians, the stars were the writing of the sky, exerting a direct influence on the lives of communities and individuals, and orchestrating events according to their positions.

Consulting the signs of the zodiac as a means of interpreting events in the process of prophecy and fortune telling is thought to have begun around 700 BC. Astrology, which could be defined as reading the stars, emerged as a type of prophecy, and over succeeding centuries developed to the point where it was the principal source for almost all prophecy. In time astrology developed into a complex system which sought to provide answers to countless specific questions.

It was believed that depending on the position of the stars at the time of a person's birth, their destiny could be predicted. Of the types of fortune telling used in Babylonia, it was those relating to astrology that the Hittites adopted and used to the greatest extent, signs relating to the moon and sun being associated particularly with the king and other members of the royal family. The Chinese also attached great importance to astrology, and Hindu astrology was a combination of the Chinese and Middle Eastern systems. From the time when astrology emerged until the beginning of the eighteenth century, physicians, philosophers, mathematicians and soldiers made use of star maps and manuals giving the positions of celestial bodies in the course of their work. However, it was undoubtedly soothsayers and fortunetellers who relied on it to the greatest extent, using the stars and planets more than anything else to seek to interpret the future and the unknown. Knowing the positions of the constellations and fixed stars, the sun and the moon, was essential for them.

In pre-Islamic cultures the supposed effects of the zodiacal constellations on human beings were more important than their astronomical aspects, as a result of the close connection with their pagan religions. They believed that the celestial bodies, each of which was a divinity, influenced human character and

actions. The civilizations of Mesopotamia which devoted much attention to the three-way relations between gods, the zodiac and human beings, developed special prophetic formulas for interpreting these.

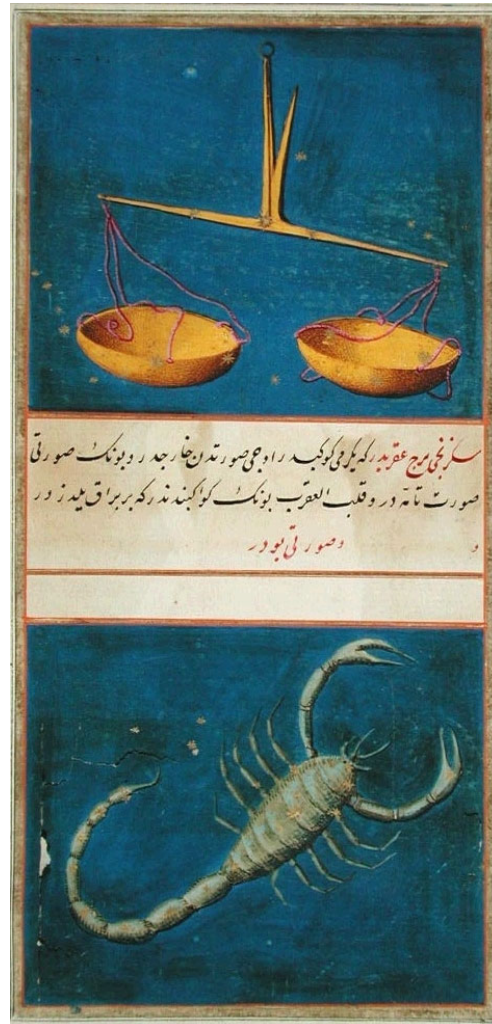


Figure 2 - Kavs (Sagittarius) and Cedī (Capricornus).

## The Zodiac

According to astronomy based on the heliocentric solar system, the sun appears to make a complete revolution around the ecliptic in a year. Thus, the ecliptic cuts the celestial equator, which itself divides the great sphere of the universe horizontally at an angle of 23.5 degrees. These points of convergence constitute the spring and autumn equinoxes. Early astronomers described the imaginary 8.5-degree band on either side of the ecliptic as the zodiac. Beginning with the spring equinox on 21 March, the zodiac was divided into twelve equal segments called signs, which took their names from the constellations situated in them. Today, however, due to precession of the Earth, they are no longer located exactly in the segments to which they belong. Since the position of these constellations shifts by 50 seconds every year as a result of precession, it is possible to calculate that the present names of the signs of the zodiac date back approximately 2600 years. Since the sun completes its apparent orbit around the zodiac in one year, and since the zodiac incorporates twelve constellations, each month corresponds approximately to a constellation. The areas covered by the constellations in the celestial sphere are unequal, so the time that

the sun takes to pass through them is sometimes less or more than a month. For example, the sun spends 42 days crossing the sign of Leo, but only nine days crossing the sign of Scorpio.



**Figure 3** - Mîzan (Libra) and Akreb (Scorpius) constellations.

## The Signs of the Zodiac

The concept of the zodiac, which before being adopted by Islamic civilization had been established in Greek, Egyptian, Mesopotamian, Indian and Chinese civilizations, was viewed from a new angle by Muslim observers, who based their views on verses in the Koran. Since Islam was a monotheistic faith, most Islamic scholars regarded that the signs of the zodiac only as positions through which the sun and moon passed. The symbolism of the zodiac, represented largely by animals in Mesopotamian and Hellenistic civilizations, took different forms in different cultures. In Greek civilization the series of constellations known as the *zodiakos kyklos* (cycle of animals) or *to zodia* (small animals) were described by Muslim astronomers as the *falak al-burûj* or *dâirat al-burûj* (both meaning 'zodiacal sphere').

Islamic astronomers continued to follow Ptolemaic cosmology as described in the *Almagest*, using the names, symbolic forms and order of the signs of the zodiac. The sun was supposed to enter each of the houses on a specific date, these consisting of twelve equal 30-degree divisions of the circular zodiacal band. The Latin and Arabic equivalents of the signs of the zodiac and the dates on which the sun enters them are given in the table below:

| LATIN       | ARABIC  | DATE         | Longitude |
|-------------|---------|--------------|-----------|
| ARIES       | HAMAL   | 1 MARCH      | 0°        |
| TAURUS      | SAWAR   | 20 APRIL     | 30°       |
| GEMINI      | JAWZA   | 21 MAY       | 60°       |
| CANCER      | SARATAN | 22 JUNE      | 90°       |
| LEO         | ASAD    | 23 JULY      | 120°      |
| VIRGO       | SUNBULA | 23 AUGUST    | 150°      |
| LIBRA       | MAÎZAN  | 23 SEPTEMBER | 180°      |
| SCORPIUS    | AQRAB   | 22 OCTOBER   | 210°      |
| SAGITTARIUS | QUOS    | 22 NOVEMBER  | 240°      |
| CAPRICORNUS | JADEE   | 22 DECEMBER  | 270°      |
| AQUARIUS    | DALWA   | 20 JANUARY   | 300°      |
| PISCES      | HOOD    | 19 SUBAT     | 360°      |

Islamic astronomers made extensive study of pre-Islamic observations, and were strongly influenced not only by the scientific knowledge of astronomers like Ptolemy, but some were also influenced by many ancient astrological beliefs and accepted descriptions of relationships between events on earth and the stars and zodiacal constellations. Some rulers sought advice from astrologers and with the generous sums on offer, numerous books were written about the way celestial phenomena influenced these events.

### Astrology for the Ottomans

Astrology (*tanjim*) was also known as *ilm-i ahkâm-i nûcûm* ('the science of drawing inferences from the stars') in Islamic culture. However, there was constant controversy over whether astrology violated the principles of reason and religion. Although many Islamic scholars judged astrology to contravene religion, astronomers continued to interpret the heavens, and sultans to act on their advice. The office of chief astronomer (*munajjim-bahs*) instituted at the Ottoman court in the mid-fifteenth century combined astronomical observations for such purposes as drawing up annual calendars, and astrological functions. But the attitudes towards astrology of the Ottoman sultans varied. While some complied with tradition and consulted the chief astrologer from time to time, others dismissed astrology as contrary to both religious

principles and reason. When Sultan Abdülhamid I (1774-1789), who belonged to the latter category, was told by his grand vizier that astronomers had given two different auspicious times for the army to march out of Istanbul on campaign, and asked which to choose, he wrote the following in reply:

*Our Lord Prophet, in whose deeds the world glories, never acted according to the stars, but put his trust in God... My affairs are in the hands of God Almighty, not the stars. In the Ottoman State great affairs of this kind have always been attributed to the propitious time, and action taken at once. It is up to one of my commanders from Istanbul, no other way is acceptable. When the enemies of the faith attack us, should we wait on the grounds that the time has not yet come? It is sometimes acceptable to choose between the opinions of notable honorable people. Otherwise whatever you wish it is up to you, I will not interfere. Our dignitaries will hinder you greatly, let the outcome be auspicious, let no one write a word about it, but march at once on whatever day is decided upon. 'May God be with us. It is not known how the weather will be by Thursday, so there is no better day than the morrow, which is Monday, the birthday of our Prophet, and I trust in that.*



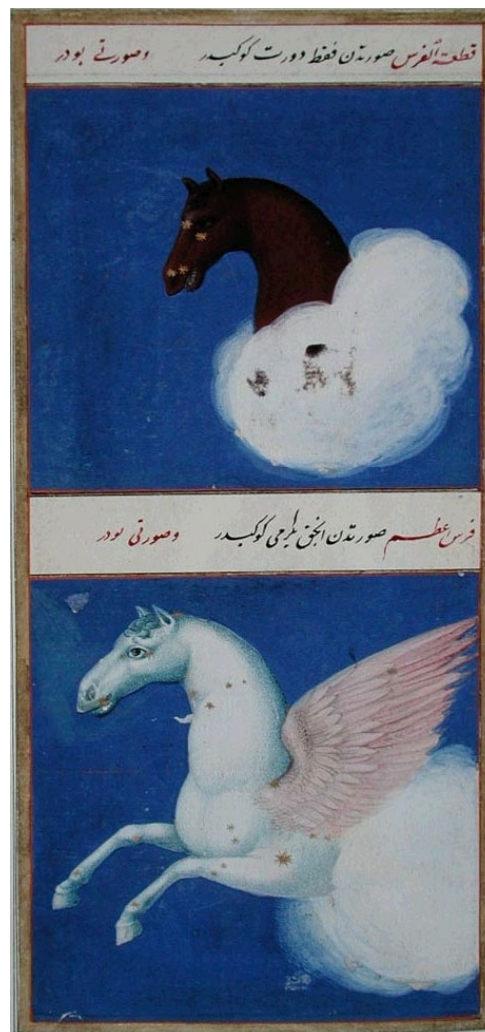
**Figure 4** - Miniature illustrations of Dübb-i Asgar (Ursus Minoris) and Dübb-i Ekber (Ursus Majoris).

Like his predecessor Abdülhamid I, Sultan Selim III (1789-1807) did not believe in propitious times and horoscopes, and when he was asked to decide between two times cited by astrologers as propitious for the sailing of the fleet, he replied:

*Every day is the day of God Almighty. I have no belief in the stars. I place my trust in God, so let the navy sail on whichever day you deem appropriate. And may the engagement take place on whichever day is appropriate.*

However, when a further horoscope was presented to him, Selim III let tradition have its way, and wrote the following reply:

*Since it has become the custom, let it be done accordingly.*



**Figure 5** - Kutta feres (Equuleus) and Feresü'l-a'zam (Pegasus) constellations.

### **Zodiac Illustrations Dating from the Tulip Era (Lale Devri)**

The *Tulip Era* is the name given to the period 1718-1730, corresponding to the second half of the reign of Sultan Ahmed III (1703-1730). The predominant figure of this period was Grand Vizier Nevsehirli Damad Ibrahim Pasha (1718-1730), under whose government the Ottoman State enjoyed a period of peace and flourishing scientific and cultural activity. Although best remembered for its pleasure-loving aspect, the



period is in fact more important for its achievements in the field of scholarship and the arts. Ibrahim Pasha encouraged scholars and poets, and enjoyed discussing scholarship and literature with them. One of the most important of the activities during this period was the second great translation movement in Islamic history.

Ibrahim Pasha organized teams of scholars to translate many books, which he deemed to be of importance from diverse foreign languages into Turkish. One of these was *Ikd al-Jumân fî Tarihi Ahl al-Zaman*, a book on world history by Imam Kadi Mahmud ibn Ahmed ibn Musa ibn Hüseyin ibn Yusuf ibn Mahmud Bedreddin al-Aynî of Antep (d. 1451), known as Imam Aynî.

This book describes the events of history from the time of Adam up to the writer's own time in the fifteenth century, and the first volume includes sections on geography and astronomy. The first section of the first volume about astronomy and geography was translated into Turkish by the poet Mirzazâde Salim Efendi (d. 1743).



**Figure 6** - Seretan (Cancer) constellation.

### **Mirzazâde Salim Efendi**

Mirzazâde Salim Efendi wrote introduction giving information about the author and his book, correcting some mistakes by Aynî on the subject of astronomy, and making some additions, which included 46 miniature paintings depicting the fixed stars and zodiacal constellations. These illustrations were intended to give readers a better understanding of the astronomical subjects discussed by Bedreddin Aynî, and they seem to have been painted by Salim Efendi himself.

The illustrations are on pages 19b-30b of the manuscript. Twelve depict the signs of the zodiac, and the remainder fixed stars. Two of the miniatures depict two constellations each, bringing the total number depicted to 48, which is equal to the number of diagrams in the star catalogue of Ptolemy, in whose footsteps Muslim astronomers followed. The book relates that the fixed stars are 1022 in number, which again is in accordance with Ptolemy, but says that only 917 of these have been illustrated in 48 diagrams. Probably the remaining 105 were not illustrated because of their faintness. Twelve of the 48 diagrams belonged to the zodiacal constellations. Twenty miniatures showing 331 stars represent the constellations of the northern hemisphere, and fifteen those of the southern hemisphere.

## Constellations

Constellations, or groups of fixed stars, were given names, such as the Great Bear, Orion, and Taurus. Twelve of these constellations gave their names to the signs of the zodiac, as described before. For astrologers what mattered was not the constellation themselves but the signs of the zodiac named after them. The Ottoman and Latin names of the constellations illustrated by Mirzazâde Salim Efendi are as follows:

Dübb-i Asgar (Ursus Minoris), Dübb-i Ekber (Ursus Majoris), Tinnîn (Draco), Keykâvûs (Cepheus), Avva (Boötes), Fekke (Corona Borealis), Câsî (Hercules), Silyak (Vultur Cadens), Dücâce (Cygnus), Zâtü'l-kürsî (Cassiopeia), Kaytas (Cetus), Cebbâr (Orion), Nehir (Eridanus), Erneb (Lepus), Siyavus (Perseus), Mümsikü'l-a'inne (Ophiuchus), Hayye (Serpens), Sehm (Sagitta), Ukab (Aquila), Delfin (Delphinus), Kutta feres (Equuleus), Feresü'l-a'zam (Pegasus), Mer'etü'l-müselsile (Andromeda), Müselles (Triangulum), Kelb-i ekber (Canis Majoris), Kelb-i asgar (Canis Minoris), Sefine (Argo Navis), Batiyye (Crater), Iklîl-i Cenûbi (Corona Australis), Hût-i Cenûbî (Piscis Austrinus), Hamel (Aries), Sevr (Taurus), Cevzâ (Gemini), Seretan (Cancer), Esed (Leo), Sünbüle (Virgo, Virgin), Mîzan (Libra), Akreb (Scorpius), Kavs (Sagittarius), Cedî (Capricornus), Delv (Aquarius), Hût (Pisces), Suca' (Hydra), el-Gurab (Corvus), Kanturus (Centaurus), Micmere (Ara).

In the brief explanations at the top of each of the miniatures, Salim Efendi gives the name of each constellation and, with the exception of the zodiacal constellations, the number of stars they contain. The positions of the stars are marked on the miniatures. Islamic astronomers did extensive studies of the fixed stars and shapes of the constellations. One of the most important of these was Abdurrahman al-Sûfî (d. 986), who wrote a treatise on the subject entitled *Risâlat Suwar al-Kawakib* that exerted a considerable influence not only on Islamic but also European astronomy.

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