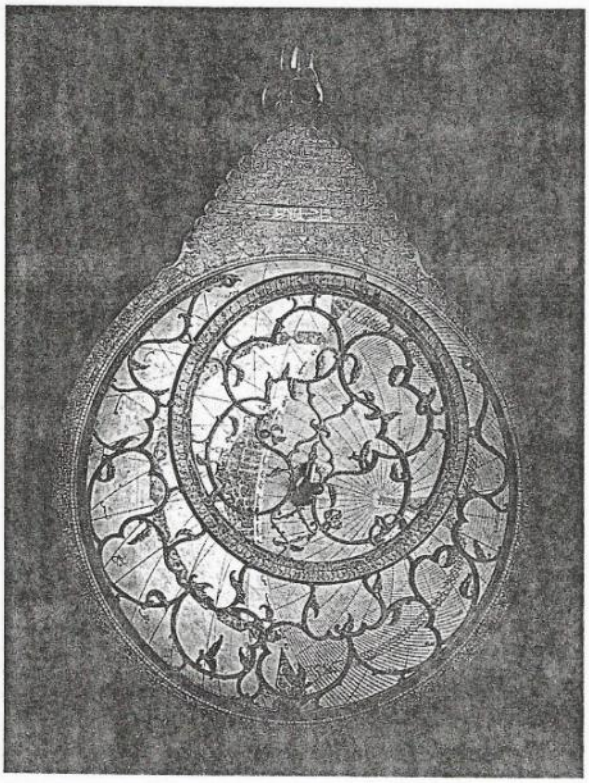

2. Astrolabe, cast and engraved bronze, diam. 402 mm, from Iran, 1712 (London, British Museum)

from an early date at all major Islamic courts, from Spain to Central Asia and India. The oldest surviving astrolabes are all well crafted as instruments, but few are notable for artistic decoration. One exception is an astrolabe (London, BM) made by 'Abd al-Karim in Cairo in 1236: the *kursī* is inlaid front and back with silver and the pointers of the rete are remarkably formed by plants, animals, birds and a human figure. Some of the most beautifully decorated astrolabes were made in Safavid Iran. One of the finest was made for Husayn I in 1712 (see fig. 2): it has a large *kursī* inscribed on the front and decorated with an elegant arabesque on the back, a rete figured as a somewhat deformed arabesque of stems with palmette leaves, both stems and leaves engraved with small leaves as infill, and the body is thoroughly inscribed on front and back with fine calligraphy.

Interest in Islamic astronomical instruments has continued in the Islamic world, and Islamic astrolabes have been popular among Western collectors since the 18th century. As a result, working astrolabes, some of which are inscribed with false historical information, continue to be produced, as well as fine but non-functional fakes.

For further illustration *see* SCIENTIFIC INSTRUMENTS, fig. 2.

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Astrological and astronomical manuscripts. Manuscripts describing the layout of the heavens, as prescribed by Classical astronomical theory, and its perceived effect on terrestrial events. This article is concerned primarily with the Western tradition; for information on other manuscript traditions, *see under* the relevant geographical and cultural articles.

1. Zodiacal and constellational imagery. 2. Illustrated astronomical texts.

1. ZODIACAL AND CONSTELLATIONAL IMAGERY. Astrological and astronomical configurations appear in several different types of manuscripts. The most common formula is that of the 12 zodiacal constellations in medieval and Renaissance calendars, where each zodiacal sign is used as the symbol for a particular month (*see* CALENDAR). The zodiacal signs are often paired with scenes depicting the related Labour of the Month, a tradition that may be traced back to Late Antiquity. Webster has argued that an early form appears in a Hellenistic frieze (Athens, Panagia Gorgoepikos), in which a row of standing figures representing the Greek months are interspersed at irregular intervals with zodiacal constellations. This kind of image must have been the impetus for such later manuscript illuminations as the zodiacal roundel in the Vatican Astronomical Tables (9th century; Rome, Vatican, Bib. Apostolica, MS. Vat. gr. 1291, fol. 9*r*), which shows a central figure of Apollo surrounded by half-length figures representing the hours and months, and is ringed by a circle of zodiacal signs. A similar design also appears in the planetary rota in two *Aratea* manuscripts (9th century; Leiden, Bib. Rijksuniv., MS. Voss. lat. Q. 79, fol. 93*v*; 11th century; Boulogne, Bib. Mun., MS. 188, fol. 20*r*; see below).

The tradition of illustrating Labours of the Months with zodiacal signs was most enduring in sculpture, as demonstrated by the architraves and jambs of countless church portals. Their influence on manuscript illumination is most obvious in such examples as the calendar illustrations to the 9th-century martyrological poem of Wandalbert, Abbot of Prüm (Rome, Vatican, Bib. Apostolica, MS. Reg. lat. 438), where the architectural frame is included in the composition. During the late Middle Ages, the illumination of the zodiacal figures in manuscript calendars became highly decorative and often quite fantastic, for example the zodiacal constellations in the calendar of the Rohan Hours (*c.* 1430–33; Paris, Bib. N., MS. lat. 9471, fols 1*r*–17*v*). Perhaps the most interesting series of zodiacal

illustrations are those of the TRÈS RICHES HEURES (*c.* 1411/13–16; Chantilly, Mus. Condé, MS. 65, fols 1*v*–12*v*) of Jean, Duc de Berry. Each calendar page is surmounted by a lunette showing the Sun riding on his solar chariot through the appropriate signs of the zodiac. The span of the month itself is correctly depicted as split between two signs, since the natural break between them usually occurs during the third week of the calendar month (for illustration *see* VALOIS, (3)).

Manuscript illustrations of the extra-zodiacal constellations generally appear in two formats only. The first, and more rare, is as an illustrative testament to astronomical references in poetry. The best example is the Riccardiana Virgil, where the constellations populate the night sky during the sack of Troy in the *Aeneid* (15th century; Florence, Bib. Riccardiana, MS. 492, fols 81*r* and 101*r*). The second format for constellational iconography is as illustrations to astronomical texts, the history of which is long and complex. The impetus behind the inclusion of pictures in these texts was, presumably, to serve as aides-mémoires. The figures were supposed to provide a reminder of the mythological shape of the constellation and the location of the stars within it. Unfortunately, what may have originated as a mnemonic device for the Classical scholar interested in astronomy, and well acquainted with the configurations of the stars, became misunderstood as the continuity of Classical learning faltered during the Middle Ages.

1. Astronomical constellation, *Cepheus*; miniature from Germanicus: *Aratea*, 9th century (Leiden, Bibliotheek der Rijksuniversiteit Leiden, MS. Voss. lat. Q. 79, fol. 26*v*)

2. ILLUSTRATED ASTRONOMICAL TEXTS. There are essentially two traditions of the illustrated astronomical text: the poetic and the scientific. Both traditions seem to have originated in the common source of the astronomical poem of the Greek writer Aratus of Soli (*fl c.* 315–240 BC), who in turn based his description of the heavens on an earlier scientific work by the Greek astronomer Eudoxos of Knidos (*fl c.* 390–340 BC). Aratus' *Phaenomena* has approximately 1150 lines, its first half is devoted to a detailed description of the constellations, their forms and relative placements in the heavens. The poem was well known in the Latin West through numerous sources: the Latin translations, known as *Aratea*, of Cicero, Germanicus (15 BC–AD 19) and Rufus Avienus (4th century AD); two anonymous medieval versions of the *Aratus latinus*; the so-called 'Compilation of 810'; the excerpts ascribed to Bede (673–735); and the various citations of the poem in such early Roman encyclopedic authors as Pliny, Varro of Atax (*b* 82 BC) and Vitruvius. There are also numerous medieval *scholia* to the Latin translations. Furthermore, the four books of the *Astronomica* by the Roman mythographer Hyginus (2nd century AD), are virtually an expanded version of the *scholia* to the Germanicus translation of the *Phaenomena*.

In the widest sense, all of the manuscripts belonging to the Aratean poetic tradition share certain resemblances. Many have one or more celestial maps as prefaces, and many share roughly the same order of the constellations. The archetypal model for the constellation illustrations themselves is found in the marble bas-relief of the celestial globe held by the 2nd-century AD Roman copy of a much earlier Greek statue, the Farnese *Atlas* (Naples, Mus. Archeol. N.). Thiele demonstrated a direct link between the constellations depicted on the globe and those found in the earliest surviving Aratean manuscripts, for instance the 9th-century Germanicus translation in the Leiden manuscript (see fig. 1), and the two early 9th-century *Aratus latinus recensio interpolata* manuscripts (Cologne, Erzbischöf. Diöz.- & Dombib., MS. 83. II; Paris, Bib. N., MS. lat. 12957). Despite the early date of these manuscripts, there is still a gap of nearly 700 years between the Farnese *Atlas* globe and the earliest extant illustrated astronomical text; and during that time, a number of the pictorial traditions had become garbled and distorted. By the 15th century the resemblance of illuminated Germanicus manuscripts to their Classical models is all but lost and their 'astronomical' content virtually non-existent. Nevertheless, the convention for illustrated astronomical literature was sufficiently strong to generate a series of Renaissance imitations, including the *Astronomica*, an astronomical poem by Basinio de' Basini (1425–57), of which at least ten illustrated manuscripts are known (e.g. Parma, Bib. Palatina, MS. Parm. 27).

The second, scientific tradition for illustrated astronomical manuscripts is no less complex, but more exotic. During the 2nd century AD, Ptolemy composed a star catalogue of the 1032 visible stars in the 48 major constellations (*Syntaxis mathematica* VII and VIII, known through the Arabic as the *Almagest*). Later manuscript evidence of, for example, the 9th and 15th centuries suggests that a version of this text may have been illustrated (both Rome, Vatican, Bib. Apostolica, MSS Vat. gr. 1291

and 1087, respectively), but the main source for illustrated versions of the Ptolemaic stellar tables comes from the Arabic translations of the text by such scholars as Thabit ibn Qurra [Thabit] (AD 836–901), Zakariyya' ibn Muhammad al-Qazwini [Kazwini] (*c.* 1203–83), and most notably, 'Abd al-Rahman al-Sufi [Sufi] (AD 903–86). In the Arabic tradition, each of Ptolemy's 48 constellations is purportedly seen from both an earthly and a heavenly perspective. Whereas the former view represents the constellation as seen in the night sky, the latter is claimed to illustrate the constellation as depicted on a celestial globe. Ptolemy describes the constellations from an earthly perspective: all the figures face the viewer. The figures depicted on a globe, on the other hand, are illustrated from a heavenly perspective and thus shown from behind. The Arabic illustrations thus show two mirror images of the constellation. Furthermore, because most Arabic scholars had lost contact with the iconography of the Hellenistic myths, the identity of many constellations became arabized. The constellation Cepheus, for example, is called *al-multahib* ('the one who burns') after the bright star in the headdress of the figure. Boötes is called *al-ṣayyāḥ* ('the Shouter'), and Orion is referred to as *al-jawzā'* ('the Violent One'). Each is depicted in Arabic or Persian dress holding local tools and weapons as attributes. The mythology of the skies did not primarily interest the Arabs; what fuelled the translations was a fascination with the science of astronomy. The advantage of the Arabic astronomical manuscripts is that even though the images of the constellations and their identities became distorted, the astronomical positions of the stars remained surprisingly accurate for centuries (*see also* ISLAMIC ART, §III, 4(ii)(a)).

Sufi's version of Ptolemy's star catalogue became available to the Latin West through the translations of Gerard of Cremona (*c.* 1114–87) and Alfonso X, King of Castile-Leon (*reg* 1252–84). In the earliest extant manuscripts of these translations, for instance the 13th-century Sicilian version (Paris, Bib. Arsenal, MS. lat. 1036; see fig. 2) or the late 14th-century manuscript from Murano (Berlin, Kupferstichkab., MS. 78. D. 12), the Arabic flavour of the illustrations is unmistakable. Furthermore, the names of the constellations remain close to their Arabic models: Cepheus is called 'Inflammatus', Boötes is 'Vociferans' and Orion is 'Sublimator' and 'Audax'. The influence of this iconographic tradition was widespread and long-lived. More than 60 medieval and Renaissance manuscripts contain what might be called 'Arabic elements' in their illustrations. As the Aratean tradition influenced later writers, so the Latin Sufi tradition spawned a number of related works: the *Liber introductorius* of Michael Scot (*c.* 1175–*c.* 1234), the *Liber astronomicus* (*c.* 1270) of Guido Bonatti, the *Dittamondo* (*c.* 1350) of Fazio degli Uberti (*c.* 1310–*c.* 1370) and the *Fons memorabilia* (final version 1402–18) of Domenico d'Arezzo.

Astronomical illustrations also often appear in astrological and magical texts. One particularly popular tradition during the late Middle Ages was the illustration of the abbreviated version of the Latin translation, the *Introductorium in astronomiam*, of the treatise by Abu Ma'shar [Albumasar] (*d* 886), describing the figures that identified the constellations according to the Greek, Arabic and Indian traditions. The Greek and Arabic descriptions are

2. Astronomical constellation, *Orion*; miniature from an anonymous Latin translation of al-Sufi: *Liber de locis stellarum fixarum*, 13th century (Paris, Bibliothèque de l'Arsenal, MS. lat. 1036, fol. 36*r*)

recognizable as portions of the familiar Ptolemaic constellations (often referred to with the slight misnomer of *paranatellonta*). The Indian descriptions, however, are based on the astrological concept of the decan or decan-god, a quasi-mythological figure distantly related to early Egyptian chronometrical hieroglyphs. Illustrated versions of the *Introductorium* appear in several guises: in the *Liber astrologiae* of Hermannus Dalmata [Georgius Zotori Zapari Fenduli] (written between 1143 and 1200); the *Introductorium in iudiciis astrologiae* (1293), the Latin translation made by Pietro d'Abano (1250–*c.* 1315) from a French version (1273) of the Hebrew original by Abraham ibn Ezra (*c.* 1089–1164); the *De figura seu imagine mundi* (*c.* 1450) of Ludovico d'Angulo; and the *Astrolabium planum* (Augsburg, 1488) of Johannes Angelus based on Pietro d'Abano's *De imaginibus*. A number of the decan figures also appear in such magical texts as the Alfonsine *Lapidario* and *Libro de las formas & ymagenes*, the *Picatrix latinus*, and the *De imaginibus caelestibus* of Guglielmo Raimondo de Moncada [Flavius Mithridates]. As Pingree has pointed out, the iconographic tradition for these figures was tenuous at best. The large-scale versions of this type of illustration, as seen in the frescoes of the *salone* of the Palazzo della Ragione, Padua (*c.* 1430), or in the Salone dei Mesi of the Palazzo Schifanoia, Ferrara (completed before 1470), highlight the ambivalent status of the

imagery (*see* FERRARA, fig. 3). Decans and *paranatellonta* seem to have been sufficiently important to warrant citation, but each version of a decan-god or *paranatellon* is strangely unique, never quite allowing its history to be traced directly back to earlier sources.

Numerous manuscripts contain astronomical diagrams that illustrate the relative motions of the planets, the structure of the cosmos, the phases of the moon, the phenomenon of solar and lunar eclipses or the apparent variation in planetary orbits. One kind of diagram worth noting is the so-called 'melothesia man', which depicts a human figure upon which the zodiacal constellations or their glyphs have been placed in order, starting with Aries at his head and ending with Pisces at his feet. The purpose of this diagram is to show the astrological 'rulers' of each part of the body. It was most often consulted for medical purposes, especially as a guideline for the times considered most auspicious for bleeding a patient (*see* MEDICAL ILLUSTRATED BOOKS, §1). The intellectual premise behind the diagram was the belief that the body of man was a reduced replica of the heavens, and that man was the microcosmos reflecting the macrocosmos of the spheres. The most convenient textual source for the illustration is the popular astrological work by Ptolemy, the *Tetrabiblos*, but his text was so widely diffused through secondary sources that much of it was probably 'common knowledge' for the medieval scholar and medical doctor.

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Astruc, Jules(-Godefroy) (*b* Avignon, 1862; *d* Paris, 1935). French architect. He entered the Ecole Nationale des Beaux-Arts in Paris in 1881. He studied there under Drouillard and Victor Laloux (the architect of the Gare d'Orsay). Astruc received his diploma in architecture in January 1889, submitting a collection of designs for a railway station 'following German principles'—a plan that he had presented to the Salon de la Société des Artistes Français in the previous year. He went on to design a large number of private buildings, but he is chiefly known for the church of Notre-Dame du Travail (1899–1901), 59, Rue Vercingétorix, 14e, Paris. Like Victor Baltard's church of St Augustin (1860–67) and Louis-Auguste Boileau's St Eugène (1854–5), Notre-Dame du Travail is built of stone and metal, but unlike them it uses industrial T-section and I-section iron girders, which are riveted and welded together. Its spacious, relatively empty surface at ground level, the openings high up that diffuse an even light throughout the building, and the use of brick and buhr-stone make the church seem more closely related to contemporaneous factories than to other Parisian churches built with metal frameworks in various revival styles. The resemblance is intentional as the curate of the parish, Soulange-Bodin, required that the building should reflect, in its structure and materials, the factories in which the parishioners of this working-class suburb worked—hence also the dedication to Notre-Dame du Travail. He launched a nation-wide appeal to raise money by popular subscription so that this universal church could be consecrated on the occasion of the Exposition Universelle (1900). The metal structure of the building, particularly the use of iron arches and iron columns to articulate the elevation of the nave, is incorporated into the design from a largely functional point of view, with a minimum of decorative features. As in the case of St Eugène, two lateral galleries cover the length of the nave and overhang the side chapels, a feature probably inspired by churches of the curate's native Basque region. The church is built on a conventional basilica plan, with masonry reserved for the choir and the solid structures of the façade. The decorative details include a neo-Palladian Venetian window on the end wall of the choir, Roman arches in the organ loft, and the trilobate windows and neo-Roman decorations of the façade. Astruc was also responsible for the design of a chapel at 18, Rue Lhomond, Paris, the schools of Notre-Dame in the Rue des Ursulines, Paris, and at the château of Presles, Val d'Oise. As assistant Architecte Voyer to the sixth arrondissement of Paris, he had an extensive practice in the southern districts of the city.

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Astruc, Zacharie (*b* Angers, 20 Feb 1833; *d* Paris, 24 May 1907). French writer and artist. He was primarily known as an art critic in Paris from 1859 to 1872. His first major publication was *Les 14 Stations du Salon*, a compilation of his reviews of the Paris Salon of 1859, with an addendum devoted to Courbet. In 1863 Astruc edited *Le Salon*, a liberal newspaper that appeared daily during the annual Salon until it was suppressed by the government.