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THE NASSER D. KHALILI COLLECTION OF ISLAMIC ART

VOLUME XII

Part One
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SCIENCE, TOOLS & MAGIC

Part One. Body and Spirit, Mapping the Universe

by Francis Maddison
and Emilie Savage-Smith
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Foreword

The Nasser D. Khalili Collection of Islamic Art documents the artistic achievements of the Islamic world, but the items it contains also serve to illustrate the high level attained by Muslim society in other spheres of culture. *Science, Tools & Magic* brings together objects that relate to several aspects of that wider culture. One such aspect is scientific endeavour in fields as diverse as medicine and astronomy. The second is the techniques employed in a variety of economic activities, from beekeeping to leatherworking. The third is the invocation of supernatural forces on behalf of the individual believer, through astrology, making talismans, casting lots and other magical crafts.

The links between these three subjects are manifold. Talismanic designs were used, for example, to protect beehives, as in the case of cat. 204 and 205, while in cat. 135, a marble template for the maker of an astrolabe, the Collection possesses a tool that was used in the production of scientific instruments. Connections also exist at a deeper level, for the conception of knowledge and craft current in the pre-modern Islamic world was not so neatly divided into categories as is the practice today. Thus a celestial globe could be employed to tell the time, a 'scientific' use, and to cast a horoscope, an activity that is no longer counted as part of science. The single most important factor binding these elements together was a belief in Islam, but this factor has often been underestimated by the modern world, especially in relation to Islamic science.

It is generally appreciated that medieval Arab civilization preserved and enhanced the astronomical knowledge current in the Mediterranean world in the Hellenistic and Roman periods, and that the transmission of this knowledge to Christian Europe marked an important stage in the rebirth of European scientific culture. But however useful Arab astronomy may have been to the development of Europe, it was of far greater importance to the functioning of Islamic society, whose preoccupations it reflected. For the knowledge in question was fostered by the Arabs and by other Muslims for reasons of their own, some of which were intimately connected to their religious beliefs. A select few were concerned with philosophical enquiry; a larger number had recourse to astrology; but every Muslim needed to know in which direction Mecca lay, and the precise times of the five daily prayers, data that could be obtained by observing the heavens. Indeed, the well-developed match between Islamic astronomy and the everyday concerns of pious Muslims explains why this form of the science continued to flourish in lands with a Muslim population long after European scientists such as Copernicus, Galileo and Newton had led European astronomy on to a different plane of enquiry.

Emilie Savage-Smith and Francis Maddison have, I believe, made a significant contribution to the study of the themes covered by this catalogue, and I am very grateful to them for their hard work and their generosity with their time and ideas. Other people have also added their thoughts and efforts, not least Ralph Pinder-Wilson, whose work on the stone press-moulds in the Collection has illuminated a subject previously obscured by misinformation. Tim Stanley has kindly contributed a selection of locks, padlocks and tools.

 Others have also made generous contributions to the project, and in particular the authors have asked me to thank, in London, Stewart Emmens of the Science Museum, Dr Sheila Canby, Dr Venetia Porter and Dr St John Simpson of the British Museum, Georgina Shirley of Sotheby's, Dr Jonathan Katz, now Master of the Queen's Scholars, Westminster School, and Regina Krabl; Dr Geoffrey Khan of the University of Cambridge; at the University of Oxford, Dr James Allan, Emeritus Professor Charles Dowsett, Miss P.M.C. Jackson, Emeritus Professor Geoffrey Lewis, Professor
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Nasser D. Khalili
London, 1997
Introduction

The artefacts and manuscripts catalogued in this volume represent a blend of the rational, the magical and the practical—a conglomeration often incomprehensible to modern readers. Yet in the medieval Islamic world, the word 'ilm, usually translated as 'science', was used for all attempts to comprehend and, to the extent that God permits, to predict and control the forces surrounding human existence. To this end, all avenues of investigation and explanation were utilized. Though such hypotheses may be largely rejected today, to many medieval thinkers magic was another form of rationality, just as astrology and alchemy were logical systems of explanation.

Astrology in some form was associated with nearly every other discipline discussed in this volume. It played a role in medical prognosis and the timing of therapy; it was a major focus for the application of astronomical theory and related instrumentation; its theories underpinned most forms of divination; and its symbolism was an important part of the magical vocabulary and of the decorative repertoire of the artisan. A magic-medicinal bowl in the Khalili Collection, cat. 259, nicely illustrates this combination of astronomy, astrology, magic, and metalworking in its anthropomorphic rendering of the planet Mercury holding an astrolabe.

Despite the fact that orientation towards Mecca and the times of prayer, which marked out the day for the entire population, are the most pervasive examples of the application of pure astronomy and astronomical instrumentation, a larger proportion of medieval and early modern society probably used divination and magic rather than the more "rational" sciences of mathematics, astronomy, or Greek humoral medicine. Divinatory techniques were used by many for the prognosis and diagnosis of mental and physical illnesses, to determine the well-being of someone who was absent or in gaol, to discover the location of lost property, or to determine the appropriateness of a proposed action. Magic-medicinal bowls and amulets represent medical care at a more popular level than the formal, learned face of medicine represented by most treatises. God’s blessing and protection were sought on all occasions and by every available means, sometimes by wearing amulets, sometimes by employing magical equipment or a talismanic chart, and sometimes by placing a talismanic or benedictory inscription on a utilitarian object, such as a mortar, lock or spoon.

Dividing this diverse collection into groups of related artefacts and manuscripts has provided the opportunity to reflect in our accompanying essays upon the importance of each type of object as a remnant of the material culture. Under each topic, we have tried to combine the evidence provided by the artefacts themselves with that of written treatises regarding the practice of a particular art or technique. On occasion there is a discrepancy between written text and object. At other times the artefacts enrich our understanding of the text, as sometimes the literature helps us understand the surviving artefact. Throughout the volume, consideration has been given—to the extent that available evidence permits—to the historical development of each type of object.

Certain classes of objects covered in this volume, such as alchemical equipment, mortars and pestles, and magical mirrors, have received very little attention from scholars. In the case of other objects (the so-called cupping glasses and the curious spherico-conical vessels, for example), their very function is still a matter of speculation. For scientific and magical material in general, there is in most instances no unequivocal association of objects with reliably dated sites. The signed astronomical instruments are a refreshing exception to this limitation, and it is possibly for this reason that they have been the subject of greater historical study than any other topic covered here. In a few
instances the makers of astronomical instruments are known to have made other metal objects, yet little is known about the relationships, if any, between the workshops that produced scientific, magical and practical tools.

Under the broad title of *Science, Tools and Magic* we have gathered in this volume of the catalogue of the Khalili Collection objects that represent the everyday practices and concerns of both the educated and the illiterate, the affluent and the poor. The material has been divided into three categories, dealing with ‘Body and Spirit’ and ‘Mapping the Universe’ in Part One and ‘Mundane Worlds’ in Part Two. The intention has been to move beyond the standard grouping often found in studies of Islamic scientific instruments, and the limitations of so many art-historical approaches. The aim instead has been to convey a sense of the diversity of objects used in a wide variety of applications, many of which are ignored in discussions of art and culture. Some of the objects presented here are of outstanding historical importance, while others are surprisingly attractive for ostensibly utilitarian objects, and are of genuine art-historical interest. Some, though they are without great aesthetic pretensions, are published with the intention of broadening our understanding of the material culture of the Islamic world. All embody techniques and principles of design that transcend their immediate, practical use. By including objects of both medieval and more modern date, we hope to demonstrate the continuity of Islamic traditional and scientific practice well into the 20th century.
Body and Spirit
لا يوجد نص يمكن قراءته بشكل طبيعي من الصورة.
The depiction of human anatomy in the Islamic world

by Emilie Savage-Smith

Systematic human anatomical dissection was no more a pursuit of medieval Islamic society than it was of medieval Christendom. It seems clear from the available evidence, however, that there were no explicit legal or religious strictures banning it. Indeed, many Muslim scholars lauded the study of anatomy, primarily as a way of demonstrating the design and wisdom of God, and there are some references in scholarly and medical writings to dissection, though to what extent these reflect actual practice it is impossible to say. What is certain is that medieval Islamic writers made two noteworthy contributions to the knowledge of anatomy: One was the result of chance observation: following the discovery of some skeletons during a famine in Egypt, the scholar and physician 'Abd al-Latīf al-Baghdādī (d. 1231) was able to improve the description of the bones of the lower jaw and the sacrum. The second was the discovery of the movement of the blood through the pulmonary transit by the Syrian jurist and physician Ibn al-Nafis (d. 1288). Knowledge of anatomy in medieval Islam was firmly based on the anatomical writings of the Greek physician Galen, who flourished in the 2nd century AD, and who to a large extent argued from analogy with animal structures. The transmission of this knowledge was principally the result of translations made in Iraq in the 9th century AD, under the patronage of the caliph al-Ma'mūn (reg. 813–33) and his successors. The leading figure in this development was a Nestorian Christian physician from southern Iraq, Hunayn ibn Ishaq al-Ibadi. In the course of his life Hunayn translated into Syriac or Arabic nearly all the Greek medical writings known at that time, half of the Aristotelian writings as well as commentaries, various mathematical treatises and the Septuagint. Ten years before his death c. 873, he recorded that of Galen’s works alone he had made 97 Syriac and 34 Arabic versions. In addition to this prodigious output of translations, Hunayn also composed his own medical treatises, and cat. 1 below is a rare copy of an Arabic treatise by him on the form and function of the organs of digestion. Galen is cited repeatedly throughout the work as the main source of anatomical information.

All the subsequent Arabic medical encyclopaedias had sections on anatomy. In the Kitāb al-Manṣūrī fi al-jibb al-Razzi, for example, the discussion of anatomy occurs in the first book or maqṣūbah (see cat. 6). Such works summarized the Galenic anatomical concepts and were occasionally illustrated with schematic diagrams of the eye, the cranial sutures or the bones of the upper jaw. However, no full-page anatomical illustrations of the body are known to have been produced in the Islamic world before those that usually accompany the Tasbīḥ-i Mansūri, a treatise in Persian composed by the Shirazi physician Mansūr ibn Muhammad ibn Ahmad ibn Yusuf ibn Ilyas for a Timurid ruler at the end of the 14th century. One of the earliest recorded copies of this work is cat. 2 below.

A general similarity has frequently been noted between five of the six illustrations accompanying the Tasbīḥ-i Mansūrī and the sets of anatomical illustrations that appeared in Latin medical treatises as early as the 12th century. The historian Karl Sudhoff referred to these European drawings as the ‘Fünfbilderserie’ or ‘five-picture series’ because they illustrated the five systems of the body (arterial, venous, osseous, nervous and muscular), though they were subsequently shown to have originally contained nine rather than five illustrations, the additional four being of individual organs. The similarity between the illustrations in the Latin and Persian sets is particularly evident in the diagram of the skeleton (see cat. 2, folio 10a, for example), which in both versions is viewed from behind, with the head hyper-extended so that the face looks upward and with the palms of the hands facing towards the observer – a posture, some have noted, suggestive of a dissection table. All of the figures are in a distinctive squatting posture. The origin of this anatomical series,
In agrarian Islamic society, medical evidence, however, indicates that, contrary to the design and putative purpose of these writings to disseminate knowledge, it is possible to say. What is known about the contributions to the knowledge of anatomy, and the knowledge of anatomy from the works of 'Abd al-Latif ibn al-Abbasi, who described the lower jaw and pointed to the passages through the pulmonary vessels. In anatomical writings of Hunayn ibn Ishaq, and who to a large extent were the basis of this knowledge that was transmitted to Europe AD, under the form of the anatomy of Arabic nearly all the important anatomical writings as well as the other schools of medicine for years before his death. Hunayn, and 99 Syriac and 94 Greek, Hunayn also composed a standard treatise by him known comparatively throughout the Islamic world. In the Kitab al-Nafsiy, it occurs in the first time of the anatomical concepts and the first time of the empirical nature or the empirical nature and the empirical nature of the body are presented. These six illustrations that appeared in Nees von Esenbeck's edition. Because they illustrate with the bone and muscular system, rather than five of the different systems of anatomy between the shoot and the abdomen, from behind, with the fingers of the hands and the palms of the hands on the dissection table. The anatomical series,
which clearly predates the Timurid treatise by Ibn Ilyas, remains a puzzle, though the text by Ibn Ilyas and the sets of anatomical diagrams are the subject of much current research. Nearly 70 sets of these Islamic diagrams survive, of which about two-thirds are associated with the Tashkhiš-i Manṣūrī. The remainder are more recent renditions, usually unlabelled, that circulated independently, as in the case of cat.3, or were inserted as illustrations into other treatises. In the Islamic tradition there is usually a sixth full-page figure showing the arterial figure on which a gravid uterus with the foetus in a breech or transverse position has been superimposed (cat.3, folio 2b). This sixth figure has no parallel in the earlier Latin series and is probably a contribution by Ibn Ilyas himself, who was particularly concerned in his treatise with Aristotelian and Galenic embryological theories and their interaction with the tradition of Prophetic medicine (on which see p.29 and cat.11 below).

While Galenic anatomy remained relatively unchallenged in the Islamic world until the 17th century, in Europe new ideas on the subject emerged from the 16th century onwards. Andreas Vesalius’s Latin treatise De humanis corporis fabrica ("On the fabric of the human body") was printed in Basle in 1543, the same year that Copernicus’s De revolutionibus orbium coelestium ("On the revolution of the heavenly spheres") appeared, and Vesalius’s work had the same transforming effect on the Western conception of the structure of the human body as Copernicus’s heliocentric theory had on Western views of the Universe. While Vesalius was heir to the Humanist medical tradition that had rediscovered the classical Greek medical writings, his Fabrica signified a definite break with the reliance on the application, by analogy, of animal anatomy to the human body. As professor of surgery and anatomy in Padua from 1537, Vesalius had undertaken human dissections in an attempt to re-evaluate traditional Galenic anatomy, thereby founding the discipline of human gross anatomy. In the Fabrica, scientific innovation was combined with artistic beauty so that the beauty and harmony of the corpus humanaum might be made manifest.

By the 17th century Vesalius’s treatise was known in the Safavid and Ottoman empires. Illustrations from the Fabrica clearly influenced the drawings of individual parts of the body by the Ottoman physician Shams al-Din ‘Itaçi, who left his native Shirvan shortly after the Ottoman conquest in 1604. In his Turkish treatise Tegril-i əhdən ve tercüman-i kabâl-i feyşesifân, dedicated to Sultan Murad IV in 1622, ‘Itaçi intermingled rather inaccurate renderings of the Vesalian woodcuts illustrating the brain, skull, vertebral column, eye muscles, uro-genital systems and bones of the legs, feet and hands with schematic diagrams in the tradition of Ibn Ilyas. Evidence of Iranian interest in Vesalian anatomy is found, for example, in an anonymous Persian manuscript of the late 17th or early 18th century, now at Yale University, which contains six folios of ink sketches of individual organs based on diagrams in the Fabrica, while the British Library has a short Persian anatomical treatise dated AH 1108 (AD 1696–7) with an excellent ink rendering of the first full muscular figure in the Fabrica.

It is possible that similar drawings formed the basis of a large oil painting in the Khalili Collection, cat.4, and that the artist did not work directly from a copy of the Fabrica. It is certain, however, that the woodcuts in Vesalius’s treatise formed the basis, either directly or indirectly, for this 17th-century Qajar painting. Formal instruction in modern European medicine began in Iran only in 1350, with the establishment of a medical and military school in Tehran. The founder of this school, known as the Dār al-Funūn ("Academy of Sciences"), was the chief minister, Mirza Taqi Khan, who had recognized the need for such an institution during his diplomatic travels in Europe, and most of the physicians who taught at the school were brought from Italy or Austria and gave instruction in
French. From extant student notes written in Persian and from Persian translations of European textbooks made at the school, we know that human anatomy formed an important part of the curriculum, and it is tempting to conjecture that the large anatomical painting was made for use in this school. If indeed this painting was used as a teaching aid, it is curious that such a device was based on the 16th-century Latin text by Vesalius rather than 17th-century treatises on human dissection and anatomy which, as we know from students' notes, were in use at that time.12

The four anatomical items in the Khalili Collection, cat. 1-4, span a period of a thousand years and demonstrate in a unique fashion the growth of anatomical knowledge in the Islamic world and the external influences upon it.

5. Newman in press, for example.
6. 'Irqi, pp. 7–18, 20, 34, 37–38; for further examples, see Russell 1983.
7. Yale University Medical School, Cushing MS.08.15, folios 1a–6b. The National Library of Medicine, Bethesda, MD, also has a Persian manuscript containing some versions of Vesalius illustrations (MS.270, folio 157b–159d); see Savage-Smith 1994, p. 91.
8. British Library, MS.08.1861, folios 35b–36b, with the illustration on folio 54, the two other illustrations to this short treatise, one illustrating cautery, the other bloodletting, also show European influence.
A treatise on the organs of digestion by Hunayn ibn Ishaq al-Thabī

Probably Iraq, 9th or 10th century

15 folios, now 18.3 x 12 cm, of a burned, light brown, fibrous paper with irregular laid lines; text area 15.3 x 7.8 cm, with 11 lines of an 'Eastern Kufic' hand (Dirhæch style) binding composite; the upper cover Egyptian or Syrian, 14th or 15th century, the lower cover probably South Arabian, 15th century accession no. 87/195, no. 18

Published Riyāḍ 1984, no. 18

This is a rare and early copy of the second chapter (masāṣalā) of an anatomical treatise written by the Nestorian Christian physician and translator Hunayn ibn Ishaq al-Thabī, who worked in Baghdad and died in 260/873 or 874/875. The rule on folio 14 is given as 10, the third (10th) chapter of the book of

miscellany in Tūrīsī copied in 1171/1181. No further details on either manuscript are available.

In this copy a leaf is missing between folios 12 and 13, and the text breaks off at the bottom of folio 13b, before the end of the chapter. There are no rubic

circles or catchwords, but there are later marginal corrections and notes in several hands.

1. Al-magālaḥ al-shābīhah min kīthul ... fihi ma’l’āla ‘suḥra min amr ʿalā al-ghulāh”, “saʿdah zahr wa-anf al-nasīʾ” in Al-Dībāj. This title is repeated on folio 17b, where it begins correctly, Al-magālaḥ al-shābīhah ...

2. For example, the forms of the terminal nouns, as well as of other lectors, are similar to those in a manuscript copied in 1080/1671 (now in Istanbul, folios 12–13), in which the head-piece on folio 12 is illuminated in green and gold, and there are five full-page anatomical drawings, annotated in black and red and with some colour for contrast, on folios 10, 18, 16, 12, and 12a.

The tissue of the skull on folio 16a is viewed from behind, with the head hyper-extended so that the mouth is at the top of the page. The full-length figure displaying the nervous system (fols. 16b–17) is also viewed from the back with the head hyper-extended and the pairs of nerves indicated by lines of contrasting colour (green, red, and black). The muscle figure on folio 15a is shown frontally, with extensive captions describing the muscles. The fourth and fifth figures (fols. 10a and 12a) showing veins and arteries, are drawn frontally, with the internal organs indicated in black line.

Cut. 2. lacks one folio between folios 25 and 26, where the text breaks off during the description of the brain and resumes with a passage dealing with the reproductive organs. The text also breaks off at the bottom of folio 57b during the discussion of the membranes surrounding the foramen. The text has scribal corrections and has been collated with another copy by a later reader, in addition to other marginalia and interpolations.

1. See folio 2a, line 10. The name of the author is given as Mānṣūr ibn Muḥammad ibn Ahmad in later copies.

2. For the identification of the patron, the life and writings of the author, and other copies of this treatise, see Richter-Berger 1978, pp. 46–53; Khalvānī 1986, pp. 8–26; Neve 1977, pp. 485–97. The manuscripts in the same library, though similar, is cut from a closely related either calligraphically or textually and would appear to be a later Timurid copy; Asberini, Minovi & Błociot 1939, pp. 31–36.

Schullian & Sommer 1935, p. 351 note an expanded and updated catalogue of the Persian and Arabic items in the collection is currently available from the Library in an on-line catalogue prepared by Emīlīe Smażew-Smīb. There are heavy indentations, caused by tracing, on the nerve figure (folio 14b), and lighter indentations on the arterial figure (folio 22a).
Three anatomical figures appear on the first two sheets of the manuscript. The figures are drawn in a simplified manner, emphasizing the major anatomical features. The first figure is depicted from the front, showing the anatomical structures of the head, neck, and upper body. The second figure is shown from the side, revealing the contours of the body and the internal organs. The third figure is depicted from the back, highlighting the anatomical details of the spine and lower body.

The manuscript contains a total of 11 sheets, numbered from 12 to 22, with each sheet featuring multiple illustrations. The drawings are executed in black ink and are accompanied by annotations in Arabic script. The annotations provide contextual information and descriptions of the anatomical structures depicted in the illustrations.

The images are accompanied by short text in Arabic, which likely serve as explanatory notes or captions. The text is written in a neat and organized manner, ensuring that the viewer can easily follow the content and understand the significance of the illustrations.

Overall, the manuscript provides a comprehensive visual guide to human anatomy, showcasing the detailed artistic and anatomical knowledge of the period.
Three anatomical drawings

Perhaps Qazvini, late 16th century

Two folios, 12.6 x 19.2 cm (MS 454-1) and 14.9 x 22.5 cm (MS 454-2), of a burnished laid paper with no visible chain lines; the drawings were executed in ink and opaque watercolours within frames ruled in ink. Accession no. MS 454-1-2.

The three unlined, full-page anatomical diagrams appear on two leaves. The first folio (MS 454-2) illustrates the arterial system, while the second (MS 454-1) shows the venous system on one side and a pregnant woman on the other. Both folios appear to be from the same set, which was based on the illustrations to the Ta'ashih-i Mawsūrât of Ibn Iyâs (see cat. 2). The fact that the woman gravid with foetus is on the other side of the leaf to the figure displaying the veins is a clear indication that these illustrations did not come from a copy of Ibn Iyas's treatise, in which the chapter on the veins does not immediately precede the chapter on the formation of the foetus. They must instead have been prepared as an independent set. The three diagrams also differ from the illustrations in the treatise in that they lack the extensive labelling that occurs in most copies of Ibn Iyas's work on all the figures except that showing the pregnant woman. This last is always unlabelled and consists basically of the arterial figure with a crosshatching, rather narrow looking, foetus inside an oval compartment in the sinew lines. In contrast to the completely circular heads found in 15th- and early 16th-century anatomical illustrations, such as those in cat. 2, the slightly elongated heads and prominent chins of these three figures suggest a late 16th-century Iranian provenance, possibly Qazvini. In design and execution, the anatomical broadsheets that comprise cat. 3 must closely resemble the unlabelled illustrations that accompany an undated copy of the Ta'ashih-i Mawsūrât now in Istanbul.1

1. Süleymaniye Library, MS Ayasofya 3598.

An anatomical painting

Iran, second half of the 16th century

Oil paint on canvas, 201 x 132 cm
Accession no. MS 873
Published Christie's, London, 9 October 1996, lot 200.17

This large anatomical oil painting was probably intended for teaching purposes. The painting, which is neither dated nor signed, illustrates the introduction of early modern European anatomical ideas into Iran, although these ideas are here intermingled with some medieval concepts and modified by the artistic conventions of the day. All seven full-length figures and the six individual parts of the body portrayed are based upon woodcuts in the De humani corporis fabrica ("On the fabric of the human body") by Andreas Vesalius, which was first published in 1543.

The small skeletal figure in the centre of the painting is a rendering of the first skeletal figure in Book I of the seven books of the Fabrica, although here the arm rests on a simple staff rather than on the handle of a spade as in the Vesalian diagram, where the figure stands next to an open grave. Here, the left hand is rotated and the head tilted further back with the mouth closed. The skeleton immediately below is taken from the third skeletal figure in Book I, showing a posterior view of the bones, but with the head turned towards the viewer and with a rod placed under the skeleton's hands, which are unrepresented in Vesalius's drawing.

The figure at the bottom left of the painting shows a frontal view of the body displaying the arrangement of the muscles. It is a mirror-image rendering of the first muscular figure in Book II of the Fabrica, which, Vesalius noted, would be of particular use to artists and sculptors, as well as to physicians. The figure at the bottom right is the mirror-image of the ninth muscular figure in Book II, showing a posterior view of the superficial musculature.

The middle figure at the top, between the arms of the two large figures, is a composite interpretation of two Vesalian diagrams: the first figure in Book IV, which shows the brain and cerebellum viewed from the right side, and a mirror-image rendering of the tenth illustration in the same book, showing the course of the nerves below the neck.

The two large figures in the painting are also composite drawings taken from several Vesalian woodcuts, with some details changed. The male figure on the left displays the venous system, in general following the sixth figure in Book II of the Fabrica but with the posture slightly changed. Where the venous system in the neck and head were detailed in the Vesalian diagram, the artist here has painted a face with side locks in the Qajar manner, and the upper part of the skull is shown removed to reveal the brain, in a manner similar to the first figure in Book V of the Fabrica. The top of the skull, showing the sutures, rests near the left foot of the male figure. The head section of the venous system is shown separately on the lower level, between the left-hand muscle figure and the skeleton leaning on a stick.

The torso of the venous figure has been altered, on the basis of the twentieth figure of Book V of the Fabrica, to show the abdominal cavity at the stage of dissection, where three intestines have been excised, leaving only part of the stomach. The unrealistically painted white intestines arranged in a rectilinear pattern were added to the painting at a later date. Male genitalia derived from the twenty-third figure of Book V are illustrated separately beneath the right hand.

The large female figure to the right incorporates the general scheme of the arterial system shown in the twelfth figure of Book II of the Fabrica, with the severed arterial head drawn separately on the lower level, between the central skeleton and the right-hand muscular figure. The torso again shows the abdominal cavity during dissection, in a manner similar to the twenty-fifth figure in Book IV, but with the intestines pulled to one side rather than removed. Only the major arterial vessels are shown, both in this painting and in the original Vesalian diagrams, in contrast to the more detailed venous figure, because the importance of phlebotomy in the therapeutics of the day necessitated greater attention being paid to the arrangement of the veins. A face with a Qajar hair style has been painted on the figure, again with a part of the skull removed to expose a view of the brain following further dissection, as in the second figure of Book II of the Fabrica, with the base of the skull shown alongside the right foot of the figure.

No herbs are indicated on the pregnant female figure. The foetus, shown as a miniature adult in a breech position inside an oval womb, is derived from medieval sources, such as the Ta'ashih-i Mawsūrât (see cat. 2). The association of the arterial figure with that of a gravid woman is also derived from the medieval Islamic tradition of anatomical illustration.

The female genitalia are depicted separately beneath the figure's left hand. The ovaries are connected by strange spring-like connections to the womb, the depiction of which is based on the twenty-seventh figure of Book V of the Fabrica, where the extraordinary conformation of the organs gave rise to much comment.2

Many of the individual anatomical parts have labels written in a Persian nasta'liq hand, and beneath the severed venous and arterial heads at the bottom of the painting are several lines of text discussing the total number of bones in the body and the number of muscles. Most of the Persian captions are damaged, however, and are no longer completely legible.

While not all the details of the Vesalian diagrams are reproduced in this painting, the artist clearly followed the woodcuts closely in designing the component parts of the painting. A similar, but smaller, painting with only five figures on it was described early in this century, but its present location is unknown.3

1. For reproductions and discussion of all the woodcut plates in the Fabrica, see Saunders & O'Malley 1975, p. 170, for an explanation of the Vesalian diagram forming the basis of this illustration.

2. Hollander 1916, where the painting is incorrectly assigned to the late 17th or early 18th century. The present location of the painting is unknown.

Medicine in medieval Islam

by Emilie Savage-Smith

A thread of continuity within learned medical practice throughout the medieval Islamic lands was supplied, as in the case of anatomical knowledge (discussed above, pp. 14–17) by the medical theories inherited from the Greek world. This heritage, mingled with some Iranian, Indian and Arab elements, was assimilated and elaborated by a community of both Muslim and non-Muslim physicians. Ninth-century Baghdad was the venue not only for the translation into Arabic of Greek medical treatises, but also for the composition of the earliest medical writings in Arabic. The following two centuries produced the most widely-read comprehensive syntheses of medical thought, including those by ‘Ali ibn al-‘Abbas, al-Majusi, al-Razi and Ibn Sina. The Khalili Collection includes a number of manuscripts illustrating various aspects of learned medieval Islamic medicine, including pharmacopoeias, general manuals on health, and a genre of medical writing composed by clerics as an alternative to medical systems based exclusively on Greek models.

The sophisticated medical texts that are the subject of this section of the catalogue, however, represent only one aspect of the medical care available within medieval Islamic society. Medical care was always multi-faceted, with the needs of the population being served by various local traditional practices as well as more formal, learned theoretical medicine. The Khalili Collection includes many examples of magic-medical bowls, amulets, and objects used as talismans and for divinatory purposes (see below, pp. 72–103, 133–47 and 149–59, respectively). Such items were employed for the avoidance of diseases and afflictions as well as their diagnosis, prognosis and cure. Medical practice varied not only according to time and place, but also to the various social strata inhabited by the patients, whose social and economic status determined to a large extent their expectations and the type of care sought.

Materia medica

Knowledge of medicinal substances in the medieval Islamic world was based initially upon the approximately 500 materials described in the 1st century AD by Dioscorides, in his Greek treatise on materia medica. Several Arabic translations and revisions of the work of Dioscorides were undertaken, not to mention the many epitomes and commentaries. In the middle of the 9th century, in Baghdad, Iṣṭaḥ fīn ibn Būṣīl translated it into Arabic in collaboration with Ḥunayn ibn Ḥašāq. This version circulated in two forms, one in the original order determined by function,1 and the other in an imposed alphabetical order. In the following century a new translation was prepared in Spain following the presentation of an illustrated Greek copy by the Byzantine emperor to the Spanish Umayyad ruler ‘Abd al-Rahman III, and in Iran the translation made by Ḥašāq and Ḥunayn was revised by Ṣaltūṭ. In the middle of the 12th century yet another translation was made in Diyar Bahr by Miḥrān fīn a Syrian version prepared earlier by Ḥunayn.2

By the end of the 12th century a number of illustrated treatises on materia medica had appeared that were original compositions in Arabic rather than translations of Dioscorides. Most of these illustrated pharmacopoeias are now lost, but one notable exception is the illustrated copy of a treatise on materia medica by the Spanish–Arab pharmacologist Abu Ja‘far Ahmad ibn Muhammad al-Ghašqī (d. 1165) that is today in the Oder Library at McGill University.3 Another, partial exception is the book of medications compiled by the Syrian herbalist Rashid al-Din ibn al-Sari (d. 1241) and illustrated with figures taken from living plants, for large extracts from this text have recently been discovered in a unique copy of a treatise written in 1268 by a Syriac writer on antidotes.5 Cat. 5, two folios from a 12th- or 13th-century manuscript on materia medica, may also represent a relic of
this tradition of illustrated Arabic herbals, rather than a fragment of an Arabic version of the Dioscorides text itself.

Numerous Arabic and Persian treatises on medicaments were written in which Islamic authors greatly expanded the field of materia medica and its applications. They were able to do this primarily because their broader geographic horizons brought them into contact with drugs unknown to earlier peoples of the Middle East, such as camphor, musk, saffron, ammoriace, safflower, and barberry. The later treatises included the immensely popular Persian-language pharmacopoeia written in AH 770 (AD 1368–9) by Haji Zayn al-'Atrar, chief physician to the Muzaffarid ruler Shah Shuja’. Unlike the earlier compositions, however, this pharmacopoeia was rarely illustrated, and the copy in the Khalili Collection, cat. 10, which was completed in India in 1648, is one of only two recorded examples with illustrations, although well over 80 copies are known to be preserved.

General medical manuals

One of the great names in medieval Islamic medicine, Abu Bakr Muhammad ibn Zakariya’ al-Razi, was born in the Iranian city of Rayy, near modern Tehran, in AD 865 and died there about 925. A physician learned in philosophy as well as music and alchemy, al-Razi served at the Samanid court in Central Asia and headed hospitals in Rayy and Baghdad. His most influential medical book was a short general textbook on medicine in ten chapters which he dedicated in 903 to the Samanid prince Abu Salih al-Mansur ibn Ishaq, governor of Rayy. The Kitab al-Mansur fr‘t-tibb (The book of medicine dedicated to al-Mansur’) became one of the most widely read medieval medical manuals in Europe through the Latin translation made in Toledo by Gerard of Cremona (d.1187). Cat. 6 is an important, though incomplete, 13th-century copy of the Arabic text.

Of all Islamic physicians, the best known name is that of Abu ‘Ali al-Husayn ibn ‘Abd Allah ibn Sina, known to Europe as Avicenna. He was born in AD 983 in Central Asia and travelled widely in the eastern Islamic lands, composing nearly 270 different treatises before his death in 1037. His magnum opus was the Kitab al-Qanun fr‘t-tibb, or Canon of Medicine, a massive medical encyclopedia in five books. The first is concerned with general medical principles, the second with materia medica, the third with diseases occurring in a particular part of the body, the fourth is on diseases such as fevers that are not specific to one part of the body, and the final book contains a formulaic giving recipes for compound remedies. A large number of epitomes and commentaries were subsequently written on the Canon of Medicine to clarify the contents, and the first book, on general medical principles, attracted particular attention from commentators. An influential commentary on the first book of the Canon of Medicine was written by Qutb al-Din al-Shirazi (d. 1111) and dedicated to Sz‘l al-Din Muhammad, vizier to an Ilkhanid ruler of Iran, apparently Muhammad Khudabandah Oljeitü, who ruled from 1304 to 1317. The commentary, entitled al-Tibshar al-Sul‘dyah (‘The present to Sz‘l‘) or Nasihat al-hukamam wa-rawzat al-asbaha‘ (‘The delight of the doctors and garden of the physicians’), is stated in the introduction to include abstracts from eight earlier commentaries. Cat. 8 is a fine Ilkhanid copy transcribed sometime around 1305–6, when an owner’s note stamp dated AH 705 was placed in it.

The most widely read medical encyclopedia in Persian was the Dhakhtirab-i Khorazmdshah (‘Thesaurus for the ruler of Khwarazm’) of Isma‘il ibn Husayn al-Jurjani, the author of a number of other medical texts and the earliest medical writer in Persian to gain a wide reputation. He undertook the task of preparing this massive encyclopaedia,
which covers all branches of medical knowledge current in his day, in 1110, while he was at the court of Qurb al-Din Muhammad Anushatkin, who governed Khwarazm on behalf of the Seljuks. Al-Jurjani supplemented the ideas contained in the Arabic medical encyclopedia written by Ibn Sina a hundred years earlier with quotations from medical writers of the intervening century, rendering them all into Persian. As a result al-Jurjani was responsible in large part for establishing a Persian scientific vocabulary. Cat. 9 contains two illuminated fragments from an exceptionally fine copy of this Persian-language encyclopedia.

In medieval Islamic medical encyclopaedias, the approach to surgery was a conservative one. Cauterization was preferred to the use of the knife, which was resorted to only when all else failed, and major or invasive surgery was scarcely ever attempted. One might be misled by a number of illustrations in Islamic manuscripts depicting births by abdominal deliveries to think that Caesarean sections were performed by medieval Islamic surgeons. Certainly they were not performed on a living woman for the delivery of a foetus, for such an effort would have resulted in the certain death of the woman, and there is no mention in the surgical literature of such a procedure ever being attempted, even as a post-mortem effort to save the foetus after the mother had died. Illustrations of the birth of the mythical hero Rustam in a number of manuscript copies of the Shahnama ("Book of kings") of Ferdowsi have also suggested to the casual observer that such operations might have been performed (see above). In the course of the poem, written at the end of the 10th century, it is suggested that the mother was given a drug to stupefy her and that she recovered fully from the operation. The illustrations are highly inaccurate anatomically and are intended merely as illustrations of a legend attributing a miraculous birth to its hero, a common attribute of great men in antiquity. They are not to be interpreted as reflecting contemporaneous medical practices.
Prophetic medicine

In addition to the Greek-based medical systems advocated by physicians such as al-Razi and Ibn Sina, there was also an alternative genre of medical writing called al-tibb al-našābi or 'Prophetic medicine'. The authors were clerics rather than physicians, and they advocated the traditional medical practices of the Prophet Muhammad's day and those mentioned in the Qur'an in preference to the medical ideas assimilated from Hellenistic society, thereby producing a guide to medical therapy that was acceptable to the religiously orthodox. The therapy recommended in these treatises included diet and simple drugs, especially honey, bloodletting and cautery, but no surgery. Other topics included fevers, leprosy, plague, poisonous bites, protection from night-flying insects, protection against the evil eye, rules of coitus, theories of embryology and anatomy, the proper conduct of physicians, and the treatment of minor illnesses such as headaches, nosebleeds, cough, colic and sciacitta. There was a prohibition against the use of wine and soporific drugs as medicaments. The treatises also provided numerous prayers and pious invocations to be used by the devout patient, with designs for the occasional amulet and talisman. Treatises on prophetic medicine were particularly popular in the 13th and 14th centuries, with some still available today in modern printings. In cat. 11 the Khalili Collection possesses a copy of one such work made for Sultan Suleyman the Magnificent. This manuscript contains the treatise written by the Hanbali theologian Ibn Qayyim al-Jawziyyah (d.1350), which was one of the most enduring expositions of the subject.

1. See Riddle 1971 for an analysis of the plan underlying the original text by Dioscorides.
2. For these different versions, see Ullmann 1970, pp. 338–42; Dubber 1953–57; Sakib 1983.
3. Montreal, McGill University, Oskar Library of the History of Medicine, Oskar ms. 7108, which has 367 coloured illustrations, was drawn in Egypt before AD 1169 (id 1169); see Guérard 1911, no. 182, and fig. 39. Some illustrations from the manuscript are reproduced in Brandenburg 1984, pp. 72 and 99.
4. Aghaif, see Dierich 1982.
5. See Richer-Bernburg 1978, pp. 3–4, for the authorities al-Jurjani cited, and pp. 3–8, for his life and writings. For additional information on other copies, see Kishwarz 1986, no. 43, pp. 149–154; Storer 1971, no. 561, pp. 257–258.
6. The illustration of the birth of Julius Caesar by 'Cassarian section' contained in a copy of a historical work in Arabic by Abu'l-Rayhan al-Biruni (d.1048) completed in AD 1207 (AD 1307) has been frequently reproduced (University of Edinburgh Library, ms. or. 16, folio 66v; see, for example, Ullmann 1970, opposite p.34).
7. Over the miniatures there is written in Arabic the statement, 'The reason for this was that his mother died in labour while she was pregnant with him, so her abdomen was opened, and he was taken out.' Since Julius Caesar's mother, Aurelia, outlived him, there has been some confusion of historical details by al-Biruni.
Two fragmentary folios from a herbal
Probably Iraq, 13th century

The upper portion of two folios, 14 x 16.5 cm (top fig. 1) and 16 x 16.5 cm (top fig. 2), of very thin but opaque paper with no laid or chain lines; each page bears 2-4 lines of text in a clear naskhi hand and the larger part of an illustration. The two folios are printed in red ink on the verso (fig. 1) and blue ink on the recto (fig. 2). The text is written in Arabic and the illustrations feature a plant with a long stem bearing alternate, serrated leaves and berry-shaped fruit. The illustration at the top of the facing page, now lost, has been printed on this page, and the same phenomenon may be observed on the other three preserved pages.

The verso of one of the folios illustrates an unnamed plant, possibly of the asar family, whose root is said to be good for all fevers. Three identical plants are shown, each with a single stem with ovate sessile leaves and a raceme of flowers, the same shade of dark green as the rest of the plant. The plant illustrated on the recto of the second folio is also unnamed and undetermined. It consists of a single stalk with opposite petiolate lanceolate leaves and triangular trilobed leaves and burgundy-red flowers on long stems issuing near the top of the stalk. The verso of this illustration from the page that was at one time bound opposite this folio is particularly clear in this instance: it illustrates a plant with many stems and perforated leaves

The verso illustrates the globe thistle, with the first line of the text reading, "It is called by the Greeks 'gripoas'." The plant is said to be suitable for treating splenic conditions. The flower head of a thistle is immediately recognizable. The style of plant illustration and script suggest that these fragments were part of a 13th-century Iranian illustrated treatise on materia medica. In the medieval Islamic world, knowledge of medicinal substances was based upon the illustrated treatise prepared by Dioscorides in the 1st century AD and translated into Arabic under the title Kitab al-bab al-shub, or 'Book of Plants'. A dispersed copy of Dioscorides, made in Baghdad in 1122, is well-known for its scenes illustrating the gathering and production of medicinal plants. The second folio is also preserved. Because of the existence of these manuscripts there is a tendency to assign to Dioscorides any leaf from an illuminated herbal that appears to be a 13th-century Baghdad product. But by this date a number of original works in Arabic that are known to have been illustrated had been compiled on the subject (see above, pp. 15-16), and the present fragments may have formed part of such a treatise.

This conjecture is supported by a number of features, for example, the nature of the discussion of the globe thistle on the verso of the second folio, which is not that found in the translations of Dioscorides made by Istakhs ibn Basai and Humayun ibn Ishak as published by Dubler. Moreover, the expression 'gripoas' is an Arabic term ('it is called by the Greeks'), used in the first line, is not typical of the Dioscorides translations and implies that the author was not a speaker of Greek. Similarly, the content of the discussion of al-jubub on the recto of the first folio bears almost no resemblance to the text in Dioscorides, and the use of the word 'gripoas' was not common in the Arabic versions of Dioscorides.

2. The Greek name is usually transliterated in the Arabic translations of Dioscorides as qurtubatibun. For attempts at specific botanical identification, including Echinops sphaerocephalus L., Eryngium maritimum L. and Carduncus corymbosus L., see Dietrich 1988, II, pp. 354-5, no. 9.
The Kitāb al-Manṣūrī
fi'l-tibb of al-Razi
Provenance unknown, dated Rabi' 1
670 (October–November 1271)

212 folios, 22.5 x 15 cm, of an opaque, threadous paper with barely visible laid lines, text area 18.8 x 12.7 cm, with 18–19 lines written in black ink, with rubrications; the script is nastā Śāhī, with some varying fonsing modern, but incorporating older, tooled covers
acquisition no. MS 159

Abū Bakr Muhammad ibn Zakariya' al-Razi (d. 1001 AD/692) composed this short general textbook on medicine in AH 492 AD for Abū Sāliḥ al-Mansūr ibn Ishāq, the Samanid governor of Rayy. It became one of the great classical works on the subject, both in the Islamic world and in Europe, where the treatise became widely known in the Latin translation made by Gerard of Cremona in 1175, under the title Liber medicinae ad Almanersionem.1 Al-Razi’s treatise was composed in ten books (maqālaḥāt), each of which was divided into a number of sections (fājūs). Cat. 6 contains a detailed table of contents (folios 1b–7b); sections 3–22 of book 1, on anatomy (folios 7b–24b); sections 24–41 of book 3, on food and simple medicaments (folios 27b–43b); and the whole of book 6, on the maintenance of health (folios 46b–62b), of book 7, on compound remedies (folios 62b–84b), of book 8, on a regimen for travellers (folios 84b–93b), and of book 9, on surgery and the treatment of wounds (folios 93b–113b). The manuscript was bound predominantly to quires of eight, which are numbered from the third quire onwards (shābīl, shi‘a‘īn). From this it is apparent that the end of section one, section two, and the beginning of section three filled the last fourth and fifth quires. The author is named at the end of the sixth book (folios 94b, line 13) and in the colophon (folio 112b); the scribe is not identified. The earliest foliation is in Hebrew numerals, and there are marginal notes in Hebrew, as well as in Persian and Arabic.

2. Sections 4 and 5 are incomplete.
3. Folio 109 is misplaced and should be read between folios 102 and 103.
The Tahaf al-Sa'diyah of Qurb al-Din al-Shirazi
North-western Iran, circa 1535

191 folios, 13 x 24.5 cm, of a burntish, thick, cream paper with no visible laid or chain lines; text area 23.5 x 15 cm, with 24 lines written in black ink, with rubrications and occasional key words in blue; the script is neatly, unruled; folio 14 bears a dedication panel illuminated in ink, gold, blue and a reddish brown binding modern acquisition no. 456.796 published Sotheby's, 12 October 1990, lot no. 214

This manuscript contains part of the extensive commentary on the first of the five books of Ibn Sinâ's medical encyclopedia, the Qanûn fi'l-Tibb, composed by Qurb al-Dîn Muhammad ibn Mas'ûd al-Shirazi, who died in Tabriz in 1315. The history of its composition, and an account of its medical education, is given by the author in the lengthy introduction. He began to write it in Shiraz while he was still a young man, and he continued working on it whilst travelling in Iran, Iraq and Syria. After his return to Iran he dedicated the work to Sa'd al-Dîn Savâji, vizier to Qûrâyshah, the Ilkhanid ruler of Iran from 1314 to 1333. 1-Al-Shirazi called the work Nâsbat al-bahman wa-tâwarîh al-šâbîhah ("The delight of the doctors and gardem of the physicians"), as well as al-Tahaf al-Sa'diyah ("The present to Sa'd").

Cat. 81 unbound, but on folios 14, 190 and 196 there are impressions of the seal of one Abu Bakr ibn Hâzan 'Ali, dated 295 (AD 1303–4), and on folio 14 there is a note in the name of al-Hassan ibn Nuh ibn Muhammad al-Tâhlik al-Shârâj, dated 1271 (September–October 1370). Since both these impressions are given in this copy, including al-Tahaf al-Sa'diyah (folio 24, line 23), and since this copy was apparently produced early in the 14th century, perhaps before the stamp dated 1303–4 was placed on it, it is possible that the treatise was dedicated to Sa'd al-Dîn Savâji, possibly in the course of his career as vizier, perhaps as a gift at the time of his appointment. Cat. 81 may be the earliest recorded copy of the treatise. 2

The illuminated panel - derived from Mamluk manuscripts - on folio 112 contains two short texts. The panels at the top and bottom are inscribed in Persian with the name of the author and a statement that the treatise is a commentary on the Qanûn, while the four lines of Arabic within the central hexagon declare that the work was copied for the library of a qâdî, but he is not identified by name. At the top of folio 129 an additional panel in a fine rubâi hand has been cut out of a separate sheet of paper and pasted on. The remnants of the text was copied in naqîâb by two hands. The first scribe was responsible for folios 1–12. This section contains marginal corrections by the scribe and has been collated with another manuscript by someone other than the original copyst. In addition, there are scattered marginal and interlinear notes in various hands. The second scribe, who appears to have been a contemporary of the first but did not make corrections, copied folios 129–195. By this point the commentary had reached the fifteenth topic (mabkûrat) in the introductory chapter (fa'âla) of the fifth section (qaba') of the first section (jann) of the first book (fikr) of the Qanûn and it continues with a general discussion of the nature and variety of the parts of the human body, breaking off before Ibn Sinâ's detailed discussion of zones.

There are four seal impressions on folio 121 including that of Abu Bakr ibn Hâzan 'Ali. Two of them, one bearing the name Ibrahim ibn Khalîl ibn Muhammad and the other the name Qâsim ibn Abdallah, appear on 1303 (ex-catalogue), and the latter of the two also occurs on 40783 in the Khalil Collection.


2. In the Sotheby's sale catalogue, the date was read as 1379 (AD 1390). The identical seal impression dated 1391 also occurs on a manuscript offered for sale at Sotheby's, 26 April 1995, no. 36.

3. An incomplete copy (Oxford, Bodleian Library, MS. Hunt. 163) was made in mid-Rûzî's 1770 (October 1357; Ueri 1789, no. 405; Nicolli–Pusey 1851, p. 166, note 23), while a manuscript

4. In Appe and another in Dublin were both produced in AD 721 (1321–2). For the later copies, see Dietrich 1966, pp. 81–3; Katnys 1976, pp. 87–93; Arberry 1991–66, no. 3728.
لا يمكنني قراءة النص العربي بشكل طبيعي.
Fragment of a medical encyclopaedia
India, perhaps 1710

1 folio, 34.9 x 21 cm, of a thin, highly burnished paper with laid lines but no chain lines; text area 21.7 x 13.2 cm, with frames in black, gold and grey-blue enclosing 27 lines of nasta'liq written in black, red and gold; folio 12 is blank except for a frame; folio 18 has a head-piece inscribed in whiteakhb with the section title and illuminated in gold, black, yellow, orange, brown, red, purple and mauve; the margins of folios 12 and 22 are ornamented with floral motifs executed in gold on a natural ground within a second, outer frame in black, gold and red and accented no. 059760-1–2

This two-folio fragment contains the opening and beginning sections of the fourth book of the Dakhkhābī (Dakhkhābī: "The book for the Kihwarazmshahs"), the Persian medical encyclopaedia by ʿAli ibn Ḥusayn al-Jurjānī (d. 1315). This work, which was completed shortly after AD 679 (1014/15), is a comprehensive medical compendium divided into nine books, to which a tenth, on medicaments, was later added. The Dakhkhābī-Khawāzīrmshah became the most widely read medieval medical treatise written in Persian, and while a considerable number of copies are preserved today, few are as fine as the manuscript of which this fragment once formed a part.

The first folio contains an illuminated opening for the fourth book (khābāb), on the diagnosis and prognosis of disease, with the title and the initial written as al-Dakhkhābī al-Khawāzīrmshah (al-khābī in white on the gilt band. The fourth book consists of four sub-sections, or gāfīs, and this fragment, following a brief table of contents for the book, contains the text of the entire first gāfī and most of the second, breaking off shortly after the beginning of the third word of the fifth half of the page. The author is not named in the fragment. A comparison with other copies, however, confirms the identification.

The fragment is undated, but its calligraphy and illumination would suggest a production of India in the early 18th century. The two leaves were previously mounted, and on the back of the mount there is a note, 34. From Arabic [32] Manuscript (Medical) dated 1710. Text in Naskhi and Nastaliq - India (Delhi?) early 18th cent.

Although it is usually claimed that the Dakhkhābī was the first major medical treatise to have been written in Persian, an earlier medical compendium was written in the language by Abu Bakr b. ʿAbd al-Qahir al-Khujandi (d. 693/1721), and a medical manual-handbook was completed in 546/1252 by one Makhdum Maynijī. The earlier works were not, however, influential and widely used as that by al-Jurjānī. His encyclopaedia was translated into Turkish, Urdu and Hebrew, and Arabic summaries were produced, but it was never translated into Latin and consequently remained unknown in Europe.

The fragment corresponds to the section in the Bodleian ed. Elliott, folio 183, folio 1224, line 11, folio 1238, line 7, and to the section in British ms. Fraser 200, folio 294, line 2, to folio 304, line 17. Both of these manuscripts are copies of al-Jurjānī's medical encyclopaedia, the former copy finished in AD 1346 (1247) and the latter in AD 1372 (1273).

For these manuscripts, see Sechel & Edent 1889, nos 176, 176, 175. An edition of this text was published in 1965; see Bakrī, 3. See Maynijī for a recent edition of the Dakhkhābī-Khawāzīrmshah.

The volume contains a rare illustrated copy of the Ikhtyārī-i Bādī ("Selections for Bādī"). This is a comprehensive pharmacoepia of simple and compound remedies composed in Persian in AD 1270 (1859) by ʿAbd al-Husayn Anšārī Shahrābādī, known as Ḥaji Zayn al-Attar, perhaps for the Muzaffarid prince Bādī al-Jamāl, who is named in the title of the treatise but of whom very little is known. Ḥaji Zayn al-Attar, who died in 846 (1445–46), was for 16 years the court physician to the Muzaffarid ruler Shah Shojāʾ (reg. 1358–1384).

The treatise is in two parts; the first section (maqāla) presents medicines in alphabetical order in 24 chapters (khābāb). The second is a catalogue of compound remedies, arranged in 16 chapters according to type, such as coridal, digestive, intensifying, collyria and so forth. This is the first copy of the first section (folios 1–195) is copiously illustrated with paintings of most of the plants and animals from which the medicinal substances are to be extracted.

This pharmacopoeia was clearly very popular, as over 50 manuscript copies are preserved. However, this is only one of many illustrated copies, the other being in Taškent, and it therefore seems likely that the original did not have illustrations. Those in cat. 20 appear to have been taken from several traditions of illustrated materia medica, including works based on Dioscorides and copies of the Kitāb il-mabādīl wa-l-qawāṣīl as-ṣayrāhī al-masjūdīlādī ("Marvels of things created and miraculous aspects of things existing") of Zayn al-Attar (d. 1283), which often have illustrations of plants and animals.

The short introduction (maqāla) to the treatise is fragmentary in this copy, with the alphabetical listing of medications beginning on folio 37. The second section of the treatise (folios 196–215) is unillustrated and imperfect after the health chapter, with fragments only of the thirteenth and fourteenth chapters. Both sections of the treatise were written by the same scribe, who gave his name and the date of completion at the end of the first half (folio 194). The author is named on folio 13, line 11, while the title of the treatise occurs on the final folio of the first section (folio 194).

For a recent edition of the first and last folios of the first part, one of them giving the name Šah al-Muṣṭaṣir al-Muṣṭaṣir, and others with notes on folios 196 and 197. Occasional marginal corrections and marginalia have been inserted in several hands, including medical uses apparently added by the scribe. Folios 178 and 179, and folios 187 and 192 have been inadvertently exchanged, and the leaves have been paginated in pencil in an Indian hand.

1. For sources regarding his life, see Richter-Bernburg 1979, p. 52. An edition of the text was published in Shiraz 1929 (see Ḥaji Zayn al-Attar).
3. Taškent, Academy of Sciences, ms. 26.6.5, copied in AD 948 (1543); see Emmisger 1965, pl. XX, for an illustration from the manuscript.
4. For Indian copies of al-Qazwīnī's treatise with illustrations somewhat similar to some of those in this manuscript, see Berenba, mss., National Library of Medicine, ms. 271, copied in AD 1210 (1757–58), 117 copies in an undated 18th-century copy, and ms. 1, an undated 18th-century copy.
5. The text on folio 1a begins at a point equivalent to p. 8, line 6, of the 1993 edition (see Ḥaji Zayn al-Attar).
Crab蒶y of things
explores several aspects of
the thirteenth-century
scholar Ibn al-Qazwini's (d. 1285)
work on the natural sciences.
Illustrations of plants
and animals are fragmentary in
the manuscripts held in the
British Library and the
University of California at
Berkeley. The author is
unknown, and the date of
the manuscript is uncertain.

The text includes a section on
the properties of plants, with
illustrations of various species.

For further information, see:

Hadi, Zayn al-Attar

A CRABBY OF THINGS
بررسی دقیقی از انواع مختلف گل و گیاهان به عنوان یکی از بخش‌های مهم علم و تاریخ‌شناسی بوده است. این موضوع به‌عنوان یکی از برترین های علمی در زمینه طبیعت و زیست‌شناسی مردم کشور مورد توجه و توجه قرار گرفته است.

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The Ṭibb al-Nabawi of Ibn Qayyim al-Jawziyyah
Probably Damascus, dated 21 Shawwal 926 (4 October 1227)

76 folios, 15 x 23.5 cm, of a burnished, cream paper with visible laid lines and chain lines in groups of three; text area 13.4 x 7.2 cm, with 21 lines written in black ink with rubrications and occasional gilt headings; the script is neat, unswelled; zagwa of Sultan Suleymân I on folio 1b in gold outlined in dark blue; illuminated title and dedication on folio 2a as a medallion in gold and dark blue; second zagwa of Sultan Suleymân on folio 75a in dark blue outlined in gold; scribe Abu al-Rahman ibn Mawsilib al- Dimitashqi al-Murattabib; binding brown leather over boards, with stamped and painted central medallions and blind-tooled frames, lined with pink paper; acc. no. 116458; published Geneva 1993, no. 43.

This treatise on Prophetic medicine (al-ṭibb al-nabawi) opens and closes with a large zagwa of Sultan Suleymân of Damascus (reg. 913-926), and the dedication on folio 2a, and the colophon on folio 75b record that the manuscript was commissioned by or for Suleymân while his father, Sultan Selîm I, was still alive. That Selîm was still living is indicated by the prayers placed after the name of Sultan Suleymân Khan, the son of Sultan Selîm Khan. These are, in the first instance, 'May God exalt their dynasty during the passing of the ages and ever after', and, in the second, 'May God make their dominion eternal?' It is also worthy of note that the manuscript was completed only 12 days after Sultan Selîm's death on 9 Shawwal 926 (22 September 1226) and just three days after Suleymân reached Istanbul from his former residence of Manisa, on 17 Shawwal (30 October).

As a scribe working in Manisa or Istanbul at this date would have been aware of the change in Suleymân's status, it is clear that the manuscript was produced elsewhere, and the style of illumination and the scribe's name, al-Dimashqi, suggest that it was copied in Damascus. The presence of the zagwa indicates that it was passed to a charitable institution that Suleymân patronized, perhaps one in his princely residence of Manisa.

The title of the treatise is given in the upper and lower panels of the frontispiece as Kitâb al-Hady al-Muhammadî fi al-ṭibb al-nabawi, 'Book of the Muhammadan path in prophetic medicine'. No author is given, but comparison with other works on this subject indicates that it is a complete copy of the treatise on Prophetic medicine by the Hanbalî theologian Ibn al-Qayyim al-Jawziyyah, a prominent defender of traditional religious propriety who died in 1350. Ibn al-Qayyim al-Jawziyyah's kitâb is preserved today in a number of manuscript copies and has been recently published in two editions. It was known as 'Zad al-dâ'î li ibn Hady bhayr al-'ibâd ('Provisions of essential matters for the path of the best of servants [of God]'), or more often simply as al-ṭibb al-nabawi, ('Prophetic medicine'). The title of the treatise given in the present copy is unusual, but there is evidence that some later writers on the subject referred to Ibn al-Qayyim's treatise by a similar title.

1. It is curious that the抄录ist used the plural rather than the dual in these expressions.
3. The text from folio 1b, line 2, to folio 75b, line 7, corresponds to that in Ibn al-Qayyim - Arâ'iat, pp. 6-45 (to line 15, with the following title omitted); Ibn al-Qayyim - Jawziyyah, pp. 41-434.
4. Al-Sarramâni (1040/1074), for example, apparently referred to Ibn Qayyim's treatise as Kitâb al-hady, or possibly Kitâb al-hady al-nabawi. See Dietrich 1966, p. 120, n.1.
Qiyam's treatise by

at the copyist used the
definition of the dual in these

p. 187, Livingston
392, pp. 245-60.
folio 18, line 1, to folio 25
belonged to that in Ibn
'ta'ir, pp. 6-21, to line 13
(see wing title omitted);
Jamila, pp. 41-43,
(d. AD 1372), for
only referred to Ibn
as Kishab al-hadhi', or
'hadhī. See Derrich.
A medical, pharmaceutical or perfumery utensil

by Emilie Savage-Smith

More than 35 early Islamic glass vessels similar to cat. 12 in the Khalili Collection have been recorded. Their intended function is uncertain, though a number of possibilities have been suggested, including their use as cupping-glasses, small alembics, funnelled cups for transferring small amounts of liquids, breast relievers, baby bottles and invalid feeders. There are arguments against most of these hypotheses, as we shall see, and no description of such objects has been discovered in the medieval Islamic literature.

None of the surviving examples is known to be intact: the elongated hollow stems or spouts are broken in every case, so that the overall length when complete is indeterminable, and consequently the original form is difficult to know with certainty. Of the preserved specimens, some are so fragmentary that little can be said regarding the form of the stem at all. Some, however, have a substantial part of the stem intact, and its position relative to the 'cup' can be observed. On many, the stem clearly curves downwards from the rim of the cup towards and occasionally even past the bottom. In addition to the example in the Khalili Collection, 16 other vessels of this form are known to survive. Others have virtually straight stems that project at right angles to the body and are usually, though not necessarily, attached to the cup near the rim. One example is recorded as having a curved stem that angles first towards the bottom of the cup before turning back towards the plane of the rim. This vessel probably had a different function from the rest, most likely as a small alembic. It has been suggested that the others mentioned above were also alembics or some form of small distilling apparatus. Their stems, however, project out and curve at an angle that would prevent their functioning as alembics. They might, nevertheless, have been used as chemical apparatus to transfer a small amount of liquid to a bottle with a narrow neck, to measure liquids, to separate liquids of different specific gravities, or to heat small quantities of liquid.

The extant Islamic glass vessels of this type have been variously dated from the 7th to the 11th century. Though most do not have securely dated provenances, some were found in Iran, at Susa, Chahar and four 'presumably' at Rayy, one of which is thought to date to the 6th or 7th century and the others between the 9th and 11th centuries. Others of a similar age have been found in Syria. The site that has yielded the most reliably dated objects is Fustat (Old Cairo), where eight examples have been found in levels securely dated to the period between the 9th and 11th centuries. Those with straight stems, as well as those with stems curving away from the rim, have been found in both Iran, Egypt and Syria. A more comprehensive survey of the artefacts needs to be undertaken in order to determine if there were regional differences in design or, indeed, whether these were many different places of production or whether the vessels were distributed from only one or two sites. If they were associated with the perfume trade, as will be suggested below, their very broad distribution might be accounted for in the same way as that of molar-tooth shaped perfume bottles, for they would have been a necessary part of the equipment of any perfume vendor.

Another puzzling feature of these glass vessels is the apparent cessation of production. It would seem that after the 12th century such items became uncommon. For a once-popular item to cease to be made when the need for it continues presents a perplexing problem to the historian. It could be that the glass vessels were replaced by pieces of equipment made of more mundane materials.

Cupping-glasses

It has often been suggested that these objects were used as cupping-glasses but, while suction can be produced by placing such a vessel against the skin and extracting the air
through the hollow stem, the known pieces do not correspond to the descriptions and drawings of cupping-glasses that occur in Islamic medical literature of the period. Al-Zahrawi, writing in Spain in the 10th century, for example, says that cupping-vessels (malāḥijim) could be made of horn, wood, copper (nabūs) or glass, though his attention is directed mostly to those of metal. The shape of all al-Zahrawi’s examples is similar to that of classical and Byzantine copper-alloy cupping-vessels – that is, rounded in cross-section and of a bellied or gourd-like form. A contemporary of al-Zahrawi in the eastern provinces, Muhammad ibn Ahmad al-Khwārīzmi, stated in a treatise dedicated to a Samanid ruler in Transoxiana and Khorasan that an alembic or still-head was ‘in the shape of a cupping-glass [malāḥijim], though the final word could also be read as ‘skull’ (junjunah). Whichever term is the original, the image is that of a bulbous object which contracts slightly near the rim, and on only one preserved glass utensil is the stem curved in the direction required for an alembic.

According to al-Zahrawi, Islamic cupping-vessels varied in their dimensions, from large ones the size of a clenched fist to small ones the size of a walnut. There was no handle or hollow stem, but there was a pinhole to serve as a valve. The suction necessary for cupping was produced by heating the vessel over a flame or by placing a small burning wick on a bar across the middle of the vessel. Once the cup had been placed on the skin the expanding hot air was allowed to escape through the pinhole in the wall of the vessel. Then a finger was placed over the pinhole while the air cooled and a slight vacuum formed. Cupping might be accompanied by scarification and extraction of blood or it could be done without scarification, for the relief of pain and itching and also to stop haemorrhaging. The vessels could also be filled with plain hot water, or with hot water in which herbs had been boiled, and then applied to the body and held there for a while.

By the 16th century, according to the Italian physician and botanist Prospero Alpino de Maróstico (d. 1617), the Egyptians no longer knew of cupping-glasses that were heated to form a vacuum. At the time Alpino was in Egypt, between 1581 and 1584, glass cupping-vessels had long tubes through which the copper extracted the air by suction, sealing the vessel thereafter by stopping the end of the tube with a small piece of leather that was attached by a tie to the vessel. These cupping devices, however, are of very different design to those found in early Islamic sites, for they are large kidney-shaped or rectangular objects, with a cylindrical extension on one of the smaller sides that was placed against the skin and a narrow tube extending from one of the larger sides.

As for some of the other uses proposed for these intriguing objects, that of a feeder for an invalid or infant seems unlikely, for the thin and fragile glass spout would probably rather dangerous. With the exception of the one recorded item whose spout curves towards the rim of the bowl, and possibly some of those with straight stems, the curve of the stem is in the wrong direction for them to have been used as breast relievers, even assuming that the stem was originally long enough to reach to the woman’s mouth while the cup was placed over the nipple.

A druggist or perfumer’s utensil

Apparent evidence for the use of such objects as cupping-vessels comes from illustrations in 11th-century copies of the Maqṣūmāt by al-Hartrī (d. 1122), but it will be argued here that they also suggest an alternative interpretation of the objects as perfumer’s utensils. In the 47th maqṣūmāt (‘session’), the trickster and wit Abu Zayd teams up with his son to fleece onlookers of their money. Abu Zayd pretends to be a cupper and his son the potential
Glass utersil
Provenance unknown, 9th–12th century

Translucent green free-blown glass, with slight iridescence-visible

height 5.8 cm
diameter of rim 5.1 cm

length 10.7 cm (including stem)
length of stem 5.3 cm (broken)

across base no. 633.474

The body of the vessel is roughly conical, with a rounded base with a pontil mark. There is a slight bulge below the rim aperture, which has a rolled rim. The hollow spout flares where it is attached to the side of the cup, then tapers and curves sharply away from the rim. The end of the stem is broken, so that its original length and diameter at the tip are unknown.

Many possible functions for this type of object have been proposed, the most frequent being that of a cupping glass. The design also suggests that such vessels may have been common utensils used by perfumers and druggists when making small quantities of scents or medicaments and transferring them to small perfume or medicine bottles.

A medical, pharmaceutical or perfumery utensil
patient who wants the nape of his neck cupped but has no money to pay for it. In the
medieval Islamic world, a cupper (hajjam) was of very low social status and was frequently
satirized.22

In a number of the illustrated copies of the Maqamat, the cupper’s place of business,
which is unspecified in the text,23 is represented as a domed structure containing shelves or
equipment. In a copy completed on 6 Ramadan 614 (5 May 1217), probably in Baghdad, by
the artist and calligrapher Yahya al-Wasiti, the charlatan Abu Zayd is shown as having
placed on his son’s back a hemispherical cup with a long straight stem which he is holding
in his right hand. The end of the stem may be in his mouth, although this is not entirely
clear.24 Shelves overhead hold two similar vessels with short stems curving away from the
rim and various bottles and containers.

Three other 13th- or 14th-century Syro–Egyptian copies of the story illustrate Abu
Zayd cupping his son. In one of them Abu Zayd is shown holding the stem of a glass
utensil of more cylindrical shape, with the stem far away from his mouth.25 Again, there are two
similar items on the shelves above. In another copy, five of the vessels are shown in the
background but Abu Zayd is about to place a straight tube on his patient’s back.26 In these
copies a total of 11 such bell-shaped glass vessels, with stems bending slightly away from
the rim, are shown either resting rim-side down on a shelf or suspended under a shelf,
among a variety of equipment including a mortar and pestle,27 objects that might be inter-
preted as knives with curved blades and storage containers with peaked or hemispherical lids.

In two other copies of al-Hariri’s text, Abu Zayd is shown not actually cupping his son
but addressing the audience. Here again, however, the shelves and cupboards in the back-
ground are shown to contain a variety of equipment. In one of these copies, there are two blue
vessels much like the glass utensils under discussion, with very straight stems branching off
near the rim and a white decorative band midway down the cylindrical body.28

The stories related by al-Hariri are satirical accounts of a clever and witty trickster, and
the illustrator might intentionally have contributed to the humor of the account by
depicting the charlatan Abu Zayd not in the normal working place of a cupper—namely, the
hammam or steam bath—but rather in the shop of a drug-and-perfume vendor (ṣaṭṭār),
whose stall could be seen in every market. The vessels in the illustrations are filled with
items likely to be found in an ṣaṭṭār’s stall: boxes for storing spices and herbs; a mortar and
pestle for crushing them to make infusions; a small alenmic for making aromatic distilla-
tions; and glass vessels like cat.12, usually resting on the shelf with the rim downwards, the
only position in which they are stable on a flat surface.

In this context, these glass vessels might be interpreted as utensils for mixing small quan-
tities of scent or medicaments and transferring them to small perfume or medicine bottles.
Indeed they function very well in this capacity, for the opening to the spout is sufficiently
close to the rim of the vessel to allow a fair amount of liquid to be held, and possibly mixed,
in the vessel without being spilt, while the slender spout would make it useful for filling a
very small bottle. If this was their function, as we would like to propose, then the humor-
ous effect of Abu Zayd’s trickery is enhanced in illustrations which show him using as a
cupping glass a common utensil which could have been seen by anyone buying perfumes
or medicines.
1. London, Science Museum, Wallis Cotton Collection, inv. nos 6565396, 6565397 and 6565391 (unpublished). Washington, DC, Smithsonian Institution, National Museum of American History, Medical Sciences Divison, inv. nos 207455, 207456 and 207457 (unpublished). stockholm, National Museum (Lamn 1935, pl. 13, item 3, Cairo, Museum of Islamic Art, inv. nos 778-11-06 (both unpublished), 66-5-110 (Kubak & Scanlon 1973, pl. viii-d), 12-0-13 (Scanlon 1981, pl. vi-d-b) and one unpublished example with an unknown inventory number. 2. Jerusalem, J. A. Mayer Memorial Institute of Islamic Art, Mayer Memorial 057 (Hasan 1979, p. 4, no. 1); Stuttgart, Linden-Museum (Kalter 1987, p. 11); Washington, DC, Smithsonian Institution, National Museum of American History, inv. nos 2342417, cat. no. 66-4057 (unpublished); Sanur, Kwait, Dar al-Athar al-Islamiyah, inv. no. 90-003 (illustrated in Qaddum 1987, p. 101); present location unknown (Riyadh 1985, p. 77), nos 90-003 (two examples offered for sale at Sotheby's, London, 10-11 October 1990, lot no. 42, one offered for sale at Sotheby's London, 30-31 April 1991, lot no. 82); one offered for sale in Paris (Lousmor & Koevoet 1981, p. 224, no. 56); Stockholm, National Museum (Lamn 1935, pl. 13, item 2); Cairo, Museum of Islamic Art, inv. nos 778-11-06 (Scanlon 1984, p. 29, fig. 65) and Pittsburgh, Carnegie Museum, inv. nos 224638 (Bergman & Oliver 1981, p. 143, item 26, where references are given to four additional examples on which the angle of the stem is not known). 3. London, Science Museum, inv. nos 6565396, 6565397, 6565398, 6565399 and 6565401 (unpublished), Stockholm, National Museum (illustrated in Lamn 1935, pl. 15, item 6); Lamn 1935, pl. 11, nos 66 and 67, nos. 12 and 14; Lane 1937, p. 63, fig. 10, item 7; Cairo, Museum of Islamic Art, inv. nos 73-3-18 (unpublished) and 79-10-41 (Scanlon 1984, p. 53, fig. 46) and one of unknown inventory number (Kubak & Scanlon 1980, fig. 9-a); and Athens, Benaki Museum, inv. no. 4192 (Clairmont 1977, pl. 23, no. 37, with references to additional examples). 4. Stockholm, National Museum (Lamn 1935, pl. 15, item 9, item 9, and item 0). 5. Kalter 1987, p. 11; and Lousmor & Koevoet 1981, p. 209. 6. Lamn 1935, pl. 13, nos 13 and 14; both with straight stems and an estimated date circa 600-900. New York, Metropolitan Museum of Art, inv. no. 38.20.193 (Bergman & Oliver 1980, p. 147); Washington, DC, Smithsonian Institution, Museum of American History, inv. no. 20073, fig. cat. no. 66-4056 and one to be found at Nishapur (Davis & Appel 1979, p. 19 with incorrect reference no. 657). 7. Jerusalem, J. A. Mayer Memorial Institute of Islamic Art, Mayer Memorial 037 (Hasan 1979, pp. 4-5). 8. Lamn 1935, pl. 15, items 8, 6, 5 and 4. 9. For those found in great quantities at Al-Mina in northern Syria, see Lane 1937. One example, with a straight stem, is illustrated. 10. Two have very straight stems (Cairo, Museum of Islamic Art, inv. nos 773-9-13 (unpublished) and 79-10-41 (Scanlon 1984, p. 29, fig. 46), dated respectively circa AD 900 and circa AD 1000. One, with a narrow bowl and a stem curving gently away from the rim, is in Cairo, Museum of Islamic Art, inv. no. 78-11-6, dated to the 10th century (Scanlon 1984, p. 29, fig. 46). The remaining finds are too fragmentary to be certain of the function of the early Islamic glass vessels. 11. This identification was advanced, among others, by Lamn 1935, pl. 13; Clairmont 1977, p. 111; Davis & Appel 1979, p. 12; Scanlon 1984, p. 29, fig. 46; and 1993, pl. 202. 12. See nos. 4-7, above. 13. For illustrations see Milne 1967, pl. xxviii-xxix, and Alpini 1779, pp. 239-41 and two plates between pp. 240 and 241. Alpino also mentioned cupping devices made of horn; mouth suction was used to extract the air and then the vessel was sealed with a piece of moistened parchement. This type of device was described in the 11th report of the Pector Expedition. Lamn 1935, pl. 13, no. 101 (unpublished). These are generally assigned to the period spanning the 8th to the 10th centuries. See Hasson 1979, pp. 27-31; and Clairmont 1977, pp. 91-3, for references to other studies. 14. A considerable number of objects rather similar in shape but made of sheet metal survive: for example, London, Science Museum, Wellcome Collection, inv. nos 6643331, 6643336, 6643357, 6643358, 6643359, 6643360, 6643361, 6643362, 6643363 (unpublished). They are thought to have come from North Africa and to be of fairly recent manufacture, although no specific information is available on their provenance. They all have a cloth wrapping at the end of the central tapering neck, as if to protect the mouth from the hot metal. Their purpose is uncertain, but they may have been used for the extraction of blood or the application of suction. 15. For Roman and Byzantine cupping vessels, see Jackson 1994, pp. 182-4 and fig. 7.12; Milne 1967, pp. 201-3 and pla xxxvii-xxxix. 16. Ryder 1994. 17. See nos. 4-7, above. 18. For illustrations see Milne 1967, pl. xxvii, and Alpini 1779, pp. 239-41 and two plates between pp. 240 and 241. Alpino also mentioned cupping devices made of horn; mouth suction was used to extract the air and then the vessel was sealed with a piece of moistened parchement. This type of device was described in the 11th
Funat Expedition, 15, pl. 1; see 60, Illustration. 1, all wheel-cut initials derive the name from the four legs of the stand. They have been found in large numbers at Ur, have been found in her site, and are usually considered the greatest number of them on the 10th century AD by the Roman writer Ctesias, briefly mentioned by al-Zahrawi in the 10th century, and was still being used in parts of Africa and India well into the 10th century, as seen by Jackson 1994, p. 183; Mille 1907, pls. 104 and 106, Alpines 1799, plate between pp. 158 and 159; Mapleton 1830, p. 24; and Davis & Appel 1979, pp. 18–19. A number of horn capping vessels exist today in museum collections, for example, London, Science Museum, Wellcome Collection, inv. no. 67696. Earthenware capping vessels of traditional design, with no tube or apparatus for suction by mouth and heated in hot embers, were still being used recently in Libya (Jurasz 1988, p. 100 and illustration on p. 122). Such uses have been suggested by Hassan 1979, pl. 51; Bergman & Oliver 1980, p. 242; and Allan 1976, p. 148.


23. In the text, the location is referred to as the copper’s museum and is mentioned with his name, both words being derived from the same root. In this context, the copper’s museum is his place of meeting and his museum could be either a mark of beauty or a mark made by a coppersmith, iron, or even the coppersmith himself. 24. Paris, Bibliothèque Nationale, Ms. arabe 3418, which manuscript has three illustrations of the scene, the most detailed being that on folio 14b, see Grabar 1984, fiche 907. On folio 15a, a second illustration shows four rather large hemispherical objects with curved stems standing on the shelves. The copper is addressing the audience; Grabar 1984, fiche 907. The third version on folio 15b is too damaged to make out details; Grabar 1984, fiche 908.

25. Leningrad, Academy of Sciences, MS. a. 23, p. 248, the most detailed of three illustrations of the scene; Grabar 1984, fiche 901, while on folio 1, the act of capping is not shown although both bell-shaped glass instruments and other equipment are illustrated (Grabar 1984, fiche 912). 26. London, British Library, MS. Or. add. 12114, folio 518, of the early 15th century; Grabar 1984, fiche 906.

27. Istanbul, Suleymaniye Library, Ms. Esad Efendi 2361, folio 15a, of the 14th century; the figures are damaged but the equipment is identifiable; see Grabar 1984, fiche 901.

28. Paris, Bibliothèque Nationale, Ms. arabe 6984, folio 2746 (Grabar 1984, fiche 907); Oxford, Bodleian Library, Ms. Marsh 156, folio 2711 (Grabar 1984, fiche 903). The latter has an illustration of two blue glass vessels.

A medical, pharmaceutical or perfumery utensil 47
Glass alchemical equipment

by Emilie Savage-Smith

In the Islamic lands, many of the techniques employed in drug production were also part of the realm of alchemy. The Arabic word *al-kiṣnayṣ* (from which we derive the word alchemy), was used for both chemistry and alchemy, and no clear distinction was made between the two activities. A wide range of chemical processes was undertaken by both the druggist and the alchemist, including distillation, calcination, evaporation, crystallization, sublimation, filtration, amalgamation and ceration. Their workshops would be stocked with a large number of vessels, such as alembics and cucurbits (respectively, the head and lower part of the distilling apparatus), receiving vessels, kettles, water-baths, filters, and crucibles, in addition to mortars and pestles for pulverizing substances and braziers and stoves for heating them. With the exception of mortars and pestles, most medieval Islamic chemical equipment was made of glass.

Distillation was one of the most important processes in Islamic chemical technology, being employed for medicinal, technological and industrial purposes, including the preparation of mineral acids and the distillation of perfumes, rose-water and essential oils. The procedure required a boiler, a condenser and a receiver. The boiling vessel was called a *qar* ('gourd, pumpkin') because of its gourd-like shape. The English term, cucurbits, is from the Latin *cucurbita*, also meaning 'gourd'. The most common type of condenser or still-head was the alembic (*anbiq*) which was separate from the boiling vessel (see cat.1) below. A liquid would be heated to boiling in the cucurbits; the distillate or condensed vapor would form on the inside of the dome of the alembic and run down into the rim or internal gutter formed by the collar, then pass out through the long delivery tube into an attached receiving vessel (*muṣqatbalah*); see fig. 3.

The cucurbits might be placed in sand or in a water-bath which could be heated by any one of a variety of furnaces or stoves. Alternatively, the boiling flask could be heated gently by means of a small lamp. Boiling vessels had rounded bottoms so that they could be easily adjusted to any required angle in the sand or water-bath or by being placed in a ring support. Eventually the arrangements of cucurbits, alembics, and receiving tubes reached grand proportions, with multiple still-heads, one on top of another, and circles of cucurbits heated by enormous furnaces with numerous receiving vessels attached to collect the distillates. Receiving flasks could take any number of forms, as long as their bottoms were also rounded and they possessed long, cylindrical necks into which the delivery tube of the alembic could be inserted. Three glass flasks in the Khalili Collection, cat.17–19, have flattened spherical bodies and could well have served such a purpose.

Figure 3: Diagram showing the arrangement of (1) alembic (2) cucurbits (3) sand (4) brick furnace (5) delivery tube and (6) receiving flask.
The origin of the process of distillation is obscure, but there is evidence to suggest that it was practised in Mesopotamia and China, and possibly India, before the advent of Islam. However, the development of the retort (al-`arrāj), in which the condenser and boiler were combined in one unit, appears to be an Islamic development and is illustrated in many late medieval manuscripts. A retort could only be used with liquids, and filling the vessel through the small aperture at the end of the long, curved delivery tube would have required a very narrow funnel (see fig. 4). Only one medieval Islamic vessel identifiable as such has been recorded. It has a bulbous, globe-shaped body with a long, narrow neck that bends through a right angle. Seven gourd-shaped vessels in the Khalili Collection, cat.13 and 16, might also be examples of retorts, particularly if one assumes that their necks were originally much longer than they are at present, although they could also have been used as condensers or receiving vessels.

There is no explicit description in medieval Islamic written sources of the method of externally cooling the delivery tube, which is a requirement for the distillation of alcohol. From a number of brief statements, such as that made by al-Kindī in the 9th century, however, it seems probable that some form of water-cooling was occasionally employed to distill wine. A system in which the entire still-head incorporates a cooling bath into its design is commonly known as a 'moor's-head' still. Its earliest recorded illustration is a Western drawing of 1481, but when and where the design arose is unknown. Metal 'moor's-head' or cold stills are illustrated in a number of 17th- and 18th-century Arabic and Turkish manuscripts on alchemy or chemical medicine, and in Algeria and Morocco they are still in use for preparing rose-water.

Another basic piece of chemical or medical equipment was a funnel (qīm), which eased the transfer of substances from a larger to a smaller container. Few funnels are described in the published scholarly literature, although several, often fragmentary, are preserved in various collections. The Science Museum in London has six Islamic glass funnels of rather different shape, and possibly of an earlier date, to that in the Khalili Collection, cat.14, an Iranian piece of the 18th or 19th century. One of these has a cylindrical body with a moulded upper rim and a lower narrow curved spout. The other five funnels are all shaped like a tobacco pipe, with a conical upright bowl at right angles to an apparently straight, tapering stem. On all five examples, however, the stems are broken so that their original lengths are unknown.

Because alchemical equipment has been considered of little artistic value, it is not normally found among museum collections, or, if it is represented, it tends to be neglected.
Such equipment, moreover, is not readily identified by cataloguers at auction houses. An Islamic alchemical, for example, which was recently acquired by the Science Museum in London, was described in the sale catalogue (where it was illustrated upside down) as 'a fine and rare Roman glass funerary vessel'. The fragility of glass utensils and the frequent corrosion of their surfaces from the impurities and acidic substances placed in them must have resulted in most items being destroyed after use. It is the items that remained unused – perhaps because of flaws in construction, as evidenced by cat.13 opposite – that tend to be preserved. Furthermore, it is difficult to evaluate the age and origin of alchemical equipment because there is little information on the provenance of the known objects. Until further information regarding medieval alchemists, coppers, and receiving vessels is collected, and a typology of forms developed, any attempts to date or locate individual objects can only be tentative, and little can be said regarding development in the design and production of Islamic chemical equipment.

2. For an example in the Science Museum, London, see Hassan & Hill 1986, p.194, fig.6–8.
4. Alternatively, they may be versions of those objects usually referred to as 'pilgrim flasks', and in form they are closely related to some Byzantine glass vessels.
6. For examples, see Sari 1986, pp.65, 69–70 and 73.
7. National Museum, Damascus; see al-Ush, Jouidhi & Zoudhi, 2008, p.210 and illustration no.113. The vase's provenance is unknown, but it has been attributed to the 10th century. The diameter of the body is 9.6 centimetres, and the maximum width across the whole object, including the neck, is 22.2 centimetres.
9. For examples, see Savage-Smith 1993, p.125 (lower-left corner); and Sari 1986, p.16.
10. See Goodfield & Toulmin 1964; Hassan & Hill 1986, pp.139–40; and Ping-Yü & Needham 1959, pp.107–8. The Science Museum, London, has a number of large metal 'moor's head' stills from the Middle East, for example, those in the Wellcome Collection, inv. nos A615435 and A615544.
11. Science Museum, London, Wellcome Collection, inv. nos A79640, A796721, A658600, and A60637, of amber or green glass. The height of the bowls ranges from 4.5 to 6 centimetres and the present length of the stems from 9.5 to 11 centimetres.
12. For example, inv. nos A610828477 of blue glass, is of the same shape, with a bowl 6 centimetres high and a stem 23.5 centimetres long.
13. See Anderson 1953, p.82.
Those in the collection, inv. nos 16537994, 16537894, 16537994, 16537894, and 16537994, are of blue glass. The lead is broken.

The diameter of the bowl ranges from 7.5 to 11.5 centimeters, with a stem of 1.5 to 2.5 centimeters in length. The height of the stem is 2 to 3 centimeters. A handle, of blue glass, is attached to the bowl, with a stem of 5 to 6 centimeters long and a stem of 3 to 4 centimeters long.

Forsyth 1982, p. 82.

...
Glass alembic
Iran, 9th-10th century

Transparent green-brown glass with patches of iridescence and a dark
weathering crust
height 12.5 cm diameter of rim 7.0 cm
diameter of body 5.6 cm
length of delivery tube 8.8 cm
diameter of tip of tube 1.1 cm
inner diameter of tube 0.7 cm
width 2.1 cm (including spout)
accession no. GLS 559

The alembic has a cup-shaped body
with an indented top where the
pointed mark is located. A cylindrical
collar forms the lower part of the
alembic. A tapered delivery tube, only
part of which remains intact, protrudes
as a right angle from the body. It is set
so far up the side of the body, however,
that the distillate accumulating in the
internal gutter could not easily drain
coll. As a result, the alembic would not
have functioned properly, and it
may have been discarded as a piece of
intellectual equipment.

A similar alembic with a delivery
tube at an equally sharp right angle,
but set lower down the body and
closer to the internal gutter formed by
the collar, presumably found at Fayy,
has been assigned to the 9th or 10th
century.1 An alembic considered to be
of Islamic origin of the 10th to 11th
century in one of four Islamic distilla-
tions recently acquired by the
Science Museum in London.2 This has
a more flattened body than the alembic
in the Khalili Collection, and its deliv-
ery tube angles downwards from the
shoulder of the body so that the in-
ternal gutter could be effectively
trained.

Three other glass alembics are
recorded that have the delivery tube
attached to the body at the shoulder
and angling sharply downwards,
but they have a knob at the top of the body
instead of a depression. They have
been associated with Egypt and con-
sidered either pre-Islamic of about
the 6th century AD, or early Islamic of
about the 8th century.3 No alembics
are recorded as coming from reliably
dated contexts.

1. Lamm: 1935, pl. 15, 1 and photograph
on pl. 28. See also the catalogue of
sales at Sotheby's, London, 21 October
1989, lot no. 27 and 15 April 1988, lot
no. 311.
no. 1978.189.210, unprovenanced; see
Other, unprovenanced, Islamic glass
alembics are in the Royal Ontario
Museum, Toronto, and the
Middelhauvenmuseum, Stockholm.
366 and pl. XXXII, Lamm 1929, 11,
pp. 28–9 and pl. 1, no. 17, and Hassan &
Hill 1966, p. 135, for a photograph of
one in the Victoria & Albert Museum,
London, which also has a 19th-century
green glass alembic and crucible from
Patna, India, inv. no. 175091 S. 1883.
The Science Museum, London, has a
modern Persian alembic and crucible
acquired in 1975 from an alchemist in
Iran (inv. no. 1977.246). For photo-
graphs of modern Iranian alembics
and alchemical equipment, see Nan 1976,
pp. 203 and 205.

Funnel
Iran, 18th–19th century

Green-brown free-blown glass
length 42.5 cm diameter of rim 10.5 cm
diameter of tip of spout 0.9 cm
inner diameter of spout 0.6 cm
accession no. GLS 534

The funnel has a long, tapering spout,
curved at the narrow end. At the wide
end there is a broad, flattened rim.
Indents are seen on the neck of the
funnel where the glassblower clasped the
wide end with a pair of
tongs or similar tool.

The stilnol has survived intact,
though its extreme fragility. It displays
few signs of use, particularly with any
acidic substance. Such a long, thin
shape would permit the easy transfer
of liquids from a larger to a much
smaller container.

A similar funnel is said to have been
made in Shiraz in the 19th or 18th
century.1

1. See the catalogue of a sale at
Sotheby's, London, 21–22 April 1986,
lot no. 337.
Glass vessel, perhaps for alchemical use
Provenance unknown
Dark-blue, free-blown soda-lime glass, with slight iridescence
height 24.5 cm diameter of neck 1.1 cm (outer) 0.7 cm (inner)
maximum diameter 6.4 cm
acquisition no. G15.254

Six glass vessels, perhaps for alchemical use
Provenance unknown
Dark-blue, free-blown soda-lime glass, with slight iridescence
height 16.6 cm diameter of neck 1.2 cm (outer) 0.9 cm (inner)
maximum diameter 8.4 cm
acquisition no. G15.252.1
height 16.2 cm diameter of neck 1.2 cm (outer) 0.9 cm (inner)
maximum diameter 8.4 cm
acquisition no. G15.252.2
height 16.3 cm diameter of neck 1.2 cm (outer) 0.9 cm (inner)
maximum diameter 8.3 cm
acquisition no. G15.252.3
height 16.7 cm diameter of neck 1.2 cm (outer) 0.9 cm (inner)
maximum diameter 8.3 cm
acquisition no. G15.252.4
height 16.9 cm diameter of neck 1.2 cm (outer) 0.8 cm (inner)
maximum diameter 9.2 cm
acquisition no. G15.252.5
height 16.2 cm diameter of neck 1.2 cm (outer) 0.8 cm (inner)
maximum diameter 9.1 cm
acquisition no. G15.252.6

These seven gourd-shaped vessels are all of dark-blue, soda-lime glass, and are of a type especially associated with Iran, though their distribution appears to have been wider. The inner and outer surfaces are as glossy as when newly made, with no signs of corrosion. This puzzling feature can also be observed on larger vessels of the same form as cat. 15 excavated at a 9th- and 10th-century site in Nishapur, and on one of more spherical shape that was found with five other Islamic glass vessels, all apparently imported by sea, in a Northern Song pagoda in Dingxiang, in the Hebei province of China, dated AD 997. A fragment consisting of the neck and shoulders of another is now in Baghdad, and there are a number of unprovenanced examples.

Were it not for the securely dated archaeological sites at which some of these examples have been excavated, their almost pristine surface condition might give rise to doubt about the dating. The lack of corrosion suggests that they were not used repeatedly, and it may be that such vessels were generally employed no more than once before disposal, in which case all the preserved ones are unused. Their export to China implies that either the vessels themselves were considered of sufficient value to warrant their being shipped empty, or that they were designed to contain a particularly valuable substance which left no trace on the interior surface. The consistent form, even of those shipped great distances, certainly suggests a deliberate design and function.

The rims of the very narrow necks of all recorded examples appear to have been sheared off at the time of production, as here, but what this implies about their intended use is unclear. Such evidence might suggest that the present length of the necks is the intended final length, in which case the flasks may have served as condensing vessels or receiving bottles attached to the delivery tube of an alembic during distillation. Spherical condensers with short but thin necks are occasionally illustrated in 18th-century Persian and Turkish alchemical manuscripts. It is also possible, given the narrowness of the openings, that they could have served as a form of retort—that is, a boiling vessel that allowed steam to pass into another container via a long, narrow neck curving downwards. Had the necks originally been longer than at present, the vessels might also have been used for distilling essences in the same way as spherical glass vessels with extraordinarily long, thin necks that are designated for that purpose and illustrated in manuscripts.

Whatever their function, the distinctive gourd-like shape of all the vessels is typical of alchemical equipment in general, the curved bottoms allowing them to be positioned at any angle required by the chemical process, and they could easily have served as receiving vessels for distillates of essential oils.
1. The form of the larger vessel is reminiscent of two late Roman elongated tubular glass flagons assigned to the Eastern Mediterranean of the 3rd or 4th century and now in the Yale University Art Gallery, gift, Mansfield Collection, inv. nos 1933.386 and 1931.387 (40 cm. and 37 cm. diameters, respectively). Matson 1986, pp. 66-8.

2. For the vessels from Wadi Halfa, see Arth 1976, p. 216; Haas 1979, p. 51, item 3, for an illustration of one now in the L. A. Mayer Memorial Museum, Jerusalem, inv. no. 317; and Jayao 1987, p. 21, fig. 22. For the Dingjiaz site, see Jayao 1987, pp. 11, 17 and fig. 21 (see p. 10); and Jayao 1991, p. 7 and fig. 8 (see p. 12). An X-ray analysis indicated that the Dingjiaz find is of seal-ink glass with a certain amount of potassium.

3. Abdul-Khalic 1976, p. 294, pl. 11, item 3; and the catalogue of a sale at Christie’s, London, 19-21 October 1993, lot no. 313; present location unknown.

4. For an illustration of a round con- denser (mudara‘ur muqaddas) in an 18th-century Turkish manuscript, see Sari 1986, p. 55 (lower right).

5. See Sari 1986, p. 60 (lower left) for an illustration of three such vessels from an 18th-century Turkish manuscript.

6. For a woodcut showing a European alchemical vessel of similar shape, see Ferrara 1958, p. 92.

7. This shape is strikingly similar to that of the cylindrical pottery objects with short stems at one end that were found at Samarra, under pavements in buildings constructed during the regn of al-Mu’tamid (829-842) and in disuse by the end of al-Mutawakkil’s reign (829-861). However, the pottery vessels are much larger (20 centimetres in diameter and 80-85 centimetres in length) and had a removable cap at the rounded end, they were also covered with bitumen and often painted with portraits and appear to have been made to contain different types of wine. See Rice 1958.
Three receiving flasks or condensing bottles
Provenance unknown

Translucent amber or green free-blown glass, with evident iridescence and white, calcium-like deposits

height 16.8 cm width 9 cm
thickness of body 0.8 cm (at neck)
8.7 cm (at bottom)
diameter of neck 2.7 cm (outer)
1.5 cm (inner)
accession no. 612.37

height 18.6 cm width 12.6 cm
thickness of body 1.4 cm (at neck)
8.6 cm (at bottom)
diameter of neck 2 cm (outer)
1.8 cm (inner)
accession no. 612.375

height 20 cm width 13 cm
thickness of body 1.5 cm (at neck)
0.6 cm (thinnest part of side)
diameter of neck 2.5 cm (outer)
1.8 cm (inner)
accession no. 612.376

The flattened, spherical bodies of these three flasks are coplanar with the cylindrical necks, which rise abruptly from the shoulders of the vessel. All the necks are broken, so that their original lengths are unknown.

The supposition that their necks were originally longer suggests that the flasks were receiving vessels or condensing bottles, to be attached to the delivery tube of an alembic. The circular form of the bodies is such that the vessels cannot stand by themselves, but when in use they could have been set in a ring-support or in sand and adjusted to an appropriate angle. Their flattened sides would allow for easy storage or shipment of the distillate if required.¹

The dates of such items are uncertain, possibly ranging from the 10th to the 14th centuries, and nothing is known of their place of production.

Little attention has been given them, even though a considerable number appear to be preserved, most without provenance. In the Science Museum in London, for example, there are 14 flasks of comparable shape and size, all with their cylindrical necks now broken.²

The forms of both the bodies and the necks are also reminiscent of those on Roman glass "pilgrim flasks" of the Eastern Mediterranean attributable to the 2nd century AD, except that the necks on the Roman pieces are slightly shorter in proportion to the body, and they all have finished rims, usually everted or rolled.³

¹ For a different interpretation of these vessels, see Goldstein forthcoming.
² Science Museum, London, Welcome Collection, inv. nos A.110947, A.110948, A.110950, A.110953, A.110957, A.110958, A.424526 - A.424530, A.612.37, A.612.374, A.612.375, A.612.376, A.612.377, A.612.378, and A.612.379, with heights varying from 12 to 14 centimetres and widths from 7.7 to 14 centimetres. Most are quite indescribable and encrusted with deposits. The Science Museum also has 11 much smaller glass flasks with flattened spherical bodies, varying in width from 2.6 to 3 centimetres and in height from 3 to 6 centimetres. The rims on three of the small ones are preserved intact, and all show little iridescence and almost no deposits on the surfaces. It would seem that the smaller vessels served quite a different function from the larger ones, probably as phials holding small quantities of essential oils.
³ For examples, see Loudmer & Kevorkian 1981, pp. 102-3.
Composite talisman
Ibn, 16th century

One of 8 folios, 3:1 ratio, highly burnished, laid lines but no visible gold or script in gold or red. The text is framed by green, red and blue in 'tallistic' or 'tallis' scripts in red, with two panels defined by gold and black in arabic. The folios are numbered 41 and 42.

This talismanic chart for a careful diagram manuscript was originally produced for a scribe or at an Islamic court. The chart is composed of various panels and script in three columns, with the central column labeled 'Whoever charts this chart will be a witness and will be able to testify.' In the main right-hand column, the names of the Holy family and the Imams of the Twelve Shi'a are written: Ali, Arif, Husayn, Ali (Zayn al-Abidin), Muhammad (al-Hasan), Asad, Mulla (al-Husayn), Muhammad, Hasan, and Muhammad. Each name is written in a separate column and the chart is arranged so that each month is represented by something. The chart contains the names of twelve months and the column names assigned to each month. The chart lists items to be checked monthly according to various authorities. The second month, Safar, is accompanied by gold and silver accents, and the chart is written in black ink. The chart is signed by Nastar al-Din (from the right), and the chart includes various other authorities and a 'wise people' or one's own name. The chart is written in black ink.
Magic and Islam

by Emilie Savage-Smith

Composite talismanic chart
Iran, 19th century

One of 8 folios, 30 x 21.5 cm, of a thin, highly burnished paper with fine laid lines but no visible chain lines, the edges ruled in gold and black; text area 20.7 x 15 cm from very fine black, gold, green, red and blue lines; text in naskh and nipa' scripts in red and black inks within finely ruled and subdivided by gold and black lines
Accession no. 385.4.12, folio 1b (see cat. 1.6)

This talismanic chart occurs on the first folio of a carefully executed, large-format manuscript which, although undated and anonymous, was evidently produced for use in the Tewehri or Imam Jomeini's community in Iran.

The chart is composed of several charts and talismans to be employed at different times and occasions, arranged in three columns, with the title for the entire chart written at the top of the central column: 'Whoever looks at this chart will be a witness to it', that is, he will be able to testify to its efficacy.

In the main right-hand column, under the barmahal, there is a square containing the names of the holy family and the Imams recognized by the Tewehri community. Muhammad, Ali, Fatimah, Hassan, Husayn, Ali (Zayn al-Abidin), Muhammad (al-Baqir), Jafar al-Sadiq, Musa (al-Kazim), Ali (al-Hadi), Muhammad (al-Jawad), Ali (al-Naqi), Hasan (al-Ashura), and Muhammad Mahdi. Below these names is a chart arranged in six columns and entitled 'For the explanation that each month it is necessary to look at something'. The right-hand column contains the names of the twelve months and the left-hand column assigns the names of a Qur'anic surah to each month. The four inner columns list items to be viewed monthly according to the opinion of various authorities. For example, in the second month, Safar, one should look at gold and silver according to the Imam Jafar al-Sadiq (second column); or a mirror according to Nisar al-Din al-Tusi (third column) and other authorities (see above, 'powerful people') or one's own hand according to yet other authorities (sukunah, 'wise people', fifth column).

Although they portrayed magical symbols whose imagery might be traceable to pre-Islamic traditions, the amulets and talismanic objects used by Muslims chiefly took the form of pious invocations to God, through Qur'anic quotations and prayers displaying a constant trust in Him. In this respect, Islamic magical practices differ substantially from Byzantine, Roman, early Iranian and other pre-Islamic magic.

Amongst the Qur'anic verses on the magical items in the Khalili Collection, the 'Throne Verse' from the surah al-Baqara (ii, verse 255) predominates. The last two surahs of the Qur'an, al-Falaq and al-Nas (xxvii and xxviii), known collectively as al-Mu'aawwidhun ("those of Seeking Refuge [from evil practices]") are also frequently employed, especially on items made for the Shi'hi community. So too is the surah al-Kafirun (cxc), which emphasizes that the user does not worship what unbelievers do. Table I presents a list of all the Qur'anic passages occurring on the magical artefacts catalogued here, and indicates which are used on Shi'hi objects.

Most magic in the Islamic world was protective in nature, asking for God's general protection. Occasionally, His intervention against other powers - the evil eye, assorted demons (shayatin) and the jinn, 'shape-shifting' supernatural creatures whose existence was recognized in the Qur'an - was specifically sought. This underlying assumption of the existence of evil beings was inherited from pre-Islamic societies, as were many of the methods of counteracting them.

Such recognition of active supernatural forces other than God's to a certain extent contradicted the strict monotheism of Islam, though not the omnipotence of God, to Whom we were directed all pleas for intervention. Clerics recognized as legitimate those forms of magic that appealed only to God, but not the illicit forms addressed to jinn and demons.

Manuals of Prophetic medicine, advocating the traditional medical practices of the Prophet Muhammad's day and those mentioned in the Qur'an, were composed by clerics who expounded largely magical and folkloric approaches to maintaining health and well-being, as in cat. 11. It was also considered acceptable to address such invocations to angels, to Muhammad, to Ali (if one was a Shi'i) or other members of the holy family, and to saints: all these were believed to intercede with God on behalf of the supplicant.

The prayers, Qur'anic verses and invocations employing the 99 asmat al-banaa ('Beautiful Names of God') applied to magical objects were supplemented by an array of symbols whose function was to strengthen the supplications. Many of these magical symbols were inherited from earlier cultures, and their origins and significance have become obscured with the passage of time. For example, a long-horned stag or oryx appears on very early amulets (see pp.35-7) but disappears as a magical symbol on objects made in subsequent centuries. Pre-Islamic magical imagery featuring lions, serpents and scorpions can be seen on several types of artefact, such as amulets and magic-medicinal bowls. The representation of the human hand played an important role in protection against the evil eye during the pre-Islamic Middle East and continued to do so in the Islamic lands, as seen on cat. 85-7. Astrological iconography derived from classical antiquity, involving emblematic representations of the twelve zodiacal signs and the seven classical planets, also played a role in talismanic design. It is displayed, for example, on some amulets, mirrors and magic-medicinal bowls (see, for example, cat. 19).

Magic writing, composed of numerals and letters as well as other marks, is another common feature, including a type of ancient magic symbol consisting of combinations of short lines ending in tight curls, often called lunette sigil. A magical design might also include pseudo-writing - that is, inscriptions, often in a script resembling Kufic, that are
unintelligible. The origin of this practice is puzzling, though it is possible that it arose over time as amulet-makers copied exemplars that they did not understand. In some cases the maker, as well as the person purchasing the item, may have been virtually illiterate and unable to understand the original inscription or recognize that the copy was meaningless. The question then arises, if a legible inscription is copied in a form that is meaningless, does it still retain for the believer its magical or invocatory power?  

From the 13th century onwards, magic and Latin squares became extremely popular motifs, and they are found on every type of magical artefact represented in the Khalili Collection. The five-pointed star or pentagram (sometimes replaced by a hexagram) was known as the 'Seal of Solomon' in the pre-Islamic Near East, and in Islamic magical practices it was combined with six other magical marks to form a logogram of seven symbols representing the name of God. This sigil of the Holy Name (sometimes incorrectly called 'the Seven Seals of Solomon' or 'the Seven Solomonian Seals') was frequently employed from about the 12th century onwards but, does not seem to have been used on early items.  

On magical artefacts (at least, on those made of durable materials), the supplications for protection and cure seem to be directed exclusively to God, with an occasional mention of angels. Supplications to darker, demonic forces rarely occur on the type of talismanic material that is catalogued here, although they are mentioned in manuals on magic, and occasionally occur on paper or parchment talismans. In illicit magic, conjurers and sorcerers would address their pleas directly to jinn and demons. 'Binding spells' were employed to place others under the direct influence of the magician or his client. Release from such spells is one of the stated uses of early magic-medicinal bowls, and exorcisms of demonic forces were occasionally conducted.  

From the 12th century onwards, manuals on magical formulas and procedures proliferated. The acknowledged master of the art was Abu'l-Abbas Ahmad ibn 'Ali ibn Yusuf al-Buni al-Qurashi (d. 1252), whose work is represented in the Khalili Collection by copies of his most popular manual, cat. 20, and of his treatise on the construction of magic squares and on talismanic designs based on the letters composing the asma‘ al-husna, cat. 22. Subsequent manuals, such as those by Abu-al-Rahman al-Bistami (see cat. 21), further elaborated the already intricate procedures advocated by al-Buni.  

Interest in magical healing during the 13th and 14th centuries must have been substantial in Egypt and Syria, for it was apparently at that time that the production of metal magic-medicinal bowls began. The earliest such bowls recorded were made in Syria in the 13th century for Nur al-Din ibn Zangi; the Khalili Collection has an important example of the type, cat. 23. Another style of magic-medicinal bowl, with schematic engravings of the Ka‘bah, is associated with the name of Saladin (reg. 1169–1193), though none of the known examples can be confirmed as having belonged to him. Saladin’s name was associated in the popular mind with other magical items, such as an amulet known in Europe as the ‘Lee-penny’, which was obtained during a Crusade by Sir Simon Lockhart and long preserved by his descendants. It was the source for a 19th-century novel by Sir Walter Scott, The Talisman, in which Saladin, in the guise of a physician, cures Richard I while he is encamped in the Holy Land during the Crusades.  

The magical artefacts in the Khalili Collection include manuscript copies of manuals on magic, household items – such as mirrors and plaques – with talismanic designs, talismanic charts that could be displayed as household amulets or folded and carried on the person, talismanic shirts that could be worn at times of crises, amuletic jewellery and magic-medicinal bowls. Besides these, many other household items could also be amuletic or talismanic when seen from the new words. The words refer to invocations to God, the asma‘ al-husna, and the but most of the diagrams, numerals and magical inscriptions would final talisman consist of lesser-symbols and are labelled 'When observing moon', look at this diagram.

1. 'Ex-cnt.' denotes an error in the Khalili Collection that was corrected or fully catalogued volume.
2. Items listed under 5. with no overtly Shi‘i or invocations.

Beneath this chart a large label reads, 'Wherein to place the diagram will overt misfortune' and there is a 15 x 15 verse square labelled 'Let him look at the arrangement of the tradition', a reference to the formula al-Asma‘ Allah (‘Praise be to God’). The square contains the entire text of the first surah of the Qur’an, which begins with this formula.

In the central column, beneath the main title, a 15 x 15 verse square contains the entire text of the surah al-Isra‘ (21) and is labelled ‘Let him look at this arrangement of the text’, the profession of the unity of God. Beneath this verse square there is a 15 x 15 square with the title ‘Wherever looks at this diagram will not become ill during this month. ‘The cells of the square are filled with the shahadah and a series of letters and numerals whose significance is not known. A very similar 4 x 4 square is drawn at the bottom of the same column. Between these two squares, a talismanic design consisting mostly of magic letters and symbols is drawn in two more, concentric squares. Incorporation into the border of the design is a label reading, ‘Whoever looks at this diagram will not become ill and fertile. It would seem that all three squares were to be contemplated in order to gain protection from illness.

The left-hand column begins with a two-column chart entitled ‘For each of these signs you must look at something’, 'The names of the twelve zodiacal signs appear in the right-hand section of the chart and are associated with them in the left-hand section: for example, a finger ring is paired with Leo.

The remaining four talismanic diagrams in this column are all to be used on first seeing the new moon. The first diagram has four cells, each containing the statement ‘There is no god but God’ and the name of a prophet, either Moses, Abraham, Jesus or Muhammad. The title of the diagram instructs the user to ‘Read these words when seeing the new moon’. The second diagram consists of magic symbols and letters and, at the bottom, the Seven Seals of Solomon. It is labelled ‘Look at this diagram when seeing the new moon’. Above the third diagram is the statement ‘It is reported of the Prophet that [he said]’:

Magic and Islam
that it arose over time, and in some cases the text is so illiterate and meaningless, does not even appear.

This extremely popular and widely used in the Khalil Collection was a hexagram) was a prominent feature of magic. Practices of seven symbols were incorrectly called talismanic, and were employed on early items. Supplications for health, protection, and various types of talismanic practices on magic, and invocations for various purposes, were employed in the book of magick and demonology known as the 'Ali ibn Yusuf collection by copies of the Talismanic Book of Magic squares and symbols of the al-busna, cat. 22, 23, 25, 27, further elaborates.

There have been substantial studies of these talismanic texts and their influence. For example, the engravings of the talismanic texts on the walls of the Known Talismanic Places of the Islamic World include the ‘Lee-Carroll’ talismanic texts. Walter Scott, The Art of Talismanic Magic, mentions that the text is encamped in a few.

Several manuals on talismanic texts exist. The talismanic texts, known as talismanic texts, are often associated with the person whose name is inscribed on the talismanic texts. These talismanic texts are often used in magic and demonology.

---

when seeing the new moon, read these words.' The words referred to are invocations to God, using four of the names of God, and in Muhammad, but most of the diagram is comprised of numerals and magic letters whose pronunciation would be difficult. The final talisman consists only of magic letter symbols and numerals and is labelled 'When observing (the new moon), look at this diagram.'

1. The context of the rest of the manuscript is discussed in the entry for cat. 106, below.

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### Table 1: Quranic Verses Occurring on Magical Artefacts

<table>
<thead>
<tr>
<th>Surah, verse (line)</th>
<th>Sunni</th>
<th>Shiai/Alid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Kafirun, verse 1-2</td>
<td>cat. 32</td>
<td>cat. 32</td>
</tr>
<tr>
<td>Al-Kafirun, verse 3-6</td>
<td>cat. 68</td>
<td>cat. 69</td>
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<tr>
<td>Al-Kafirun, verse 7-12</td>
<td>cat. 104</td>
<td>cat. 104</td>
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<tr>
<td>Al-Laila, verse 1-5</td>
<td>cat. 55</td>
<td>cat. 55</td>
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<tr>
<td>Al-Laila, verse 6-9</td>
<td>cat. 57</td>
<td>cat. 57</td>
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<tr>
<td>Al-Laila, verse 10-13</td>
<td>cat. 58</td>
<td>cat. 58</td>
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<tr>
<td>Al-Laila, verse 14-17</td>
<td>cat. 59</td>
<td>cat. 59</td>
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<tr>
<td>Al-Laila, verse 18-21</td>
<td>cat. 60</td>
<td>cat. 60</td>
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<tr>
<td>Al-Laila, verse 22-25</td>
<td>cat. 61</td>
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<tr>
<td>Al-Laila, verse 26-29</td>
<td>cat. 62</td>
<td>cat. 62</td>
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<tr>
<td>Al-Laila, verse 30-33</td>
<td>cat. 63</td>
<td>cat. 63</td>
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<tr>
<td>Al-Laila, verse 34-37</td>
<td>cat. 64</td>
<td>cat. 64</td>
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<tr>
<td>Al-Laila, verse 38-41</td>
<td>cat. 65</td>
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<td>Al-Laila, verse 42-45</td>
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<td>Al-Laila, verse 46-49</td>
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<td>Al-Laila, verse 50-53</td>
<td>cat. 68</td>
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<tr>
<td>Al-Laila, verse 54-57</td>
<td>cat. 69</td>
<td>cat. 69</td>
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<tr>
<td>Al-Laila, verse 58-61</td>
<td>cat. 70</td>
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<tr>
<td>Al-Laila, verse 62-65</td>
<td>cat. 71</td>
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<td>Al-Laila, verse 66-69</td>
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<td>Al-Laila, verse 70-73</td>
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<td>Al-Laila, verse 74-77</td>
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<td>Al-Laila, verse 78-81</td>
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<td>Al-Laila, verse 82-85</td>
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<td>Al-Laila, verse 86-89</td>
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<td>Al-Laila, verse 90-93</td>
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<td>Al-Laila, verse 94-97</td>
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<td>Al-Laila, verse 98-101</td>
<td>cat. 80</td>
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<tr>
<td>Al-Laila, verse 102-105</td>
<td>cat. 81</td>
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<tr>
<td>Al-Laila, verse 106-109</td>
<td>cat. 82</td>
<td>cat. 82</td>
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<tr>
<td>Al-Laila, verse 110-113</td>
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<td>Al-Laila, verse 114-117</td>
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<td>Al-Laila, verse 118-121</td>
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<td>Al-Laila, verse 122-125</td>
<td>cat. 86</td>
<td>cat. 86</td>
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<tr>
<td>Al-Laila, verse 126-129</td>
<td>cat. 87</td>
<td>cat. 87</td>
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<tr>
<td>Al-Laila, verse 130-133</td>
<td>cat. 88</td>
<td>cat. 88</td>
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<tr>
<td>Al-Laila, verse 134-137</td>
<td>cat. 89</td>
<td>cat. 89</td>
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<tr>
<td>Al-Laila, verse 138-141</td>
<td>cat. 90</td>
<td>cat. 90</td>
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<tr>
<td>Al-Laila, verse 142-145</td>
<td>cat. 91</td>
<td>cat. 91</td>
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<tr>
<td>Al-Laila, verse 146-149</td>
<td>cat. 92</td>
<td>cat. 92</td>
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<tr>
<td>Al-Laila, verse 150-153</td>
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<tr>
<td>Al-Laila, verse 154-157</td>
<td>cat. 94</td>
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<tr>
<td>Al-Laila, verse 158-161</td>
<td>cat. 95</td>
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<td>Al-Laila, verse 162-165</td>
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<td>Al-Laila, verse 166-169</td>
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<td>Al-Laila, verse 170-173</td>
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<td>Al-Laila, verse 174-177</td>
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<tr>
<td>Al-Laila, verse 178-181</td>
<td>cat. 100</td>
<td>cat. 100</td>
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<tr>
<td>Al-Laila, verse 182-185</td>
<td>cat. 101</td>
<td>cat. 101</td>
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</tbody>
</table>

1. 'Ex-cat.' denotes an object in the Khalil Collection that is not illustrated or fully cataloged in this volume.

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<table>
<thead>
<tr>
<th>Verses/Sections</th>
<th>cat.</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>XLI, verses 1-6</td>
<td>cat.37</td>
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<tr>
<td>XLI, verses 3-5</td>
<td>cat.39</td>
<td>cat.34</td>
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<tr>
<td>LXI, verse 8</td>
<td>cat.46</td>
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<tr>
<td>LX, verses 23-24</td>
<td>cat.51</td>
<td></td>
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<tr>
<td>LXII, verses 7-9</td>
<td>cat.52</td>
<td></td>
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<tr>
<td>XLI, verse 13 (LII)</td>
<td>cat.58 and 101</td>
<td>cat.50, 51, 49 and 86, 71-809 (ex-cat.)</td>
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<tr>
<td>LXIII, verses 1 (LII)</td>
<td>cat.53</td>
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<tr>
<td>LXIV, verses 2-3</td>
<td>cat.55</td>
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<tr>
<td>LXIV, verse 1 (LII)</td>
<td>cat.55</td>
<td></td>
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<tr>
<td>LXVII, verses 41-42</td>
<td>cat.54 and 50</td>
<td>cat.51</td>
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<tr>
<td>LXVII, verses 14-20</td>
<td>cat.55</td>
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<tr>
<td>LXVI, verses 1-4</td>
<td>cat.59, 59 and 100, 71-813 (ex-cat.)</td>
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<tr>
<td>LXIV, verses 1-8</td>
<td>cat.59</td>
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<tr>
<td>LXIV, verses 1-9</td>
<td>cat.59</td>
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<tr>
<td>LXV, verses 1-9</td>
<td>cat.59</td>
<td>cat.57 and 75</td>
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<tr>
<td>LXVI, verses 1-9</td>
<td>cat.59</td>
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<tr>
<td>LXVII, verses 1-30</td>
<td>cat.56</td>
<td>cat.51</td>
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<tr>
<td>LXVIII, verses 1-70</td>
<td>cat.51, 53 and 81, 71-813 and 71-820 (ex-cat.)</td>
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<tr>
<td>LXVIII, verses 1-70</td>
<td>cat.54</td>
<td>cat.50, 51 and 52</td>
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<tr>
<td>LXIX, verses 1-90</td>
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<td>cat.50, 51 and 52</td>
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<td>LXXIV, verses 1-90</td>
<td>cat.54</td>
<td>cat.50, 51 and 52</td>
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</tbody>
</table>

These include locks with talismanic designs, beehive covers, spoons, ladles, scissors and other implements (see, for example, cat.69).

It is almost impossible to align a talismanic design on an artefact with its precise equivalent in the popular magical manuals such as those by al-Bani. Some of the earliest amulets, of the 9th and 10th centuries, have designs that appear to have fallen out of fashion by the 12th century or were used only in provinces distant from Syria and Egypt, where most of the manuals originated. The talismanic rings and gems that have been published bear no resemblance to the elaborate designs suggested in the manuals or in treatises on the use of stones in magic. Of all magical artefacts, magic-medical bowls are the most informative, because the early examples are inscribed with their therapeutic uses. The majority of talismanic artefacts, however, fail to specify their intended functions, nor do they name a person or refer to a particular astrological or calendrical moment – such as the Ascendant being in a certain zodiacal sign – in the manner given in the instructions in the manuals. One explanation, perhaps, for this discrepancy between artefact and written source is that most of the objects that have survived were made of a durable material and were probably...
intended to provide comprehensive protection for many different occasions. A general function would require a non-specific design, whereas most of those presented in the manuals are for use in very precisely defined circumstances.

There is ample evidence that people of all classes and religions throughout the Middle East, Christians, Jews and Muslims, had frequent recourse to the preventive and curative power of amulets and talismanic objects. In an uncertain world, the educated and wealthy as well as the illiterate and poor employed every means at their disposal to ensure good health and protection from evil and calamity. From the evidence so far available, it would appear that while the magical literature of Islamic societies nourished and nurtured complex theoretical systems, the makers of amulets and other magic equipment maintained a simpler tradition. They employed a more limited number of designs and, with the exception of the early magic-medical bowls, manufactured a generic product useful against all calamities. Moreover, Islamic magical practice, in contrast to the theoretical and literary tradition, appears to have maintained a stricter adherence to the Muslim belief that it was only to God to whom one could turn for protection and cure in time of pestilence, disease or any other dreaded misfortune.

1. Numerous attempts have been made to define magic, mostly in terms of European practice, which nearly always invokes forces other than God; see Koranby 1991, p. 123, n. 13; and Mauss 1954. The best introduc-
tions to Islamic magic are Doucé 1918; Ibn Khaldun—Rosenkranz, 111, pp. 196—217; Dols 1977, pp. 122—125; Dols 1992, pp. 266—305; Irwin 1994, pp. 172—123; Pielow 1995; and see Macdonald 1934. For an extensive bibliography, see Anawati 1973. For pre-Islamic magical amulets, see Morony 1984, pp. 38—43; Parame & O'Brien 1991; Gager 1993; Stoll 1993; and Reiter 1993.

2. Protection from jinn is mentioned on two talismanic mirrors in the Khaliq Collection, cat. 55 and 56. The same objects also offer protection from mardid and mardidah, male and female evil spirits disobedient to God, and one (cat. 62) safety from every 'accursed demon' (shay'ibin). which is also invoked on two magic-medical bowls (cat. 82 and 83) and a talismanic chart (cat. 47). For the jinn, see Irwin 1994, pp. 107—106; and Macdonald et al. 1964. For the evil eye, see Seligmann 1927; and Spooner 1970.

3. For the genre as a whole, see Dols 1992, pp. 245—60. For healing amulets in Islam, see Dols 1992, pp. 211—43; and Crapanzano 1973. For angels, see Macdonald 1990; and Gaudet—Demombynes 1971.


5. For recent studies of ancient Greek astronological iconography, see Guedala 1990 and Richer 1994; for its influence in Islam, see Hartner 1958; Barz 1966; Hartner 1972; and Savage Smith 1992, pp. 65—7.

6. For recent studies of ancient Greek astronological iconography, see Guedala 1990 and Richer 1994; for its influence in Islam, see Hartner 1958; Barz 1966; Hartner 1972; and Savage Smith 1992, pp. 65—7.

7. For lunette sigils, see Doucé 1908, pp. 158—69, 244—8 and 288; and Canaan 1937—9, pp. 141—3.

8. This question was raised by Vincent Porter when undertaking the cataloguing of Islamic amulets in the British Museum, London. 9. For a discussion of the various types of magic and Latin squares, see the essay on talismanic charts, p. 106—7, below.

10. See Doucé 1908, pp. 114—7.
The Shams al-ma'arif of al-Buni
Marrakesh, dated 4 Rabii' 1185
(15 July 1768)

233 folios, 24.8 x 19.9 cm, of an ivory paper, watermarked; wheatman 1427, with the edges ruled in red; the text area, 16.7 x 11.4 cm, with at to 11 lines to the page, written in maghribi script, in ruled in black, with significant words in gold, red, or blue; the text is illustrated with numerous tables and diagrams in the same colours; the head and accompanying marginal device on folio 1b and the lengthy colophon on folios 220v–221b are illuminated in gold, white, blue, green and red; folios 112v, 117v, are blank. Scribe Muhammad ibn Ahmad Banani, filling burgundy leather covers with reserved centre- and corner-pieces, the design picked out in gold and blue, and some tooling in gold; green leather doublet, red gilt in gold with an overall repeat pattern. Accesion no. MS 156.

The most widely read medieval Islamic treatises on talismanics, magical squares, and all manner of occult practices was the Shams al-ma'arif ('The illumination of knowledge') written by Abu'l-'Abbas Ahmad ibn 'Ali ibn Yusuf al-Buni al-Qurashi, who died in 1323. Virtually nothing is known of his life, though he is said to have died in Cairo. Of his numerous writings on the occult, the Shams al-ma'arif was the most influential, and al-Buni prepared three versions of varying length: a short one, which was possibly the original form, one of medium-length, and a long one. The latter was apparently the most popular, and its size is reflected in the full title given in this copy, Kitab Shams al-ma'arif al-kubra ('The greater [version of the] illumination of knowledge'). The treatise comprises 40 chapters dealing with the magical use of numbers and magical squares, the occult properties of certain Qur'anic verses and the amsa al-bawma. In it, al-Buni drew on Hellenistic, Jewish, and other pre-Islamic magical practices that had passed into the popular culture of his day, as well as incorporating the pious Muslim use of prayers and readings from the Qur'an. The present copy is a good example of the illumination, calligraphy and bookbinding produced in the scribal workshops of Marrakesh during the second half of the 15th century. According to the illuminated colophon at the bottom of folio 120v, the copy was finished on Rabi' 1185 (15 July 1768), and in the large illuminated medallion on the following page (folio 220v) the scribe gives his name as Muhammad ibn Ahmad Banani al-Marrakushi. He goes on to specify that Marrakesh was his home since childhood (al-mandha'), that his family was from Fez (al-dhi al-Fati afl-afl) and that he was descended from the tribe of Nafri (al-Nafri afl-afl). The scribe states in the same medallion that the copy was prepared for Mawlawi Hassan ibn Amir al-Muminin Mawlawi Muhammad ibn Amir al-Muminin Mawlawi 'Abd al-Rahman ibn Amir al-Muminin Mawlawi 'Abd al-Muminin Mawlawi 'Abd al-Muminin Mawlawi al-Muminin Mawlawi Isma'il ibn Amir al-Muminin Mawlawi Muhammad ibn Amir al-Muminin Mawlawi 'Abd al-Muminin Mawlawi Isma'il. From this it is evident that the copy was produced for the future Sultan Hassan I of Morocco (reg 1873-1895), during the reign of his father, Muhammad IV (1859-1873). In a subsequent full-page illuminated medallion the scribe, after seeking the blessings of God upon the recipient, provides unusually detailed information about his method of collating the manuscript and obtaining the best possible text. The present copy is the final volume from a two- or three-volume set, and contains only the last two chapters of the treatise, the illuminated heading on folio 18b stating that the text begins with the third part (juz) of the treatise. Beneath the heading, the text begins with the 39th chapter ('al-ail'), the longest in the treatise, on the occult use of the amsa al-bawma. The copy then concludes with the 49th, also related to prayers and invocations, followed by an appendix (khazina) giving various chains of authorities for scholars in relevant areas of expertise such as the magical uses of letter-numerals ('abu al-bawma'). In the modern printed editions of this treatise, the entire composition is divided into four rather than three parts, and in these editions the 39th and 49th chapters, as well as the appendix, are consequently placed at the end of the fourth, rather than the third, juz as here.

This copy includes a number of carefully drawn diagrams and magic squares, some with gold decoration. A particularly well-executed example, which is more informative than the equivalent in the printed version, occurs on folio 34v in the discussion of one of the amsa al-bawma, namely 'alim ('Ormancite'). The chart is intended to illustrate the relationship of God with the jinn. God is represented by some of his names written within circles placed in a stylized human form, while the jinn are represented by symbols at the bottom and right-hand side of the diagram. There are marginal corrections by the scribe and some extensive glosses.

2. The title is given on folio 13b in the illuminated heading and on folio 220v, in line 2 of the illuminated colophon.
3. For the divine names or ephebes of God, al-amsa al-bawna, see Gardet 1940, Doutey 1948, pp. 199-205; Fahid 1966, pp. 234-47; and Gimaazet 1981.
4. The intended vocalization and meaning of the word 'Bawmi' are unclear.
5. For the name of this Beher tribe, see 'Nafri' 1993.
6. The text corresponds to that in al-Buni, Part 4, pp. 22-140; and al-Buni - al-Adabi, Part 4, pp. 19-123.

20
A treatise on the magic properties of letters and magic squares

Middle East, 16th century

158 folios, 21 x 15.2 cm, of a dark-carmine, burnished European laid paper with 15 laid lines to the centimetre and single chain lines; the text is written in three different naskh hands in two different types of black ink, with rubrications on folios 38–42b, 21 lines of a well-formed, slightly angular naskh written within a text area 21.6 x 9.3 cm; on folios 74a–75a, 15 lines of a more curvilinear but still clear hand within a text area of the same dimensions; and on folios 234a–236a, 16 lines of a slightly larger, similar curvilinear hand within a text area 23.6 x 9.3 cm, with all three variations present on the same page, with some tables and diagrams in black and red; folios 1–13, 1987 bear later notes binding burgundy leather covers and flaps, ruled in blind with a double frame and set with a centre-piece and pendants, corner-pieces and border cartouches stamped in gold on separate pieces of leather; double-signatures of dark-carmine laid paper printed with a floral design in gold, accession no. 1005 243.

This is the only recorded copy of a previously unknown treatise on magic squares and the magical properties of letters, titled Tābīkh zindah Shams al-asqaf ([The spiritization of the illuminations of the Shams al-asqaf]). The anonymous author of this abridgment gives the title of the treatise in the prologue (folios 44 a, line 6) and again at the beginning of the conclusion (folios 68a, line 14). He states (folios 44 a, line 5) that he was based on Shams al-asqaf ma'rifat al-burāyif ‘uqal-asqaf ([The sun of distant lands regarding knowledge of the magical properties of letters and magic squares]), a treatise that was written in 1431 by Abū al-Rahman al-Bīrūnī, a Syrian mystic of the Husayni order of dervishes who moved to the Ottoman capital and gained the favour of Sultan Murad II, so whom the treatise is dedicated. 1

The treatise consists of an introduction (maqaddimah) in 31 sections (fāṣidas) on the magic attributes and alignments of letters, 18 dīrāsah (‘articles’), one devoted to each letter of the alphabet, with an addendum (khisamid) on lāmi-ṣafī, each with associated magic squares, Latin squares and talismans; and a conclusion (khāshamid) in two chapters (jams). 2 In the conclusion, an interesting history of the art of letter magic gives the names of various sources and authorities including Pythagoras, Plato, Hermes and Galen (folios 168b–173b). This is followed by 28 al-‘Iṣlāh (again, ‘articles’), in which each letter of the alphabet is assigned talismanic uses (folios 42b–43b). Various Arabic authorities are cited. 3 On folio 198b a later hand has written a propheticogram chart from which, using the numerical value of a name, it can be determined whether an absent person is living or dead. Foliols 200a carries a lengthy later note on the talismanic uses of the ‘Throne Verse’ from the surah al-Baqarah (211, verse 235). An owner’s note, also on folio 200a, in dated al hajj 1964 (1513–14) and written by Amīr ibn ‘Abd al-Rahman ibn Amīr Hāshim ibn Amīr Muḥammad ibn Dīn al-Jādirī, who states, which is of Ottoman design, appears twice on the folio. In the note he states twice that the volume contains the well-known treatise Shams al-asqaf ma’rifat al-burāyif ‘uqal-asqaf ([The sun of distant lands regarding knowledge of the magical properties of letters and magic squares]), a treatise that was written in 1431 by Abū al-Rahman al-Bīrūnī, a Syrian mystic of the Husayni order of dervishes who moved to the Ottoman capital and gained the favour of Sultan Murad II, so whom the treatise is dedicated.

The introduction occurs on folios 38b–39a, the dīrāsah and addenda on folios 58b–188a; and the conclusion on folios 178a–180a.

3. For example, folio 174a mentions Abu al-Qasim al-Qashtirī, Abu al-Hakim ibn Burhan, Abu al-‘Abbās al-Iqlīsī, Abu al-Ḥamd al-Ghanī (both dated 1315); Abu al-‘Abbās al-Sabī (who died, according to some, on 666/1269 or who, according to others, was still alive after 796/1297); Abu al-Qasim al-Iqlīsī al-Andalusī, dates unknown, who wrote a treatise on the magical properties of the letters of the alphabet (Ahkāmdar 128–99, entry no. 177c). Al-Ghanī was a famous theologian to whom many occult writings were falsely attributed. For al-Sabī and al-Shadhilli, see Brockelmann, Sagel, pp. 209–210 and 82–4, respectively.

112 folios, 26.0 x 17.6 cm, of a thick, creamy, fibrous, burnished laid paper with 9–10 laid lines to the centimetre and chain lines in groups of three; the text area, 19.9 x 13.0 cm, with 21 lines of naskh, in black, with rubrications, the vowelling on folios 19–22 added later; this text is illustrated with numerous diagrams in red and black, with Hebrew written in two rows of a more careful hand; folios 12, 119–121 b filled with notes and texts in various hands scrawled Abu al-Muhammad ibn Ahmad ibn al-Kurbi al-Baghdadi binding letter cover of burgundy leather, with a beader tacked and ruled in gold and a stamped centre-piece outline in yellow, lined with plain paper accretion no. 1005 243.

This manuscript contains the earliest recorded copy of a treatise on the magical uses of the names of God Middle East, dated 16 Dhu'l-Qa'dah 838 (24 September 1435), providing protection from a scorpion, controlling fever, quelling the crying of children, stopping epileptic seizures and alleviating headaches and aching joints. Al-Buni cites several authorities on these matters, about whom nothing further is known. 4

Folios 118b–120a contain extracts in Persian from two chapters (bidas) on making brass look like gold, a Qur'anic quotation (4, verse 24), various pious phrases, a magic square, magic numbers and letters, and a magic alphabet, all added later in a casual hand. Folios 124a–126 contain various magic and pious statements in Arabic and Persian, with a later addition of magic phrases and 3 x 3 magic square. 5 Folio 22 a has a later note in a very casual hand giving magic formulas, while folio 14 a has a note giving the date of the manuscript, a recipe, and a title, Kitāb al-burāyif (‘Book of occult properties’).

The whole text has catchwords and some marginal corrections by the scribe; headings and other marginalia are in various hands.

1. Vītīn, ibn al-Mundhary, naskh, British Library, Oxford, ms. Bodl. Or.1443, these are quite different in content.
2. Sahīh ibn Abī Shāhīb al-Bīrūnī (folio 38b), Ibnu al-Shārīf al-Burāyif (folio 58b), Sharaf al-Dīn ibn ‘Aṣmū (folio 8a), and Abu Zarkāy, who wrote al-Zabhikhab (folio 118b).
3. For the various types of magic squares, see pp.106–7.
...ion from a scorpion, quelling the crying of a Dalmatic vest, and restoring several authorities about whom nothing has been written in extracts in the Chapters (hablas) on the gold, a Chy'tan, 6.3.1, various pious squares, magic squares, and a magic square in a casual text written on a leaf, 6.3.2, various statements in Arabic. We may note a very casual formula, while giving the date of the first line of the recipe, and a title, "Book of occult has..."

6a26(76); see Flügel, no. 2492; the word in the present manuscript is treatise by the title al-Lam'a 'at such as Bodleian ms. Bodl. Or. 1, but referent in content. 7. ibn 'Abbas (folio 9a), 7′, who wrote 6.-7. other marginalia and catchwords and titles.
وأما تعالى وإذا تعزقت القرآن فجعلنا نكره إلى الله وسعون بالآخر
فكان شامنا وجعلنا على طوله، أخذنا بفعله في إنا عهم. وقرأ
وأما إذا دارت ركضه القرآن، ورحب أطرافه وانفشد فنورا، وقوله رضي
فأن مولوا ففيهة للفوا الإلهاءهم لو نضج فقومه وغند القلب، خلقهم
ها بنان، أن كرمنا أيما طردهم، ومن فتحنا وإنا طيب
موسوهم، وعرفنهم. وارضاءهم. إذ أننا الحاضر في دينه، لا يجد
وابن عادان، وأذكرهم. وعملنا عليه مزايا، فتعلقت عليه من تراك
فإذ أدركتنا فقابلنا الفطر، فعملنا عليه. وأعداءه سهبت لرده:
وأما إذا تعزقت القرآن، فكنا نكره إلى الله، وسعون بالآخر.
هكذا

فهيئته

4

6

8

10
Bi-folio from an astrological manuscript
Morocco, 19th century

A folio, 11.8 x 16.6 cm, of an ivory 

trove paper; the text area, 

15.7 x 10.6 cm, is ruled in blue, black 

gold and contains 20 lines of a 

maghrib handwritten in black, 

with significant words in gold, red, 

green or blue; the text is illustrated 

with two diagrams in gold, black, blue 

and two shades of red. 

accession no. 3665714

This bi-folio is a fragment from a 


From the sources cited it is evident that the treatise was composed sometime 

after the 13th century. The extant text begins with the beginning of a section 

called al-mukhtar al-akhbārī (“The fifth topic”), and it is concerned with the 

alignment of letters of the alphabet with the lunar mansions, the zodiacal 

signs, the anusā al-basūnah, and the names of angels (here called al-rāhštīyāb).

After citing several authorities, including the late 13th-century author 

Ibn Sab‘īn, an authority on the beneficent uses of passages from the Qur’an, 

the author goes on to say that there are three differing opinions regarding the 

alignments of letters of the alphabet with the lunar mansions and the signs 

of the zodiac. The lunar mansions are 38 groups of stars, or asterisms, 

that reflect a pre-Islamic system of seasonal and weather-prediction by using 

certain prominent star groups. They played a large role in astrology, and the fact that there were 38 of them 

invited a magical association with the 38 letters of the alphabet and then with 

all other items, such as the elements and seasons, with which the letter 

numerals were associated.

The first interpretation of the author attributes to the famous 13th-century authority on the occult, al-Buni, and 

to Ibn ‘Arabi, that al-Muhay al-Din ‘Abū al-‘Arabī, who died in 1247. In the diagram illustrating this first view, on 

folio 2a, the names of the two authorities are written at the center of the concentric circles. The surrounding ring 

is blank, while the next ring has seven letters in the abjad order of letter 

numerals written in each quadrant. The proceeding ring has the names of 

three zodiacal signs assigned to each quadrant. The four outermost concentric rings are divided into 8 compartments, 

the innermost containing the 38 letters of the alphabet in the same order as given earlier, although one has 

been inadvertently omitted in the first quadrant. There then follows a ring with the names of the 8 lunar mansions, 

surrounded by a ring of 8 of the 

anusā al-basūnah. The outermost ring contains the names of 38 angels.

The second theory is illustrated by another circular diagram on folio 2b, that has the name Samur al-Fandi 

written at the center. An Indian 

authority on the occult named Samur is occasionally cited in other astrological 

and magical treatises, but nothing is known of his life and his ideas are 

known only indirectly through citations. The innermost ring in this 

diagram has the name of one of the four elements—fire, earth, air, water— 

written in each quadrant. In the sur-

rounding ring each quadrant contains 

seven letters of the alphabet, but in this case they are not in their abjad order 

but rather are grouped as the letters are 

associated with the four elements. The next concentric ring has three zodiacal signs written in each quadrant, again as 

they are associated with the elements. The outermost four rings are divided 

into 8 compartments, the innermost 

repeating the letters of the alphabet. 

The next ring has the 38 lunar mansions, not in sequence but as associated with the elements, and the two outer 

most rings contain 38 of the anusā al-

basūnah and 8 names of angels.

The two circular diagrams share many of the features found in a diagram on folio 8b of cat. 21.

Unfortunately, the fragment breaks 

off after the second diagram and we do not learn what the third theory 

regarding the alignments of letters and sacred names with zodiacal signs 

and lunar mansions was.

1. Ibn Sab‘īn, an authority on ikhwāsīd 

al-Qur‘ān, was born in al-Ṭīr 668–9 

(1270–71); see Fahd 1966, p. 42. 

2. Amongst the numerous writings of Ibn al-‘Arabī were several treatises 

containing astrological and divinatory material, such as his Kitāb Qubr 

al-anusā wa-baḥṣat al-ard; see 

Ullmann 1972, pp. 342–47; and Atei 

1972. 

3. For abjad letter-numerals, see 

Table 2, p. 159, below. 


5. In the latter diagram many of the 

labels have been over-painted and new inscriptions added.
Magic-medicinal bowls are distinct among magical artefacts for a number of reasons: they were not carried with the sufferer, and they did not function continuously, as a household or personal amulet would have done; they were employed only when needed; they were of a durable material; and, when the afflicted person was unable to sip from the bowl, a proxy could be appointed to drink on his or her behalf. The 20 Islamic magic-medicinal vessels in the Khalili Collection, whose dates of manufacture span more than a millennium, from the late 8th century to the late 18th or early 19th century, represent nearly all the previously recorded types of Islamic magic bowls and include some designs which are otherwise unknown in scholarly literature.

Even though large numbers of Islamic magic bowls were made from at least the 12th century, and probably earlier, there are almost no references to them in contemporary medical or magical literature. Only two references have so far been found in written sources. At the end of a 13th-century copy of an Arabic Alexandrian treatise on urina, a magical formula against colic or intestinal obstruction is given with instructions to inscribe it on a red copper plate or bowl when Scorpio is in the ascendant, or to carve it – at any time – on a bowl of walnut wood. If the sick person drinks from the vessel, the treatise continues, the affliction is eliminated and the poison carried off immediately or – if his agent drinks from it – after an interval of time. In the late 14th century the cleric al-Sanawbari (d.1412) included in his own treatise on Prophetic medicine a recommendation that protection against delusions and melancholia (zawannah) could be gained by drinking, before breakfast for three days, a liquid from a bowl on which Qur’anic verses and a particular magic square had been written.

From the evidence of the objects themselves, the manufacture of Islamic magic-medicinal bowls in metal seems to have been well-established in Syria and Egypt by the 12th century. In concept and design they probably evolved from several earlier traditions, one of which is represented by the early Islamic dish in the Khalili Collection, cat. 24, which must have been made around the 9th century; the figural representations and some of the magical designs on this item can be traced to pre-Islamic concepts. There must also have been a strong influence from the earthenware pre-Islamic magic bowls with Jewish Aramaic, Syriac and Mandic inscriptions, although the connection between the latter and the Islamic magic bowls was not a linear one. The pre-Islamic vessels were made of clay and bore inscriptions invoking demons written in ink in a spiral; the extant Islamic bowls are of metal and their inscriptions, often written in concentric bands, noticeably lack any references to jinn and demons, being instead inconspicuous for their invocations addressed directly to God. Four undated though evidently later bowls with Judaico-Arabic inscriptions – that is, Arabic invocations written in Hebrew script – were engraved, possibly prior to the 12th century, for the same individual, Muhhib ibn ’Atiqah, and represent yet another variant within the tradition of magic-medicinal bowl production.

In the Islamic world, the magical tradition of maintaining well-being, curing illness and relieving the pain of childbirth through drinking water that had touched Qur’anic texts was well established. For example, the 9th-century treatise from the Twelver Shi’a tradition of Prophetic medicine, the Tibb al-a’immah, refers several times to Qur’anic verses being written in ink on paper and then washed in the water that was to be subsequently consumed. It also mentions the practice of reciting a certain Qur’anic verse 30 times over a bowl of water that is then to be drunk. Similar recommendations are made by the Sunni theologian and historian al-Dhababi (d.1348) in his own treatise on Prophetic medicine. The next logical step was to engrave the verses upon a metal bowl which could then be used repeatedly.
Early types

The earliest such Islamic bowls preserved, other than cat. 14, are hemispherical in shape, engraved with their therapeutic uses, and often depict animal or human figures in schematic form. Fifty-nine of this type are known either through publication or examination. The entire group are Syro-Egyptian products. The vessel bearing the earliest reliable date was made in AH 563 (AD 1167–8), two years before cat. 25 and for the same patron, Nur al-Din ibn Zangi, who ruled Syria from 1146 until 1174, when the Turkish Zangid rule ended with the ascendancy of the Ayyubids under Saladin. It is worth noting that Ibn Zangi was the founder of the important hospital in Damascus that bore his name, the Nuri hospital. His interest in magic-medical bowls as well as in hospitals indicates that he was open to a variety of approaches to medical care.

The magic-medical bowls bearing dates earlier than that on the Ibn Zangi bowl are all problematic, for the dates inscribed do not correspond with those of the given patrons. One bowl, for example, is recorded as having been made in AH 570 (AD 1174–5) for Asad al-Din Shirkhu, the uncle of Saladin who entered the service of Ibn Zangi, even though Shirkhu died in AH 564. Its inscription also confers on its 'patron' the title of Sultan, a title Shirkhu was not authorized to bear because he was not an independent prince. Fifteen magic bowls are stated to have been made for Abu al-Muzaffar Yusuf, that is, for Saladin, the founder of the Ayyubid dynasty in Egypt who ruled from 1169 to 1193. Of these, four are dated AH 580 (AD 1184), six are said to have been made in Mecca and all apparently bear a schematic engraving of the Ka'bah at the centre of the interior. Since these bowls also have personal names and titles not otherwise associated with Saladin it is likely that the attribution to a ruler was added by the maker to give the item added authority. A number of the early bowls of this design also state in their inscriptions that they were copied from others that were in a royal treasury, implying that such an association would increase their validity and potency. Judging from the appearance of many of the extant examples, copies of bowls with the centralized depiction of the Ka'bah continued to be made over a long period of time.

The spurious ascription of a magical bowl to a prominent ruler in order to enhance its value is exemplified by cat. 26, which was probably made in the 14th century but is stated to have been made in AH 502 (AD 1108) for the Abbasid Caliph in Baghdad, al-Mustasim bi'llah, who died in AH 616 (AD 1218). Magic bowls were also ascribed to other 13th-century rulers, including the Mamluk ruler al-Zahir Bukh al-Din Baybars (reg. 1260–1277), and the Rasulid ruler of Yemen al-Malik al-Muzaffar Shams al-Din Yusuf (d. 1293). For various reasons, these ascriptions are also suspect. It is only with the Mamluk ruler al-Mu'izz Izz al-Din Aybak (d. 1317) that we find an example with a dedication that seems legitimate. There is considerable similarity in overall design between this bowl and one in the Khalili Collection, cat. 28, which is undated and lacks a patron's name.

‘Poison cups’

Another group of early Islamic magic-medical bowls that has attracted considerable scholarly attention are the ‘poison cups’. Like the bowls discussed above, these 'cups' are always hemispherical in shape and their inscriptions include a list of therapeutic uses. In other respects, however, their designs differ. Poison cups are consistent in their representations of a scorpion, a serpent, an animal that is probably intended to be a dog – though some have called it a lion – and two intertwined dragons. They also bear fairly consistent magical formulas or words, at least one magic square, and other magical symbols, such as five-pointed stars. Unlike the previous group, the poison cups are never dated, although the
Magic-medicinal dish
Provenance unknown,
late 8th–early 9th century

Leaves, cracked in places
Height: 0.9 cm (approximate)
Rim: 7.1 x 6.5 cm
Accession no.: 11.13.421

This small, very early dish is inscribed with both Qur'anic phrases and several decorative motifs typical of earlier Sassanian wares. Although its inscriptions and decorative elements do not follow the patterns usually associated with magic-medicinal bowls, it can be considered a prototype magic-medicinal bowl for, like later bowls of more familiar form and design, the pious inscriptions, amplified by the beneficial effects of astrological and magical symbols, must have been thought to provide divine protection. Presumably it is also functioning in a manner similar to that of the later bowls, in that protection was sought through sprinkling or sprinkling from the bowl a liquid that had been touched by the words of the Qur'an. In this case, however, the broad rim would have made drinking from the dish difficult, and the pious phrases occur on the underside of the vessel, so that whatever was placed in the dish did not come into direct contact with the words. Perhaps the efficacy of the dish was believed to be similar to that of mirrors, where the pious and talismanic inscriptions were often on the back of the object.1 The dish appears to have been struck, like a coin, from a lead ingot. The square rim is very large in proportion to the rest of the shallow vessel. The designs on both the interior and exterior of the piece are in relief. On the flat underside of the circular bowl there is a two-line inscription reading “In the name of God” and “God is sufficent!” The latter is a Qur'anic phrase which occurs in the surahs al-
Tawba (10). verse 129 and al-Nour (24), verse 38. The calligraphy employed is typical of early Islamic script of the 8th to the 9th century.2 The inscriptions have stars above and below, a feature of Roman magic gems and one which continued in use in the Islamic world until the 13th century.3 The sloping outside walls of the dish are decorated with vertical ridges.

All 22 of the poison cups recorded to date, and no doubt many more in unpublished collections, appear also to be Syro-Egyptian products. None can be dated with any certainty as they continued to be copied for several centuries, and all of them are virtually identical except for the external therapeutic inscriptions. Occasionally, there might be a statement on the object to the effect that it was copied from an exemplar in a royal treasury.16 However, as in the case of other magic-medicinal bowls, it would be unwise to use such statements as a means of dating either the vessels or their exemplars.

The term ‘poison cup’ is somewhat inappropriate for these magic bowls, for providing an antidote to poison was only one of a large number of uses assigned to them in the inscriptions they bore. Furthermore, not all poison cups even mention poisons. It must be allowed that protection from the effects of animal and stings does form a substantial part of their repertoire of uses, but the same is true of earlier magic bowls of the type represented by cat. 25, 26 and 28, which are not designated as ‘poison cups’.

Applications for early magic-medicinal bowls

Of all magical artefacts, the early hemispherical magic-medicinal bowls and their copies are the most informative about the medical conditions for which their use was prescribed. To date, 83 magic-medicinal bowls are recorded as having therapeutic inscriptions engraved on them: 59 of these were either examined personally or have been published in sufficient detail that their prescribed uses might be compared in the inscriptions they bore. Furthermore, not all poison cups even mention poisons. It must be allowed that protection from the effects of animal and stings does form a substantial part of their repertoire of uses, but the same is true of earlier magic bowls of the type represented by cat. 25, 26 and 28, which are not designated as ‘poison cups’.

The inscriptions on these vessels provide an interesting guide to the diseases and afflictions considered prevalent at the time – or at least at the time the earliest bowls were designed – and, of course, to those thought to be responsive to magical formulas.

From the number of references on these bowls it would appear that in Syria and Egypt in the 12th and 13th centuries there was an overriding concern with scorpion stings and the bites of snakes and mad dogs. Scorpions were, and still are, a dreaded feature of life in arid climates. It is interesting to note, however, that rats and other rodents are not mentioned. On seven bowls there are general terms used for any creeping and crawling creature, especially reptilian.15 The ailments and diseases that dominate the inscriptions are various gastro-intestinal complaints, mentioned in total 135 times: colic,27 general abdominal pain,25 gastric pain,23 abdominal pain caused by eating herbs with earth on them,26 flatulence,23 dropsy,26 difficulty in urination,27 and haemorrhoids,24 and two statements to the effect that the use of the bowl is a general aid to the stomach.29 The suggestion that the use of a bowl is beneficial to the spleen and kidneys is cited six times and once respectively.30

The next most frequent application of the bowls was to assist a woman in labour and ease a difficult birth. This is mentioned 67 times on the bowls, sometimes repeating the idea in different words.31 Associated with it is the occasional statement that the bowl should also be used to increase the milk of a nursing mother, as seen on cat. 26 and 28.32 Calming the restlessness of babies is mentioned six times,33 but infertility only once.34

Headaches of one form or another are mentioned 48 times.35 Thrashing pains in general are named 36 times,36 but toothache is specified only once, on cat. 26.37 The stopping of nosebleeds is mentioned 13 times,38 while preventing haemorrhaging in general is listed 39 times.39

The usefulness of magic-medicinal bowls as antidotes to poison is mentioned only 35
and their copies are not prescribed. To the inscriptions engraved on sherds in inscriptions considered - and, of course, in叙利亚 and Egypt in inscriptions on stings and the amount of life in arid regions are not mentioned. Treatment, therefore, gastro-intestinal problems, such as gastric pain, discomfort, difficulty in labour and ease of delivery. Calming the pain in general.

The stopping of pain is mentioned only

and the bottom and upper edges are encircled by a pearl border.

In each corner of the underside of the flat rim there is a four-petalled flowerhead with visible calyxes, drawn in a manner reminiscent of the flowers on some Sasanian metalwork of the 7th and 6th centuries, and on Umayyad textiles of the late 7th to mid-8th century. Two animals - one a creature like a snail, very elongated, with a long thin tail, the other a quadruped with large ears, arched back, and a broad flat tail like a beaver's - are also depicted twice on the underside of the rim. On the upper side of the vessel, the upper and lower edges of the depression are decorated with small dots and the interior sloping walls with ridges, the overall effect being reminiscent of a circular cloth or leather pouch sewn together with a type of loop stitch, sometimes called a Cretan or Persian stitch. The illusion of hand-sewing is reinforced by the decoration at the outside edge of the square rim, which is slightly raised and reproduces the form of knotted stitch, another looped stitch used as an edging.

At the bottom of the dish there is the image of a winged horse, with a flowerhead like those on the underside of the rim and another small flower in the background. The wings of the horse are depicted in an abstract manner similar to that found on Sasanian wares. An even more common Sasanian motif is the bird holding a flowered plant or vine; this is clearly reflected in the 18 birds, possibly pheasants, that parade around the upper face of the rim, single males in each corner with three females placed along each side.

With the exception of the animals on the underside of the rim, which are unusual in form, the decorative elements and calligraphy on the dish are consistent with those on other early Islamic pieces that maintain Sasanian traditions of design. However, no magic dish of a similar design has been recorded.

1. See the essay on talismanic mirrors and plaques, pp. 154-5.
2. For example, the form of the final mina - rounded with a short extension to the left - and the 3t with a retroflex tail can be seen on a glass weight dated AD 729-30 (Crummell 1971).
times. The bowls are occasionally said to be effective in increasing physical strength as well as alleviating facial paralysis, both indicated with words that are easily confused with one another.42 Other named uses are the cure of colds, catarrh and epilepsy.43

There is no mention of any specifically contagious condition—that is, one that was said in the medical literature to be transmissible or which we know today to be so—except for ophthalmia, which is specified on five of the earliest bowls, including cat. 25 made for Ibn Zangi.44 Fevers—an accompanying symptom of many contagious conditions—are mentioned in general terms on 31 of the 59 bowls surveyed, with more specific fevers named on 28 bowls.45 There is also one mention of pustules that arise on the body and another of erysipelas, an inflammation and reddening of the skin especially on the face, together with pustules.46

The use of these bowls for the ‘annulling of sorcery’ (ṣiḥal-al-siyr) is recommended 26 times, with 21 recommendations for their use against the evil eye, assuming that this mention of the eye was not intended medically.47 Driving out malicious spirits is mentioned on five bowls, including cat. 25,48 and one of these is also prescribed for use against magic spells (raḥtan). On four vessels, which again include cat. 25, their usefulness in releasing the bewitched is noted,49 with the addition on one that the bowl can make others agreeable (ṣabīl) and obedient (taʿab). On one of the bowls supposedly made for Saladin it is said that one should sprinkle water from it on a house that has been the object of sorcery.50

Nine bowls, including the two made for Ibn Zangi (see cat. 25) recommend their use to cure the abdominal pain of a horse which has eaten earth.51 Other, non-medical, uses of the vessels occur only once: for instance, the use of a bowl will ensure that no lion or wolf will turn upon the user, or it will increase his daily income and means of livelihood. On some of the bowls purportedly made for Saladin, it is stated that the user can thereby gain easy access to princes and kings, can make peace between enemies, and can prevent houses from being robbed or burnt or ships from being wrecked.

As in the earliest written references mentioned above, the inscriptions engraved on many of the early hemispherical bowls instructed the patient to drink water from the bowl to receive the desired benefit. Sometimes the afflicted person, or someone acting as an agent for him or her, was told to drink three times from the vessel. Occasionally, a specific type of water was indicated, such as rain water, water from the Nile, hot water, or saffron water, the latter being especially good for difficult childbirth. In the case of snowbeds, the water was to be stuffed or inhaled. Sometimes other liquids were recommended, such as oil (ṣatī) or milk (labūn), both mentioned on bowls in the Khalili Collection (see cat. 25, 26 and 28).

Some of the early types of magic-medical bowls may have been put to yet other uses. Ibn Khaldun, writing in the 14th century, mentions among the diviners those who ‘gaze into transparent bodies, such as mirrors and bowls of water’.52 A modern account relates an Indian practice of writing a particular 3 x 3 magic square on a porcelain or copper bowl, filling it with water, and having a child look into it in order to see visions of the future or the unknown.53 The artefacts themselves, however, provide no evidence for such use.

Later magic-medical bowls

Later magic-medical bowls took other forms than those already examined. One of these is exemplified by cat. 27, which is shallow with a flattened bottom and a wide rim. It may be a Syro-Egyptian product of the 14th or 15th century, although the only other shallow plates appear to be late Safavid or Qajar work.54 It has no therapeutic instructions nor animal representations, a magical square (but not a true magic square) being the focus of the
design. It also bears an invocation to Sham'ali, a good spirit, which is relatively unusual on Islamic magic bowls, although invocations to archangels do occasionally occur.

From the 15th century onwards, it appears that one of the most common forms of magic bowl had a boss in the centre. The bosses are either rounded, conical or flat on top, and it has been suggested that they derive from the Graeco-Roman omphalos or umbo of wine vessels. Bowls of this shape tend to be devoid of animal figures and, with only one exception, they lack a list of therapeutic uses. Qur'anic verses usually form the principal decoration. This style of magic bowl has been erroneously termed a ‘fear cup’, based upon 20th-century folkloric practices studied by anthropologists, in which a person might drink from a bowl in times of trauma and terror. It is unwise, however, to extrapolate backwards from modern accounts when there is no corroborating evidence. Certainly, on the only known example of this type which lists its uses, fear is not mentioned.

Thirteen of the known magic bowls with a central boss are clearly work from Safavid Iran. The dating and provenance of the others is more difficult. Generally speaking, those with large rounded or flattened bosses appear to be products of the 15th to 17th centuries and range in provenance from Syria and the Jazirah to Mughal India. Later bowls, probably made from about the late 17th century until the present day, tend to be smaller and have conical bosses. The calligraphy is often very poor, and most of them, but not all, were made for Shi’i communities. They appear to have been produced, or at least were marketed, over a wide area – Egypt, Saudi Arabia, Turkey, Qajar Iran, Afghanistan – but examples found across this area are virtually indistinguishable in design.

On some of these recent products, a small circular plate or cup with holes around the edge is attached to the central conical boss. Attached to the holes are small metal tags with writing on them, usually the busmalab or some of the asma` al-husna, written in a very casual script. Occasionally a metal bird, fish or even an amulet in the form of a human hand is attached to the conical boss. Sometimes, rather than being attached to the central elevation, the tags are grouped on a cord attached to the rim of the vessel. Of the 41 later bowls with conical bosses that have been examined or are recorded, 12 have a central circular plate to hold lugs.

Three Safavid magic bowls with central bosses are dated. The earliest was completed by a maker named Husayn Kashani on 27 Ramadan 960 (5 September 1553). It bears no animal or zodiacal forms, but rather Qur’anic texts, Shi’i prayers, and wishes for ‘good health’ engraved around the maker’s name on the underside of the bowl. The calligraphy and general form of the bowl bear some resemblance to one of the undated Safavid bowls in the Khalili Collection, cat. 33.

The other two dated Safavid bowls were finished within two years of one another and are so similar in design that they must have come from the same workshop. The earlier bowl was completed by an unnamed maker in AH 1042 (AD 1633), while the second one, cat. 35, was finished in AH 1044 (AD 1634–5). The inscriptions on the earlier bowl appear to provide interesting information about the length of time required to produce such a fine piece of metalwork, for it is said that the bowl was begun on 1 Rabii’ I 1042 (2 October 1633), taking three and a half years to produce. It may be, however, that this extravagant claim was made to enhance the value of the item. The latter magic bowl, produced for the Twelver Shi’i community, is an impressive example of Safavid metalwork, with emblematic representations of the zodiacal houses and the seven classical planets. Three similar bowls, all of outstanding design and execution, may have been produced in the same workshop as the two dated examples.
Only two magic bowls with bosses that are clearly not Safavid products are known to be dated: one in AH 986 (AD 1579) or possibly AH 989 (AD 1582), by an engraver (naqqâsh) named Ibrahim, and one in AH 1271 (AD 1854). Safavid magic bowls have received relatively little scholarly attention, but they are well represented in the Khalili Collection. All but one of the examples with bosses that are catalogued here are Safavid products made for Shi‘i: the exception, cat. 34, was produced in India by an otherwise unknown maker, Ali Rida.

Two of the bowls in the Collection were made for Sufi communities in the first half of the 17th century. One, cat. 33, was made in AH 1052 (AD 1642–3) for the Qadiriyya order. Of three metal magic-medical bowls from north-west India of the 17th to 19th centuries, two were clearly made for Shi‘i (cat. 36 and 37), while the third is non-sectarian in the choice of its inscriptions (cat. 35). None of the three bears any magic squares or sigla. They appear to be similar to two bowls said to have been made in Bedar and used for colic and in confinements. Their method of construction is markedly different from that of the other metal bowls, in that the inscriptions were part of the casting.

All the metal bowls show clear signs of having been smoothed and polished on a lathe, for there are usually indentations at the centre of both the exterior and interior surfaces, or on top of the boss. Occasionally some surface treatment of the alloy is also evident, as in cat. 18 or 36, where the colour of the surface may be due to the alloy containing some silver. On one item made in India, cat. 34, the word haft-jiysh was inscribed by the maker on the underside of the bowl. The term is used today by Iranian metalworkers for what is a high-tin bronze, forged and quenched, though traditionally they claim it to be an alloy of seven metals, usually copper, silver, tin, antimony, lead, gold and iron. So far as is known, this is the only preserved piece of metalwork to have the word haft-jiysh engraved on it. High-tin bronze has a silvery appearance and is a brittle alloy that cracks easily. The alloy of this particular bowl, however, has a reddish cast with no evident cracks. Haft-jiysh was also associated with magical objects, possibly because of its relationship with seven elements. Whether the word was inscribed on this bowl to designate its alloy or whether it had a magical purpose can only be settled by a determination of its elemental composition through a metallurgical examination.

Although the majority of extant magic-medical bowls are made of metal, there are examples in other materials. A small agate Shi‘i magic bowl (cat. 35), with a delicately etched design, was made in AH 1014 (AD 1606), in India. No similar piece has been recorded. A considerable number of bowls, however, were made of Chinese porcelain, and these are discussed separately, below.

In summary, then, the numerous Islamic magic-medical bowls preserved today demonstrate that both shape and decorative motifs evolved over the centuries of their production. The earliest types (and those bowls copied from them) exhibit a relatively simple hemispherical form, engraved with some magical symbols, and nearly always have specified therapeutic uses. With time, the shape of the bowls became more sophisticated, the therapeutic statements were abandoned, and Qur‘anic texts dominated the design, leaving few overtly magical symbols. In this way, the pre-Islamic folkloric traditions that first informed the decoration of these bowls were gradually replaced by texts and images more acceptable to orthodox religious belief.
1. Bodleian Library, Oxford, ms. Marsh 665, p. 274, written in the same hand as the rest of the manuscript, which was copied in 1340 (AD 1342) by Ibrahim ibn 'Abd al-'Aziz ibn 'Abd Allah ibn 'Ali ibn 'Adnan Sib 'Umar ibn 'Abd al-'Aziz ibn Marwan. The magical formula is very similar to that occurring on the 'poison cups' discussed below.

2. Sarawari, p. 191; see also Dols 1992, p. 218. The magic square that Sarawari specified was one he called 'the seal [of] knowledge of al-Ghazali', which was the 3 x 3 magic square called budleli; see the essay on talismanic charts and tables, pp. 106-107. For modern uses of earthenware and metal magical medicinal cups, see Lane 1896, pp. 266-267; Walker 1934, pp. 69-70; Kiss & Kiss-Heinrich 1962, p. 129.

3. More than 72 such earthenware magic bowls have been found inscribed in Jewish Aramaic, 25 in Mardin and 13 in Syria. All were made in Mesopotamia or Iran sometime between the 4th and 7th centuries. Many were unearthed in an inventoried position, and a number were found in pairs joined with bitumen at the rim to form a closed container. One of the most common theories regarding their use is that they were demon traps: Montgomery 1935; Yamaouchi 1967; Hamilton 1971; Isbell 1975; Naveh & Shaked 1985; Gager 1990, pp. 226-35. 4. Reich 1938.


6. Dhabbi, p. 166 (margin). There has been much confusion regarding the authorship of this tractate since Elpel 1916 mistakenly translated it under the name of the 15th-century theologian al-Suyuti. The recent English translation continues this error (see al-Suyuti, especially p.166). For the two versions of Dhabbi's treatise and their relationship to al-Suyuti's writings, see Savage-Smith 1995, pp. 73-74.

7. In addition, there should be included in this general category one flat-bottomed bowl that otherwise meets the criteria: present location unknown, sold at Christie's, London, 22 October 1991, lot no. 1260, and one Jazairi stem-cup with a fictitious attribution to Rabi' ibn Yihy and the date AD 418 (1056-76). Geneva 1985, no. 284. Five, clearly later, hemispherical bowls have schematic animal forms but lack a list of uses, while two others, also rather recent, have neither uses nor animal forms.

8. The bowl, whose present location is unknown, was published with a lithographed reproduction by Rabehas 1978, pp. 214-217. The present location of this bowl is unknown; see Spive 1991, pp. 124-6.

9. Other examples include a bowl dated 353 (AD 1054) and said to be made for the Manesh ruler al-Manshur Husain al-Din al-Lajin (d. 368/AD 1079) at Wiet 1932, pp. 16 and 164. Another bowl dated 553 (AD 1113) is stated to have been made for the Hammadid ruler of Syria Sayf al-Dawlah (d. 554/1159/1160); Wiet 1932, pp. 154 and 164. One dated 553 (AD 1113) presents a fantastic and impossible genealogy for its patron; Wiet 1932, p. 171.


11. For instance, 'copied from an example in the treasury of al-Munsir'; see Wiet 1932, pp. 111, 116, 117.

12. Another bowl, whose present location is unknown, is dated 577 (AD 1177-78) and states in the inscription that it was made for al-Mustasim b'ilah Abu al-'Abbas Zahir, which has been interpreted as a reference to a descendant of a Fatimid caliph (Canaan 1976; see also Wiet 1932, pp. 154 and 166 for objections to Canaan's arguments).

13. For items bearing Baybars' name, see Wiet 1933, pp. 14, 173, 174, 176 and 181; for one perhaps referring to a Rasulid ruler, see Wiet 1932, pp. 154 and 156. A later Rasulid ruler, al-Mujahid al-Mansur 'Ali (d. 1365) may be intended as the patron named on another bowl (see Wiet 1932, pp. 154 and 156).

14. See Wiet 1952, pp. 121 and 122; the interior is badly worn and virtually illegible. A similar inscription and design are found on an unpublished bowl in the Science Museum, London, inv. no. 66393, which may be a fairly recent copy.

15. See, for example, Rabehas 1873, pp. 317-18; Ibrag 1982.

16. See also, for example, Rabehas 1873, pp. 317-18; Ibrag 1982.


18. For example, 'reproduced from [an example] in the royal treasury of al-Malik al-Mansur' (Wiet 1932, p. 165); or copied from one in the possession of 'the people of Damascus' (Canaan 1956, p. 116, no. 4, and the catalogue of a sale at Christie's, London, 20 October 1992, lot no. 142).
specific complaint, leuc, or obstruction of the intestines.
22. Maghbal, mentioned 37 times; khit hridal, four times; and way al-karb once.
23. Way' na'l-qalab, often written simply as way' al-qalab, mentioned once.
24. Maghbal, mentioned 16 times; Canaan 1936, pp. 112–13, n. 214.
25. Riyad, mentioned twice. For the term ri'ad al-sharkabah that occurs on four bowls, including cat. 13, see the discussion of this piece below, note 3.
26. Lezq, mentioned once.
27. 'Eir al-bulaq, mentioned seven times.
28. Bawal, mentioned twice. For the Jazarian stem-cup with the fictitious attribution to Kafar the Khidshahid (see above, note 7), the curious term khamdum, possibly meaning potter's wheel, is used, though in what sense is not clear.
29. Matallaq (a woman in labour), mentioned 31 times, 'ar al-wadl (a difficult childbirth), mentioned 10 times, and al-bint al-mawrath (a difficult labour), mentioned 14 times. Khabdhal (dereliction associated with a difficult birth) is mentioned once.
30. Maghbal, mentioned 24 times, and maghbal al-bulad, mentioned once. The wood maghbal, when following the mention of a woman in labour or a difficult labour, appears to mean increasing the milk of a nursing mother. When the wood modifies faras, the word for horse, it appears to refer to abdominal pain suffered by a horse that can eat. See Canaan 1936, pp. 112–13, n. 214.
32. Sabih al-bahah.
33. Shaghbaq (migraine), mentioned 36 times, indad (a general term for headache), five times, and wa' al-rat (pain of the head), four times.
34. Durasah. Spoor (1933, p. 256) incorrectly translated this term as 'plagues'.
35. Way' al-dar.
36. Ri'ad is mentioned seven times and gat al-ra' of six times.
37. Ramy al-darn (discharge of blood), three times, gat al-darn (stopping bleeding), once, gat al-nazif (stopping haemorrhage or fluxus), three times, and nazif, twice.
40. The word al-quinuqah (physical strength), occurring 16 times, is often confused with the word lunqah (lunqah) (‘facial paralysis’). Lunqah occurs once, lunqah and li-ridd al-lunqah five times each. See Canaan 1936, p. 113, n. 120 and p. 114, n. 131.
41. For colds and catarrh, the term nazalib occurs six times in inscriptions on bowls, including those on cat. 25 and 26; see note 4 of the discussion of cat. 25. For epilepsy, marya, which can also mean madness, occurs once, while the awakening of an epileptic (ijagat al-mawrith) is mentioned eight times. See Dols 1993, p. 276 et passim.
42. Ramad (ophthalmia) on four bowls and re' al-ramad (curing ophthalmia), on one.
43. These are splenic fevers, mentioned 14 times; hepatic fever, 17 times; phlegmatic fever, once; cold fever, once; hot and cold fevers, once; hot and malignant fever, twice; cold and malignant fever, twice (including cat. 18); and the general ‘sitting of fever’, five times. 44. L7; bhab al-habib (kiss of love) and L5; bhab al-habib (kiss of love).
45. Only 16 bowls have the two inscriptions in common. On 20 of the 23 bowls where the word ‘way occurs, including cat. 25 and 26, it is immediately followed by al-nazifq, literally meaning sight or vision, which, with interpretation as a reference to the evil eye. Canaan, among others, however, has translated al-nazifq as ‘improving sight’, and such a translation would encourage a medical rather than magical interpretation of the word ‘way. This reading is supported by the occurrence on four bowls, including cat. 7, of the word ramad, (ophthalmia), immediately following the word wayqah.
46. The word armahb is not translated by Canaan (1936, pp. 105 and 114). In one occurrence the reading itself is questionable. Spoor (1933, p. 216) translated the word as flatulence, and indeed its occurrence in two instances in the midst of a list of gastro-intestinal complaints and haemorrhoids would support its interpretation as a variant of rayj (flatulence). See also note 6 to the entry for cat. 33.
47. ‘All al-ma’ qad (unbinding the tied). The word ma’ qad is bound with knots, a commonly used term for a person upon whom a spell has been cast. The concept of binding spells whose knots must be untied is an ancient one, referred to in the Qur’an (cxt, verse 4).
50. Ibn Khaldun, 1, p. 186; see also Ibn Khaldun—Rosenthal, 1, p. 216, where the phrase al-marajj wa al-marj is translated as ‘mirrors, bowls, or water’.
51. Thomas 1905, p. 57. For the diagonal square, see the essay on talismanic charms, pp. 106–107.
52. Ann Arbor, MS, Hatcher Graduate Library, Department of Rare Books, inv. no. i.55.166.
53. London, Wellcome Collection, inv. no. 20.115.167; only the last item has been published. See also Fedor 1990, p. 167, n. 10.
55. The exception is described by Canaan (1936, p. 210 no. 6). Only three of the bowls are known to bear animal figures: Musée de l’Institut du Monde Arabe, Paris, Destombes Coll. 21 (see Moulisca 1989, pp. 12–13); Ann Arbor, MS, Hatcher Graduate Library, Department of Rare Books, inv. no. C1.7, unpublished; and that auctioned at Christie’s, London, 29–31 October 1993, lot no. 3168.
56. For example, see Zwemer 1920, p. 179; Canaan 1935, Walker 1934, p. 69; and Malof 1979, pp. 119–120.
57. These include cat. 50, 31, 33 and 34. See also the bowls sold at Christie’s, London, 20 October 1992, lot nos. 113 and 158, present locations unknown; private collection, London; Science Museum, London, Welcome
astro-intravital comm-
hemorrhoids would
interpretation as a
34 (‘loosening’). See
a 21q (‘unbinding’
who is bound with
seal which is used for a
which have been
be unfolded is a
referred to in the
ill in antiquity, see
u.1 µin-ha al-bayj al-abd
al-mmagh al-bil, in two
v.48 u.1 µin-mmagh al-
19.56, p. 215–17, n. 314
Dabron, p. 186; see also
Rosenblat, p. 316;
the term ‘mash’ is
translated as
in the literature.
For one assigned to Syria
the jadeite or jadeite of the 15th to 16th
century, see Allan 1986, p. 128; for an
untreated Mughal example, see
These tags or ‘keys’ no doubt
gave rise to a practice referred to
by 21st-century writers: Zwemer
(1920, pp. 312–31) describes the
placing of ordinary keys in a
magic bowl, covering them with
water and letting them stand for a
while before drinking the water,
and comments (p. 170) on the
potential effect of the image of iron
on the patient.
In one instance, a Safavid bowl
of the mid-17th century, holes
were drilled at regular intervals
around the rim of the bowl and a
tag attached at each point: Science
Museum, London, Wellcome
Collection, inv. no. A128451,
unpublished. The tags may
well have been added sometime after
the manufacture of the bowl: they
could never have been immersed
in the water while in this position.
Magic-medical bowl
Syria, dated 63 (AD 1269–70)

Copper alloy, cast and turned height 8.5 cm; maximum diameter 19.0 cm accession no. 1945.3

This is the second oldest reliably dated Islamic magic-medical bowl known. The oldest was made two years earlier, in 65 (AD 1267–8), for the same patron, Nur al-Din Mahmud ibn Zangi, who ruled in Damascus from 1193 to 1194.1

The bowl is hemispherical with a slightly everted rim. It has a dark finish and white inlay on the engraving. On the outside of the bowl, beneath the rim, a circular inscription reads, "This blessed cup is for every poison. In it have been gathered proven uses, and these are for the sting of serpent, scorpion and fever, for a woman in labour, the abdominal pain of a horse caused by eating earth, and the bites of a rabid dog, for abdominal pain and colic, for migraines and throbbing pain, for hepatic and splenic fever, for [increasing] strength, for [stopping] hemorrhage, for chest pain, for the eye and vision [evil eye], for opthalmia and catarrh, for riyyah al-shar- takah, for [driving out] spirits, for releasing the bewitched, and for all diseases and afflictions. If one drinks water or oil or milk from it, then they will benefit by the help of God Almighty. It was prepared while the sun was in Leo and engraved for the sultan al-Malik al-Azh al-Mahmud ibn Zangi in the year 65."

Beneath this dedicatory inscription, and separated from it by a plain fillet, is a broad band filled with 14 lines of magical writing apparently overlaid by three narrow, interwoven bands. On the underside of the bowl a ring of magic script encloses a blank fillet which in turn encloses nine lines of magical writing, now so worn as to be scarcely legible. The significance of the letters, numbers and symbols here is not apparent.

On the inside of the bowl, immediately beneath the rim, there is another line of similar magic writing. Beneath it, a broad panel and the nine medallions within it are defined by the undulations of a continuous plain fillet against a ground of magic writing. The interior is bad worn through extensive use so the only faint traces of the writing and the figures within the medallions are now illegible. One circle appears to contain a human figure, possibly a pregnant woman, sitting cross-legged with arms down at the sides. Other medallions contain a second schematic human figure, with one hand raised and pointing to its head; a scorpion; traces of what may have been interwoven serpents; a four-legged animal; and a square tablet of four columns and four rows. These are all or most of the remaining three medallions. The rest of the interior of the bowl apparently contains other medallions and rings enclosing writing, which are all virtually obliterated.

The style of the magic writing and the nature of the dedicatory inscription, though short, is very similar to that on the earlier bowl made for Nur al-Din ibn Zangi, though the latter is slightly larger. On the earlier magic bowl the circles containing figures are engraved on the outside of the bowl, whereas here they are inside, as was common in Syria and Egypt during the 9th and 10th centuries for some items which might be an unclear skin disorder, or could simply refer to the effects of hot, sand laden winds, or even to the stringing effects of the activities of jinn, which were sometimes associated with plague and pestilence.2

1. Rehak (1978, plate between pp. 204 and 205) published a lithograph drawing of the outside of the bowl, and misinterpreted the date given in ahijad letter-numerals at 65, reading a 'a instead of a 'ad. In attempting to correct this error, Furtig (1982, p. 81, 12) introduced another by giving the letter at the value 40 instead of 65. In reading the year at 845.

The bowl's present location is unknown.

1. Al fatara al-maghaba; see Canaan 1933, pp. 112–13, n. 114.
3. Al nazaqat al-nazzāl. In the ophthalmological literature the term is used specifically to ophthalmia, but can be used generally for any inflammation and congestion of the eye. The latter term refers to a set of hot, red, and bright symptoms in general as well as congestion of the eyes or any other inflammation symptoms in the respiratory organs. Canaan 1933, vol. 1, p. 114, n. 117; and Savage-Smith, 1980, p. 175.
4. Azrudh is translated as 'malignant spirits' by Canaan (1933, p. 114), though Spier (1935, p. 166) translates it as 'fatigue' and Rehak (1978, p. 205) as 'wind'. It occurs on the same four bowls as the term riyyah al-shar- takah, and on one attributed to Baybars and dated 634 (AD 1234), now in the Louvre, Paris (Vitrac 1931, pp. 53 and 57, where he leaves the term untranslated).

The Qur'anic verses are from the suras Al Istanbul (113, verses 18–19), Yitrus (9, verses 17 and 18), Al-Baqi' (8), verses 18–19 and 22–23, Al-Malaq (6), verses 18 and 20, Al-Asy'ar (241), verses 18–20, Al-Baqi' (8), verses 1–4, Al-Baqi' (241), verses 18–20, and Al-Furqan (258), verses 1–4. There is also a small 5 x 5 magic square, with the common sum of 15, in one of the circular medallions containing a winged animal. See Rehak 1978, pp. 206–9. 7. Rehak 1978, p. 201.

12. Lemo 1890, pl. 4, p. 1621.
13. For example, Doh 1977, pp. 115–19.
15. Rehak 1974, plate between pp. 204 and 205.
16. Present location unknown; see Spier 1935, p. 217 and above, p. 73.
17. Hazari Collection, Wirt 1922, pp. 53–57.
137 and 81), al-Ra’d
1-Nabî (xxvi, verse 78),
verse 82), Ta’-ha’
and 46), al-Shu’ara
40), al-‘Asr (xxv, verse
22), al-‘Imran (xxxvii,
verse 18–21),
verse 4–20) and
verse 1–4). There
magic square, with
of 15, in one of the
containing a
See Rehtanzé 1978,
p. 301;
Spree 1931,
p. 194;
Hava 1951,
pp. 67;
92;
pl. 4, p. 161.
pp. 90–91.
A plate between
unknown, see
and above, p. 73.
J. Wett 1933,
pp. 53–57.
Magic-medical bowl
Perhaps the Jazirah, mid-12th century

Copper alloy, cast and turned height 8.2 cm
maximum diameter 20.1 cm
accession no. 1971.189

In its size, form and the style of magic writing of its inscriptions, this hemispherical bowl is similar to that made for Ibn Zangi, ca. 1215, although the metallic surface has a rosy colour and the engraving a dark inlaid, and there are consistent differences of detail in the scripts.

On the outside of the bowl, beneath the rim, there are two narrow lines of magic writing, with a broader band between which carries an inscription. This blessed cup neutralizes all poisons. It has been gathered proven useful, and it is useful of healing from the Book of God the Powerful. It is [useful] for the string of serpent, scorpion and fever, for a woman in labour and increasing milk of a nursing mother), for the [image of] a rabid dog, for abdominal pain and colic, for migraine and swelling, for hepatic and spastic fever, for [increasing] strength, for [stopping] haemorrhage, for chest pain, for toothache, for cancer, for the eye and veins (cf. 1:19) and for all diseases and afflictions. [If the afflicted person or their agent drinks oil or water or milk from it, then they will be healed, by the help of God Almighty. By order of the Imam al-Musta'lim bi'Illah Muhammad al-Baghe while the moon was in the House of Scorpio in the year 502].

In fact the date given, A.H. 572 (AD 1175-5) is almost 30 years before the reign of the Abbasid caliph al-Musta'lim bi'Illah (1242-1260).

Since it is clearly named, the bowl cannot have been produced before the middle of the 12th century. We can conclude either that the bowl was made for him and the engraver made an error when inscribing the date, which is written out in words, or that the name and date are both incorrect and were added to a later object to give it a provenance. Another magic-medical bowl is recorded as being al-Musta'lim bi'Illah's name and an inauspicious 12th-century date, and it is possible that both objects came from the same workshop. While the overall design and calligraphic style are similar to those on cat. 27, the engraving and calligraphy are also very similar to the magic inscriptions on the only recorded magic-medical stem-cup, dated either A.H. 538 or 538 (AD 1146-7 or 1155-6) and bearing the name of Katur ibn al-Ikhbadal, but which has been attributed to the northern Jazirah in the second half of the 12th century. In addition to specifying various conditions for which the bowl could be useful, the dedicatory inscription also refers to the Qur'anic verses which it carries. These are found about halfway down the inside of the bowl, and comprise the 'Throne Verse' (11, verses 1-5) followed by an unidentified short passage and concluding with surah 7, verse 17. Above this band are seven concentric rows of magic writing, the top row separated from the other six by a thin blank fillet which curves down to form eleven semicircles overlaying the writing. Beneath the Qur'anic text there are five more lines of magic writing with seven interlinking semicircles lying over them to produce an imbricated pattern. A few traces of Arabic, perhaps more Qur'anic verses, can be detected in the bottom of the bowl, but virtually all the engraving in the centre has been obliterated during years of use.

On the outside of the bowl, beneath the dedicatory inscription and its framing bands of magic script, there are 11 lines of magic writing apparently overlaid by a blank fillet forming contiguous loops. The underside of the bowl seems to have carried additional lines of magic writing, now virtually obliterated.

1. See p. 82, note 32.
2. See p. 92, note 45.
3. The name is written as al-Musta'lim bi'Illah Abu al-Abbas Zahir and the date given is AH 572 (AD 1175-6). Its present whereabouts are unknown and only the transcribed inscription has been published. See Caiasso 1971, pp. 323-50; Wiet 1935, pp. 54-166.

Copper alloy, cast and turned height 8.2 cm
maximum diameter 20.1 cm
accession no. 1971.188

This shallow, flat-bottomed magic-medical bowl has a wide, curved rim. The large, carefully executed and fully rounded inscriptions are filled with a black substance which now appears white in most areas, probably due to cleaning, making them very readable against the dark metallic alloy, which has a silvery cast. There is relatively little sign of wear on the inside of the vessel although there is pitting of the surface and traces of aggressive cleaning. No date or patron's name appears on it, and no magic-medical bowl of comparable design is recorded. The general nature of the metalwork and inscriptions, however, suggests that it might have been made in Syria or Egypt in the late 12th or early 13th century.

The bowl bears no engraved therapeutic instructions nor any animal representations. The exterior is covered with Qur'anic verses, but the focus of attention is a large talismanic square at the bottom of the bowl. This is an 8 x 8 magic square whose horizontal and vertical lines have the letter 'â' at either end, except for four near each corner which begin with the numeral three. Letters of the alphabet, especially 'â' and 'zâ', and magical symbols occupy the cells. The symbols are arranged so that the resulting figure is neither a true magic square nor a Latin square nor a verse square. Except for the two cells at the left-hand end of the bottom row, which contain the words harakat lakh ("blessing on us"), the significance of the magic letters and symbols in the talismanic square is undetermined.

On the curved inner surfaces of the bowl, surrounding the square, blank semicircular bands interlock to form a six-lobed star or flower figure. Four concentric rings of prayers, with the occasional use of Qur'anic words and phrases, all fully rounded as if to be read aloud, are inscribed on the ground behind this figure. The 'Throne Verse' (11, verse 25) is inscribed on the upper surface of the rim, beginning above the top of the talismanic square.

On the underside of the rim are inscribed a quotation from the surah al-Qal'âm (62, verses 1-2) followed by the whole of the surah al-Ikhbâs (112). Beneath the rim a row of ten truncated pentagonal cells contains verses 1-6 from the surah al-Fâtihah (1:1-7). The areas above the cells are filled with magic ciphers. Beneath these, two concentric bands of inscriptions contain the surah al-Fatâj (113:1).

followed by al-Nâ'î (xxvi), concluding with invocations reading, 'The light obeys, O Sham'alî, O his master, O his representative, O his lord, Who is in the Living One, the Eternal, O the Enduring One... Come, ... come. Majesty belongs to God. The Ruler is God the [Everlasting], Exalter of rank.'

1. For definitions of such squares, see pp. 106-107, below.
2. The name of a good spirit.
3. In a similar invocation, the name Sârûfî, apparently that of an unidentified angel — perhaps 'Irfâ' — is written in place of what appears in this inscription to be shârâ' al 'ard; see Caiasso 1935, p. 87. For angles' names in general, see Caiasso 1937, p. 81-3.
(cvi), concluding reading, "The light of His face," O his master, O his lord, Who has come, Who has come, to God. The Ruler is [Divine], Exalter of
Magic-medical bowl
Egypt or Syria, 13th–14th century

Copper alloy, cast and turned height 5.7 m maximum diameter 10 cm accession no. 1939.136

The walls of this small, shallow, hemispherical bowl have become slightly deformed, and the engraving on the underside as well as at the bottom has been badly worn. Two small plugs appear to be repairs to fill holes that were drilled in the bowl at some time. The dark, silvery colour of the surface may be due to the alloy of which the bowl is made containing some silver; the bowl is quite heavy for its size. With the passage of time some of the copper may have leaked away, leaving behind a silver-enriched surface which has tarnished.

No date or maker’s name occurs on the bowl, but it does provide a list of therapeutic uses. Although the bowl is smaller than usual, its design has elements typical of magic-medical bowls that appear to be 13th- or 14th-century products, probably from Syria or Egypt.

On the outside of the bowl, near the rim, a band of Arabic writing reads, "This blessed cup neutralizes all poisons. If it has been gathered proven uses, namely for the bite of serpent, scorpion and rabid dog. [For] a woman in labour, a headache, for [3] increasing the milk of a nursing woman[,] [increasing] strength, for a migraine, there and for a cold and malignant fever. The one afflicted or his agent drinks water or milk or oil in it, [it] will be blessed."

This inscription has several interesting features. The most striking is the lack of reference to God at the true agent for any cure brought about through the use of the bowl. The use of two different words for a headache, "headache" and "headache", is also distinctive: the first term seems oddly placed, interrupting the list of conditions relating to childbirth, and might be a mistake; the latter is usually restricted to a hemispherical headache or migraine.

The reference to a cold and malignant fever occurs on only one other recorded bowl,1 which is similar in many other respects to this piece.2 The expression probably refers to feverish chills as well as a fever that is potentially lethal. Also unusual is the failure to mention the gastro-intestinal complaints that are virtually ubiquitous on all other magic-medical bowls. Beneath the inscription giving the bowl’s therapeutic uses there is a band containing six medallions defined by a blank fillet. Each medallion contains five lines of writing with a further three lines in the spaces between the circles. Below this there is a ring of illegible Arabic script and, in the innermost ring, traces of engraved magic numerals. The base of the bowl is pitted and worn.

The inside of the bowl is of a rather complicated design, now quite badly worn. Next to the rim is a ring of magic writing and immediately under this a thin fillet that is blank except for four groups of magical numbers [6611/1611/ 62114/61141]. In four places, the thin bands curves down to form a circular medallion. Inside each of these medallions is imprinted design, once inlaid with silver or now difficult to read. In an antilockwise sequence these are a scorpion with a prominent hook at the end of its tail and the numeral 61; a schematic rendering of a human figure with breasts and a big belly, stringing cross-legged, also accompanied by the numeral 61; a design composed of three rows of magical symbols and numerals, with what might be a snake in the centre; and the numeral 61; a schematic rendering with small squares and geometrical forms, of another human figure, possibly kneeling with the arms folded over the chest or, perhaps, cradling a baby in her arms. A square containing Arabic text is placed between each of the circular medallions and the spaces between the squares and the medallions are filled with lines of magic writing. Reading anti-clockwise from the scorpion design, the squares contain words in a formula found on the so-called ‘poison cups’; a quotation from the surah al-Furqan (xxv, verse 43); a quotation from the surah al-Imāra (xxxv, verses 1–4), followed by the phrase ‘and the pregnant woman delivers her child and is fertile’; and a quotation from the surah al-‘Ala‘ (iii, verses 69–70). The text from surah xxxv, verses 1–4, occurs on other early magic-medical bowls, and is usually accompanied, as here, by additional non-Qur’anic statements calling for the safe and easy delivery of a child.

On this bowl it is placed next to the medallion containing the seated figure with arms crossed over the chest or cradling a baby.3 This is probably intended to represent a nursing woman while the other figure represents a pregnant woman. Similar figures, as well as the scorpions, are found on other magic bowls of a fairly early date. Further down the interior of the bowl another band appears to have carried an Arabic inscription that is now obliterated and four more circular medallions with engraved figures, the spaces between filled with magic writing. This area was once inlaid with silver and is now so worn that no details can be read.

The bowl which most closely resembles this example, and shares the reference to cold and malignant fever, was described by Rehatsch and reproduced in lithographed drawings.4 Its interior is also similar in layout to the inside of cat. 18, with quotations from the surah al-Furqan and al-‘Ala‘ and a non-Qur’anic statement assuring safe delivery of a child occurring in two of the four central areas. By contrast, however, the other two areas contain non-Qur’anic pious statements and invocations, the ‘Throne Verse’ appears near the rim, and only one abstract geometrical design is repeated in the circular medallions. The exteriors of the two vessels are similar, except for a small ring of magic letters near the rim of the item described by Rehatsch that is not on the Khali bowl. The main point of difference between the two,

judging from the lithograph, is the quality of engraving, which is finer on cat. 18. All these features suggest that the slightly larger magic bowl described by Rehatsch might be a later copy of the basic design represented by the more carefully executed bowl in the Khalili Collection. In overall design and layout both bowls are similar to that made for the Mamluk ruler al-Mu’izz ‘Izz al-Din Aybak.5

1. A plug in the bowl occurs at this point and obliterates the word.
2. See p. 85 above, note 32.
3. humma al-bāridah tu’āl khabhabah. Of the last word, only al-khabhaba is completely clear, and the final two letters could also be interpreted as ya’sa and al-dal marhabah. On the comparative bowl the word for ‘malignant in written as al-khabhabah.
4. Present location unknown; Rehatsch 1573, p. 119, 60.4.
6. On the bowl made for Ibn Zangi in 1208/9 (1601/2) the quotation is also placed next to a cross-legged human figure and followed by addi-
tional phrases for the safe delivery of a child (present whereabouts unknown; Rehatsch 1578, p. 258). See also Rehatsch 1573, pp. 114, 115–9 and 166 (nos 2 and 4, unlined) and Canaan 1986, p. 214.
7. See note 4, above.
8. West 1935, p. 123 and plate 12; photographs were also available for study. The inside is now so worn that reliable readings cannot be made.
Lithograph, is the ring, which is finer on features suggest that a magic bowl
statek might be a later design represented fully executed bowl in context. In overall
both bowls are made for the Manshak
"Izzi al-Din Aybak."5

The bowl occurs at this point the word.

5, note 31.

"Izzi wa't-khâbâtibah...
only al-khâbâth is
and the final two
be interpreted as a na'f
ab. On the compar-
ated for 'malignant' is
kâbâthab.

unknown;
139, 504.
Ja. see Jirg. 1982, p. 87;
5 p. 139:
made for Ibn Zangi in
996 the quotation is
a cross-legged
following by addi-
tion the safe delivery of a
southeastern unknown;
180). See also
p. 146, 179-90 and 181
(reprinted); and Canaan

we.
51 and plate 136;
also available for
is now so worn that
cannot be made.
Copper alloy, cast and turned; a large crank has been repaired
height 5.1 cm diameter 18.3 cm accession no. N8213

This shallow hemispherical bowl, which has a flattened bottom, has been
carefully executed in a metallic alloy with a dark finish and a silvery blue
cast. No magic bowl of comparable design is recorded, but the artistic
conventions it displays reflect those of the Qur'anic school in the 16th century.
At the centre of the bottom of the bowl the anthropomorphised face of the
Sun is shown encircled by rays. The treatment of the round face, with its
double-cheek and hair rising to a
point, is typical of 16th-century artists in Qur'anic. An indentation made when
the bowl was turned on a lathe hides the point where the nose should be.
Surrounding the Sun are two rings of contiguous cells with oval arches,
twelve in each ring, arranged to form a
double-petalled flower and enclosed by a
band of text framed by two blank
fillets. Both the cells and the circular
band contain prayers and affirmations of
faith, inscribed in densely written
Arabic.

On the curved sides of the interior, two thin, slightly scalloped fillets
interlace to form six large circular medallions and six small ones. Engraved
within the smaller medallions are personalizations of the remaining clas-
sical planets, all but the Moon being incised over grounds of spiralling vines
and flowers. The Moon, placed to the
left of the Sun, is represented by
another facial type associated with
the Qur'anic workshops, surrounded by a
pearl border. Proceeding anticlockwise
from the Moon, the next figure is
Jupiter, represented by a turbaned and
robed male sitting with his left leg
folded under him and reading from a
book resting on his raised right knee.
The next figure has been defaced by
the repair to the crack, but the presence of a stringed instrument, which is still
visible, indicates that it represented
Venus. The following figure is Mars,
represented by a running man wearing a conical hat or helmet and having five
arms, one holding a sword and the others a scorpion, an arrow, a dish and a
severed human head. The next circle
contains the figure of Mercury, a
turbaned figure stringing cross-legged
and holding an astrolabe, with a
writing tablet behind him. Mercury is
usually portrayed as a man in the act
of writing, though there are some
instances in manuscript illustrations
where he is depicted with an astrolabe.¹
The last medallion contains a male
figure representing Saturn; he is seated
cross-legged, wears a hat and has seven
arms carrying magical emblems that
include a kid or lamb, a club, an axe
and a net.

Prayers and invocations fill the large
medallions and the spaces between
them and the small medallions. Below
the rim on the interior of the bowl a
band is divided into six elongated car-
touches containing the "Throne Verse" and three other verses from the surah
al-Asr (265-8), begin-
ning above the figure of Saturn and
followed by prayers and pious phrases.

On the exterior of the bowl, another
narrow band beneath the rim contains
circular medallions enclosing the
names of the zodiacal houses engraved
on a ground of spiralling vines. The
name of Aries (hamal) is inlaid with
brass ox, possibly, silver. Between the
names of the signs elongated cartouches
are inscribed with verses 9-10 from the
surah al-Asr (265-6), beginning after
the medallion containing the name of
Aquarius (alqadd). Beneath this band,
12 circular medallions with scalloped
profiles are formed by the interlacing
of thin fillets, as on the interior; they
are decorated at the top and bottom
with flowerheads, with single straight
fillets extending from the lowest
points. The medallions contain
emblems of the twelve zodiacal signs
egraved over a ground of flowers and
spiralling vines against hatching; each
medallion is positioned under the cor-
responding name in the narrow band
near the rim. Gemini is shown as a
two-headed, male figure, Virgo, a
kneeling turbaned man reaping corn
with a scythe, Libra, a male sitting
cross-legged beneath a pan-balance
suspended above him; and Aquarius
by a particularly fine representation of
a man drawing water from a well. The
zodiacal house of Leo is represented by
a roaring lion in front of a large
radiant Sun, a design illustrating that
the Sun was most often associated
with, or domiciled in, Leo. The house
of Sagittarius contains a centaur shot-
ing an arrow at his tail, which terminates in the head of a dragon, representing
the 'pseudo-planet' or lunar node par-
ticularly associated with Sagittarius.

The ground between the zodiacal
medallions is covered with inscribed
prayers and invocations, with an occa-
sional Qur'anic passage such as that
from the surah Al'Imran (3), verses
16-19, written near the top of the
medallion containing Virgo.

On the bottom of the bowl, now
badly worn, there are five more medallions with prayers and other, indeci-
pherable, material. On a sixth,
shield-shaped, cartouche which has
been damaged by the repairs to the
crack, a single word can still be read,
naqab ("engraver"). Unfortunately
the rest of the inscription is so worn or
damaged that the date or the name of

any maker or patron that might have
been engraved there is now obliterated.

1. For example, an illuminated
horoscope made for Iskandar Sultan,
grandson of Timur, in MS 813
(AD 1410–11) in the Wellcome
Institute for the History of Medicine,
London, MS. Penz 474, folios 78b–79a
(see Savage-Smith 1992b, pp.674 and
pl. 25; and Savage-Smith 1993b,
pp.19–22); and an illustration in a
17th- or 18th-century copy of
al-Qarwini's A'azab al-makhlukat in
the Walters Art-Gallery, Baltimore,
MS.593, folio 10a.
Magic-medical bowl

Copper alloy, cast and turned
height 7.5 cm
maximum diameter 21.0 cm
acquisition no. MTF 794

This carefully executed magic-medical bowl has a large, nearly hemispherical, central boss, an exed rim, and a low circular foot. There are traces of a black composition which was once inlaid in the engraving of the small inscriptions and the grounds behind the large inscriptions and the zodiacal and planetary figures that play a prominent role in the overall design.

The central boss and surrounding circular band are engraved with seven roundels containing personifications of the seven classical planets in their usual sequence (the Moon, Mercury, Venus, Mars, Jupiter and the Sun). The last, Saturn, is engraved on top of the boss. The Moon is represented by a circular disk within a ring of flowering vines. In a clockwise sequence, the next figure is Mercury, a seated, crowned man shown in the act of writing, against a ground of spilling vines. Venus is a seated woman playing a stylized stringed instrument, also shown on a ground of spilling vines. The Sun is a circular disk surrounded by rays. The figure of Mars, also engraved on a ground of spilling vines, is shown in a crown and with a shield. The central boss, with its right hand raised.

In three of the areas between the rosettes—that is, between those containing the figures of Mercury and Venus, the Sun and Mars, and Jupiter and the Moon—the traditional Shi'a prayer beginning "Call upon Allah, through whom miracles are made manifest" is inscribed in small script written inside a ring, in contrast to those containing the other inscriptions. The remaining three intervals contain inscriptions in larger script and engraved with a recessed ground. Most of these cannot be read, though one segment seems to have "QDs" repeated several times. Written on the underside of the ring and on the sides of the boss, additional text is engraved in a small, tightly written script consisting of prayers and Qur'anic phrases, for example, "And He has power over all things". The bowl's curved interior walls are also covered in densely written small script, some of which can be identified as prayers and Qur'anic verses, including part of the surah al-Kahf (18, verses 1–29), versed 23–25, followed by the surah al-Saff (23, verses 1–25). The writing occupies the spaces between a network of thin scalloped fillets crossing to form an imbricated pattern that covers the interior surface to within about three centimetres of the rim. The area nearest the rim is cross-crossed by bands to produce rectilinear areas of text; for instance, in the form of six-pointed stars.

The upper surface of the rim is engraved with the "Throne Verses" and the following verses from the surah al-Fatiha (1–7), followed by text from the surah al-Baqarah 2–3 (36–37), written in a cursive script. The underside of the rim, inscribed with a similar script, contains prayers seeking protection from, among other things, "all afflictions" (man jamat al-siwar).

Immediately beneath the rim, on the outside of the bowl, is a band containing an inscription in large nasta'liq script on a hatched ground with spilling vines. The inscription invokes blessings upon Muhammad and the Twelve Imams. Beneath this the formula there is a very wide band containing two mirrored rows (one inverted) of ogival arches, 24 each in row, which form 12 large medallions, and 12 pairs of small medallions. The zodiacal figures are represented in the large medallions, engraved on a ground of spilling vines with flowers engraved overhanging. Leo is represented as a lion of rather unconventional appearance surrounded by a radiant, teardrop-shaped Sun, representing the Sun domiciled in Leo. The figure of Sagittarius is the last node of the dragon's head at the end of its tail, as on cat. 29. The areas between and around these medallions, and in the interposed small medallions, contain prayers and invocations, again written in a densely packed, small script.

Near the foot of the bowl another band of large, flowing script contains Qur'anic phrases, beginning beneath the figure of Arias with part of the surah al-Nasr (11), verses 1–3, followed by the surah al-Saff (23, verses 38–46). The foot itself is inscribed with prayers written in small, tightly written script in six elongated cartouches. On the underside of the bowl, at the bottom of the cavity formed by the boss, the invocation is inscribed in a script consisting of prayers and Qur'anic phrases, for example, "And He has power over all things".

Four unpublished bowls are strikingly similar in design to this piece, though not identical. One, an inscription on the underside of the boss reads "this bowl was begun on 7 Rabii 1052 (21 February 1699) and finished on 12 Rabii 1054 (1 October 1695)." All seven of the planetary figures, however, are shown in the ring around the boss rather than having Saturn on top of the boss, as is the case on cat. 27 and three other similar bowls, all of which are undated. Two are quite similar to the Khulul example, although there are differences in the design of the network of cross-crossed bands forming the cartouches and in the text in the bands containing the planetary figures. The fourth bowl also differs slightly in the bands enclosing text and medallions, with an additional slight variation in the placement of some texts. So striking is the similarity among these five pieces, two of which were made within two years of one another, that it suggests that all were made in the same locality in Safavid Iran, and possibly in the same workshop.

1. The figure of Saturn has been lost but obliterated through wear, but appears to be represented by a crowned and seated figure with six arms holding a crown, an axe, a club, a fish and two other unidentified objects. Such a figure is very clear on a similar bowl in the Brooklyn Museum, New York, Department of Asian Art, inv.no. 73.51.1 (unpublished), one of three related bowls that have the same arrangement of planetary figures.

2. On all the similar bowls discussed here, the disks of both the Sun and the Moon have engraved faces, which may have worn away on this example.

3. In the unusual numbering system used here, the zero is written as three vertical dots. A line under this numeral could be interpreted as the word samah ("year").


5. The magic bowl described and illustrated by Rehmat (1974) has similar zodiacal figures on the outside, but in all other respects of design and text differs from this group of Safavid bowls.


7. Science Museum, London, inv. 10.21.8451, and a bowl known to be in a private collection in London as of January 1994. The Science Museum example is rather badly worn and corroded and has had a series of metal tags bearing the inscription attached at intervals around the rim.

8. Brooklyn Museum, New York, Department of Asian Art, inv. no. 73.51.1.
Magic-medicinal bowl
Iran, 16th–17th century
Copper alloy, cast and turned
Height 5.4 cm
Maximum diameter 18.7 cm
Acc. no. MTP 18.
This shallow bowl has a short circular foot, an everted rim and a low central boss. It is undated and bears no patron's name, but on the basis of its design and execution it appears to be a Safavid product of the late 16th or 17th century. The hemispherical boss is engraved with the names of Muhammad and Ali, each given four times, on a hatched ground. The name 'Ali is written so as to form a four-petalled floral design in the centre. Identical bosses are found on two other Safavid magic-medicinal bowls, one attributed to the mid-16th century, although there are otherwise several differences in text and design between these bowls and cat. 31. The boss is encircled by a narrow chain or interlace design enclosed by a broader band of stylized lotus blossoms. The curved interior walls are covered with prayers and invocations written in Arabic, in a dense curvilinear script. The upper surface of the rim is engraved with invocations and affirmations of faith; the underside of the rim is blank.

On the exterior of the bowl, immediately under the rim, there is a wide band with a hatched ground bearing the 'Throne Verse' (51, verse 111), engraved in rhubarb script. Beneath this band, six rounds containing prayers and invocations in a densely written curve script are evenly spaced around the sides of the bowl. The spaces between them are filled by three concentric bands, the middle one containing stylized intertwining vines. The texts in the upper and lower bands are to be read from top to bottom in each section between the rounds. One section of the text calls for blessing on Muhammad, gives the shahadah, and ends with a line from the surah al-Baqarah (2, verse 282). Proceeding anti-clockwise, the other sections contain Qur'anic texts from the surahs al-Fatihah, al-Hadaj (1:1) in the upper panel and al-Nûs (68, verses 1–3) in the lower panel, al-Falaq (113), verses 1–5; al-Nour (24, verses 1–2) in the upper panel and al-Kafirun (25, verses 1–3) in the lower panel, al-Rahman (55, verses 1–2) in the upper panel and al-Qalam (68, verses 1–2) in the lower panel. A narrow chain or interlace design surrounds the foot, which is undecorated.

On the underside of the bowl the Persian expression muntazah-bad, 'may the prayers be heard' is engraved three times, with a palm-leaf design positioned between the repetitions. There are two small plug repairs in the wall of the bowl, one in copper and the other in a white metal which may be silver. In two other places, there are minute pin-sized holes where the walls of the metal dish have been thinned by extensive engraving. Presumably, the two plugs were inserted to repair similar pin-holes and thereby extend the useful life of the object.

High-relief bronze, cast and turned height 17.3 cm maximum diameter 43.2 cm accession no. 17148

This unusually large and elegantly engraved bowl is cast in an alloy with a rich dark-brown patina. The appearance of this alloy inside the footring gives an idea of the irregular texture of the cast metal and the need for lathe-turning after casting in order to achieve a perfectly smooth surface. The level of craftsmanship achieved in this bowl is of an exceptionally high order. The engraving, mostly on the interior surface, has been filled with a white substance.

The bowl is hemispherical, with a slightly everted rim, and rests on a gently flaring circular foot. The exterior surface is simply ornamented with two small torus moldings, one just below the rim, and a small number of engraved concentric lines, probably cut when the bowl was turned on a lathe. A diskplug 1.5 centimeters in diameter has been hammered into the bottom of the bowl as part of the process of manufacture.

The circular design at the center of the bowl is formed from eight wedge-shaped segments with scalloped ends. Four cartouches with scalloped sides and oval arches are attached at intervals of 90 degrees to this circular design and the whole figure is filled with inscriptions and prayers in Arabic and Persian.

Above the tip of each of the cartouches there is a roundel with a pendant cartouche of the same form. Three of the four roundels contain prayers, the ‘shahadah, and invocations, while the fourth contains Persian and Arabic titles and formulas typical of Sufi devotional orders (‘ajadhat). Reading anti-clockwise, the four attached cartouches contain the surahs al-Falaq (2:109), al-Nās (30:45) and al-Kāfūrūn (45:4) and more formulas and titles indicating a Sufi context. The particular Sufi order to which they relate has not been identified.

The central design, the roundels and cartouches divide the interior surface of the bowl into quadrants, each containing two squares with cloud-collared profiles, five magic squares and four small circles. The circles contain prayers and invocations, including quotations of C.Mesker, G.Croissant, O.Eternal One” (‘al-Ḥāfiz, ‘ayl ḫāfiz, ‘ayl ḫāfiz), and prayers for protection from ‘evil devil’ (min kālšuṣīrāt). Most of the cloud-collared squares contain prayers, sometimes employing the ‘crowning words’ or mystical letters with which several surahs commence. The two such devices on either side of the roundel containing the surah al-‘Nās (30:45), are inscribed with the ‘Throw Verse’ and two following verses from the surah al-Baqara (2:253-255) while the other contains verses 1-3 from the same surah and the surah al-‘Ikhlās (2:1). The bottom of the ‘cloud-collar’ square to the right of the cartouche containing the surah al-Falaq (2:109) is inscribed with surah al-Bahār (55:11-14), following some prayers. Under the rim of the bowl, 23 scalloped rectangular cartouches each contain four lines of prayers and invocations.

Of the 20 magic squares inscribed on the bowl, two are taliqic squares, one with four lines of magical letters and numerals, and the other with three lines and four columns of letters, mostly composed of kaf, waw, dāl, and lā’ repeated in various combinations. The remaining 18 are true magic squares; 13 are 3 x 3 squares and the remaining five are of the 4 x 4 order. Nearly all these magic squares are correct as written, though small errors do occur in some. Of the 3 x 3 squares, all are ‘augmented’ squares—that is, a square with a sequence of numbers higher than the usual 1 to 9. Four of the 3 x 3 squares use a sequence of nine consecutive numbers, but none omit one digit in this sequence and hence the diagonals will not produce the same common sum as the columns and rows.

Of the five 4 x 4 squares, four are augmented, having sequences of numbers higher than 1 to 16. One of these maintains a sequence of 16 consecutive numbers, while the other three omit one digit in the sequence. With 4 x 4 magic squares, however, a break in the sequence does not affect the property of the diagonals to produce the same sum as the columns and rows. The fifth 4 x 4 square on this bowl is unusual in that it is only partially augmented, for it is formed of the numerals one to eight and 13 to 16, yielding a common sum of 24. Furthermore, the pattern of placement of the numerals within the square is different from the method employed in the other 4 x 4 squares.

In all the magic squares, the numeral 0 is written as a small circle rather than the more common dot, while the numeral 5 is usually represented by a figure closely resembling the modern European 3, but rotated so that it opens toward the right with the bottom curve slightly fuller. Occasionally, the bottom curve is closed so that the numeral resembles a small Greek letter delta. A similar form for the numeral 1 can be seen in some 17th- and 18th-century manuscript copies of treatises discussing numeral forms in use among Western Arabs.

1. Following such Sufi expressions as al-qanarūb wa-al-qalbī al-‘īlam (‘the Supreme Defender and Supporter’), there occurs the title abūl-barkat al-a‘īlam al-‘adīn abūl-barkat al-'ābūd al-ma‘ṣūm al-muilīna al-ma‘ṣūm al-‘a‘īsbiq, perhaps implying an association with the class of mystical poet-ministers called ‘ābūd, whose adherents were particularly numerous in various Circassian orders in the 17th century (see Lewis 1960).

2. For the magic use of these letters, see an essay on talismanic charts and seals, p. 121, note 12.

3. For ‘augmented’ squares, see Cailmann 1962, p. 254, n. 32.

4. For example, a copy of a treatise on arithmetic begun in 1620 and finished in 1630, and another treatise on arithmetical copy in the 18th century: Bibliothèque Nationale, Paris, pers 2474 and 2465 (Ifrīj 1981, p. 202). The forms of many of the other numerals in these manuscripts differ, however, from those on the bowl.

See also Iran 1955.
Magic-medical bowl
Iran or India

Perhaps high-tin bronze, cast and turned.

This deep bowl, with a rounded, conical boss and a low, slightly flaring foot, is unadorned, but the name of the maker is given on the underside, within the footring, as 'Ali Rida.

This ring is framed by five concentric fillets.

The curved sides of the bowl's interior are divided into twelve contiguous arch-shaped panels. The areas above the arches and nine and a half of the twelve guards contain prayers written in Arabic and Persian. The surah al-Nisā' (2:280) begins in the middle of the tenth guard and continues in the eleventh guard, where it is followed by the surah al-Kifārūn (39:1-6). The final guard contains the surah al-Fātiq (40:19), followed by the Shi'ite's metrical prayer beginning 'Call upon Allah through whom miracles are made manifest' and ending with 'O God, most merciful of those who show mercy. In the year A.H. 1296 (AD 683-4)'.

On the exterior of the bowl, immediately beneath the rim, a band is inscribed with various Sufi titles and epithets, and the name of Sultan Muhammad al-Din Abu Muhammed Khusraw al-Abd al-Qadir al-Husayni al-Jallali, usually known simply as 'Abd al-Qadir al-Jallali (d. 664/1266), the mystic and founder of the Qadrīyah order of Sufi dervishes. Beneath this band of inscriptions there is a row of twelve circular medallions with scalloped rims. The medallions and the ground between them contain prayers in Arabic and Persian. Beneath this band a decorative ring formed of interlocking arches terminates at the top of the footing.


96 Magic-medical bowls
Magic-medicinal bowl
India, possibly for the Indonesian market, dated Ramadan 1014
(to January–February 1664)

Agate, engraved and polished.
Height: 2.7 cm
Maximum diameter: 9.8 cm
Accession no. T.113.6

This elegantly engraved bowl is hemispherical with a small, flat base, which is occupied by an octagonal cartouche containing an inscription. According to this, the bowl was finished in the month of Ramadan 1014 (to January–February 1664), "purposely on a Friday". Symmetrically positioned around this cartouche on the exterior are four octagonal medallions with inscriptions in a broad script on a ground of circles and flowerheads. The four inscriptions are apparently intended to read in a clockwise sequence but rather one followed by the one opposite. In this order they read: God, Muhammad, Allah, Husain, God's Will (be done). There is no power but God (Allah, verse 33). I ask God's forgiveness. At the lowest point of the octagon four tiny cartouches each contain one of the names of God. The centre of the bowl's interior is decorated with an octagonal medallion containing, in a broad swash script, the shahadah. Five concentric rings occupy the interior walls around this central inscription. The inner ring contains the surah al-Hijra (2:1), in densely written naskhi script. The next ring contains a large engraved flowerhead, marking the beginning of a quotation from the surah al-Ashra4 (33a, verses 6-7), written in a very broad script on a decorated ground. The third ring contains the surah al-Nas (28:4), written in small naskhi. The fourth ring contains four elongated cartouches alternating with four smaller scalloped ones. The inscriptions inside these cartouches read as follows: (beginning with the smallest medallion in line with the lower part of the central octagon): "O Healer of diseases"; "Help from God and a speedy victory", from the surah al-Saff (2:161, part of verse 152); "O Framer of rain"; "And God has power over all things", from the surah Al-Fatihah (1:1, part of verse 2); "O Framer of welfare"; "Which none shall touch but those who are clean", from the surah al-Waqi' (2:10, verse 75); "O Sufficient in difficulties"; "And if anyone puts his trust in God [sufficient is God for him]", from the surah al-Talaq (6:1, part of verse 3). The fifth ring, near the rim, has the "Throne Verse" (2:255) written in a small script.

This is the only recorded example of an agate talismanic bowl. Numerous cornelian, chalcedony and quartz talismanic pendants and gem stones from Safavid Iran and Mughal India are preserved in various collections, including the Khalili Collection (see cat. 81 discussed below). Few of these are dated, however, and those that are come from the second half of the 17th century or later. The early date on this talismanic bowl appears to provide clear evidence of the established production in India of this style of talismanic carving in agate and related stones in the late 17th and early 18th century.

1. See Kaya 1966, p. 49, where two examples are dated: cat. 81 (AD 1664-65) and no. 113.21 (AD 1700-10); see also James 1981, p. 22, for one dated AD 1672 (AD 1663).

36-38
Three magic bowls
North-western India, 18th–19th century

Tinned copper alloy, crack in the rim on one.
Height: 9.9 cm
Diameter: 21.2 cm
Accession no. T.269

Copper alloy, cast in one piece, height: 6.6 cm, diameter: 13.9 cm
Accession no. T.269

Copper alloy, cast in one piece, height: 6.6 cm, diameter: 13.9 cm
Accession no. T.269

The method of making these bowls was markedly different from that of other metal bowls, in that the inside part of the casting was turned on a lathe after some of the inscriptions were touched up before the ground was added. The final appearance of the object was obtained by polishing with a coarse abrasive. Although these bowls are constructed as a single piece, they appear to be made to have been added and used for collecting and storing. There is a silver ring cast at the base that appears to be a surface treatment; it is tinned or silvered to give an appearance of the object. At the centre of the innermost medallion contains the phrase "Imam Hazrat, O Im". Four concentric rings alternate with small inscription, followed by the surah al-Nas. The inscriptions are as follows:
Three magic bowls
North-western India,
18th –19th century

Timed copper alloy, cast and engraved; crack in the rim on one side. Height 5.9 cm diameter 17.3 cm. Accession no. MWF 167

Copper alloy, cast and engraved. Height 6.4 cm diameter 16.4 cm. Accession no. MWF 165

Copper alloy, cast and engraved. Height 6 cm diameter 16.4 cm. Accession no. MWF 117

The method of manufacture of these bowls was markedly different from that of other metal magic-medicinal bowls, in that the inscriptions were part of the casting. The pieces were turned on a lathe after casting and some of the inscriptions and decorations were touched up by engraving before the ground was filled with a dense black compound, making the large inscriptions very prominent. Although these bowls bear no magic sigils, they appear to be similar to two bowls said to have been made in Bedar and used for colic and confinement.

There is a silver cast to the alloy of cat. 36 that appears to be the result of surface treatment; it was probably tinned or silvered to conceal the rough appearance of the object after casting. At the centre of the interior, a circular medallion contains the invocations ‘O Imam Hasan, O Imam Husayn’

Four concentric rings, beginning at the innermost, contain the ‘Throne Verse’ followed by the surah al-Hijr (2:220). The inscriptions are cut with a recessed ground and are fully vocalized. The exterior of the bowl has no inscriptions, but is decorated near the rim with a band of undulating vines enclosing flowers, a thin s-link chain, and a row of incised semicircles, some containing flower buds and with pendent buds at the ends.

The inscription on the interior of cat. 37 are in a well-formed naskh script and are fully vocalized. The inscription on the exterior is in a casual naskh script that could have been added later. The surface of the bowl has been badly eroded with a corrosive substance. Traces of a black material still adhere to the dark, recessed and hatched ground of the inscription. In its original condition the interior of the bowl must have been quite black, with the inscriptions in high contrast. There are three small copper repairs, one filling a hole near the rim.

At the centre of the bowl there is a roundel containing the words ‘O God, lend us support!’ This is surrounded by four concentric rings of inscriptions which read as follows, from the uppermost ring downwards: ‘I seek refuge with God from the accursed devil!’ followed by the ‘Throne Verse’ (2:225), which extends from the uppermost to the third ring; followed by the prayer, ‘O God! Bless Muhammad the Chosen!’, concluding, in the innermost ring, with the prayer ‘and bless Ali the Accepted, and bless Imam Hasan [and] Husayn the martyr of Kerbala.’

The interior of cat. 38 also has inscriptions engraved on a recessed and hatched ground, which was once filled entirely with a black compound. A band near the rim carries a quotation from the surah al-Kahf (18, verses 1–4). Verses 5–6 then continue in three of the six roundels that form a ring in the centre of the bowl. The remaining three roundels contain the haurudah followed by text from the surah al-Saff (33, part of verse 13), which is continued in a central roundel.

The exterior, which has no inscriptions, is decorated with two series of small pointed arches, one under the rim, the other next to the foot, with an intervening broad band of four pendant designs, in a pattern similar to that on cat. 37. The engraved lines, too, were once filled with a black compound. Traces are still visible in some areas, especially in the contours of the pointed arches.

Although there is no mention of ‘Ali, or other indication of its being intended for a Shi’i use, the bowl appears to have been made in the same workshop that produced cat. 37, which was intended for the Shi’i community.

1. Ismail 1921.
2. The word ‘imam’ has been written incorrectly as ‘ayyam’ in both instances.
3. The name of Husayn and the word for martyr (shahid) have been conflated by the engravers.
Magic-medicinal bowls in China

The great majority of bowls produced in the Islamic world are made out of ceramic, but few were known. However, porcelain bowls, in fact, were produced in China. Muslim communities are found in South and East Asia. Two main groups are identified, one whose production began in the late 17th century, the other in the 19th century. The use of the latter group is relatively rare, but their occurrence is frequent. These groups consist of inscriptional and decorative items that otherwise are unique. The 17th-century group does not bear many inscriptions, but the inscriptions used a traditional layout confirming identification as magic bowls. These two groups, therefore, be distinguished from Chinese porcelain in outstanding specimens from blue and white, Xunode and Zhejide.

Glossary:

Swatow: The distinctive type of Islamic magic-bowls produced in the late 17th century is made of porcelain that is called "Swatow" ware. The name Swatow arises from the manufacture of the name of the city, in northern China. The site of manufacture is no longer located, but the bowl is characterized by a dull white slightly coloured, glazed surface painted in a raised manner. All Swatow bowls, intended for export to India or the Middle East.

The Swatow magic-bowls can be divided into three groups. The first two have an inscription that mentions the name of the God. The third group is surrounded by another inscription.
Magic-medical bowls in China

The great majority of magic-medical bowls produced in the Muslim world were made out of metal, and it is not known how many ceramic ones were made. However, porcelain magic-medical bowls, inscribed in Arabic, were produced in China for export to Muslim communities principally, it would seem, in South-east Asia and India. Two main groups can be identified, one whose manufacture began in the late 13th or early 14th century, the other in the late 18th. In the case of the latter group, their magic-medical character is borne out by the frequent occurrence of magic squares. The squares are accompanied by mostly Qur'anic inscriptions, and the same choice of inscriptions occurs on technically and decoratively related items that otherwise lack the magic squares. The 16th- and 17th-century group do not bear magic squares, but the inscriptions used and their compositional layout confirm their traditional identification as magic-medical bowls. These two groups should, therefore, be distinguished from earlier Chinese porcelains inscribed in Arabic, outstanding specimens of which range from blue-and-white wares of the Xianze and Zhenzhe reigns to a large gilded service produced evidently for the Ottoman court in the late 15th century.1

Group One. Swatow wares

The distinctive type of Chinese—Islamic magic-medical bowl produced in the late 16th to early 17th century is made of a porcellaneous stoneware that is commonly referred to as ‘Swatow’ ware. The name Swatow arises from the early transliteration of the name of the port of Shantou, in northern Guangdong province. Shantou was not, however, the site of manufacture for these wares; in fact, no site that is known to have manufactured Swatow wares has been located. The shallow, saucer-like dishes have a coarse greyish or buff-white body with a dull white, or sometimes slightly coloured, glaze, and they are usually painted in a rather unsophisticated manner. All Swatow wares, whatever their design, were apparently intended for export to South-east Asia, India or the Middle East.

The Swatow magic-medical bowls can be divided into three groups. The first two carry a Persian inscription that mentions ‘Khan-i Khanan, follower of Akbar Shah’. Both have a central inscription within a disc surrounded by eight roundels, also containing inscriptions, and another inscription near the rim. The nature and arrangement of these inscriptions varies. In the first group, the inscription near the rim contains a text from the surah al-Isra (v. 22), followed by the phrase, ‘Praise be to God, my Great Lord’. The roundels contain four phrases, ‘There is no god but God, Muhammad is the messenger of God’ (the shahada), ‘I ask God’s forgiveness’, ‘I beseech the Shah (اللّهُ)’, and ‘O Conqueror’ (سُلْطَانُ). Each repeated twice. The names of the first four Caliphs and invocations to Muhammad and Allah are set between the roundels. The central disc contains the statement, ‘the humble servant, well-wisher, Khan-i Khanan, follower of Akbar Shah’ (Rashid al-kamal al-dawla al-khwar khan-i khan-i khusraw al-murar i Akbar Shah). The second group is more unevenly Shi’ite. The statement naming Khan-i Khanan is given twice in two of the eight small roundels, while the other six roundels contain the statements ‘There is no god but God, Muhammad is the messenger of God’ and ‘Glory be to God and praise to Him’, each written twice, and text from the surah al-Isra (v. 23, verses 1-4) and al-Nas (v. 38). The word Allah is written between each roundel and the ‘Throne Verse’ from the surah al-Baqarah (v. 253) begins near the rim and is completed in the central disc. Surrounding this disc is the metric Shi’i poem beginning, ‘Call upon Allah, through whom millions are made manifest’.2

The reference appears to be to the Mughal Emperor Akbar (r. 1556–1605). In Akbar’s day the Khans of Khwaju or Khan-i Khanan was a senior military title granted to only one person at a time.3 The two most likely figures to whom the inscription might refer are Miram Khan, who was appointed Khan-i Khwaju in 1568, and held the post until his death in 1576, and Mirza Abd al-Rahim, who was given the title in 1568 and retained it until his death in 1629.4

How the title Khan-i Khanan came to appear on this group of Swatow wares is unknown; other was added to give the porcelain a spurious air of authority and efficacy, or the Swatow porcelains were derivatives of a magic bowl that was indeed produced for a member of Akbar’s court, though it need not be assumed that the model was necessarily itself Swatow ware. The third type of magic-medical Swatow ware bowls are non-sectarian, and may have been produced for a quite different market than the previous types. An example in the Topkapi Palace Museum, Istanbul, has the ‘Throne Verse’ written in a central roundel, encircled by four smaller roundels containing undeciphered inscriptions and a poem written beneath the verses. Arabic inscriptions are written in turquoise and black enamels. A second example, cat. 59, has the best calligraphy of any recorded specimen of ‘Swatow’ wares intended for Islamic communities, whatever the design. Although it lacks the ‘Throne Verse’, which generally plays such a prominent role in the inscriptions on magic-medical bowls, it does have some black granules of the surahs of the Qur’an inscribed in the central and six surrounding roundels. Neither of these non-sectarian ‘Swatow’ magic-medical bowls is dated, but both are attributable to the late 16th or early 17th century.5

Group Two. Fine porcelain bowls of the 18th century

A much later type of Chinese—Islamic magic-medical bowl, dating from the last quarter of the 18th century and made of much better porcelain than the Swatow wares, must have been produced in数量的 examples, for many examples are recorded. The commonest forms are either deep bowls or shallow, saucer-shaped dishes, both types decorated with concentric rings of inscriptions, most often enclosing a central magic square. On the rims with a magic square at the centre, the Arabic inscriptions are always the same and are laid out in a consistent form and in the obvious lack of knowledge of Arabic on the part of the Chinese painters resulted in numerous errors or illegibly formed letters.’ The nature of the inscriptions indicates that the wares were intended for shipment to centers of Shi’ism. At least 19 items of this design are known, including two particularly fine examples in the Khalili Collection, cat. 41 and 42. The 4 × 4 magic square occupying the centre of this design is always the same, although numerous mistakes were made by the painters of the porcelain, who clearly did not understand Arabic numerals. Of the 16 sets of numbers in the square, on average only about five or six are correct as written on the bowls. The square that was in the original pattern employed by the workshop producing these wares can be reconstructed as follows:

The square’s common sum is 194. Around the square the Shi’s formula usually rendered as ‘There is no hero except God. There is no god but God, except Dhu’l-Asaq’. It is written in four parts. On all Chinese—Islamic magic bowls of this design, the word ‘conqueror’ (sultā) is written instead of the word for hero (hārā) or fate (fatīḥ).7

The Shi’s formula is often found on amulets, on military pieces, and on printed talismanic charts with drawings of swords, Dhu’l-Asaq being the leader of the Shi and the Prophet Muhammad acquired as a boy in the battle of Badr.8

On the saucer-shaped dishes with a central magic square, there are five concentric bands of inscriptions. Of the four outer bands, beginning with that nearest the rim, contain the ‘Throne Verse’ and following verses from the surah al-Raṣūl (v. 110). Verses 251-253 followed by a set of prayers and invocations. There is no god but God, Muhammad is the messenger of God. There is no god but God, great is his splendour. There is no god but God, great is his praise. There is no god but God, sacred is his name. There is no god but God,Absolute is his majesty. There is no god but God, to Whom there is allegiance. There is no god but God, his throne is outspread. There is no god but God, in Whom there is trust. In the name of God the Healer. In the name of God the sufficient. In the name of the Chosen of Restorer. In the name of God, by Whose name nothing comes to birth in the heavens. His throne is known and he is the All-Mighty.9

The innermost, fifth band contains the metric Shi’i prayer beginning, ‘Call upon Allah, through whom millions are made manifest.’

On the deep-sided bowls, the square is encircled by the four-part Shi’s formula at the bottom, surrounded by a ring of Arabic containing the metric Shi’s prayer calling upon Allah. On the outside of the bowl, four bands of Arabic inscriptions are interpersed with bands of decoration; the rest of the Arabic here is identical to the outermost four bands on the inside of the saucer-shaped dishes.
rings of inscriptions—these sometimes take the form of small, four-petalled flowerheads or, more commonly, foliate scrolls—and in the colour of the inscriptions, which may be written in black, gold, or gold on a dark blue ground. Occasionally the foliate scrolls are in red enamel, with gold inscriptions in gold on a dark blue ground; more often they are in red enamel with the script in black enamel or in gold that has now faded. At least three examples are known where the foliate scrolls were painted in red, but now badly faded, with the inscriptions in black enamel. The most elaborately executed scrolls tend to be those painted in dark blue enamel, like cat. 4. In terms of the execution of the script and the foliate scrolls, this is one of the most recorded examples of a Chinese-Islamic magic-medical bowl with a square magic.

Very similar porcelain magic-medical bowls, but lacking the central magic square, were apparently made by the same workshops that produced the more common type. Also made for export to Shi’i communities, this second type is less well-known, and is represented by two pieces in the Khalili Collection (cat. 41 and 42) as well as by two unpublished examples in London. Like those with magic squares, this type of ware has the shoulder-dub in a two-part inscription at the centre. On the shallow dishes nine concentric bands enclose the central inscription, similar to those on the bowls with magic squares, and in the bands a foliate scroll design alternates with Arabic writing. The next two bands differ, however, from those on vessels with magic squares, for in this design the five bands of Arabic comint only the ‘Throne Verse’ and the two following verses from the surah al-Baqarah (2:225–7) followed by the phrase ‘Call upon Allāh, through whom miracles are made manifest’. In the case of the deep bowls, this prayer encircles the central inscription in a single band, with the ‘Throne Verse’ and following verses written on the outside of the bowl in four bands that alternate with three bands of foliate scrolls with flowers placed at regular intervals. This brief survey of the extant Chinese-Islamic magic-medical bowls demonstrates that they were produced in two main phases—the Swatow wares in the late 17th and early 18th century, and the fine porcelain wares in the late 18th century. Despite their common function they are of quite different types and come from different centres of manufacture. This suggests that there was no continuity in the production of magic-medical bowls within China, and therefore no market for them in that country. They were made intermittently in response to trends from Muslim communities outside China, but they appear to have had no influence on the pottery of the areas to which they were exported.

1. For two examples with Shi’ite inscriptions in the Topkapi Palace Museum, see Khalil 1986, pl. 39–40 and 41–2; also see Donatius 1971, fig. 1. For two examples of non-Sunniate characters in the Topkapi Palace Museum, see Khalil 1986, pl. 58, nos. 779–80. The largest Chinese–Islamic dish with a Zhengde mark (8.5 centimetres in diameter) appears to be non-Sunniate. It was in the collection of the Asadabad Shrine and is now in the Iran Bastan Museum, Tehran, Arabali Collection, inv. no. 8474; see Pope 1996, pls 75 and 76 and Tehran 1981, nos. 58.


3. Four plates of this design are now in the Museum Negara, Kuala Lumpur, inv. no. 887.197.1967a (b), 887.197.1967b (c), 887.197.1967d (d); see Yatim 1981, pl. 12, fig. 9, and for illustrations and pp. 21–24 for a partial reading of the inscriptions. Another plate of this design was in the Bibi Baghara Collection, Aurangabad; see Hunt 1966, pls 65–6 and 69–70, where a translation is given but no photograph or transcription. Two more are in the Museum Het Prinsenhof, Leuwen; and in the Hanyang Museum, inv. no. 1998.031 and car 3914; see Harrison 1979, pp. 110–113, nos. 218–25.

4. Two examples are in the Museum Negara, Kuala Lumpur, inv. nos. 887.197.1968a (1) and 887.197.1968b (2); see Yatim 1981, pls 6 and 7, and another bowl, acquired in Hyderabad, was in the private collection of E.H. Hunt; see Hunt 1966, pp. 6–9 and pls 7 and 8; for another, see Te’Kun 1972, p. 203 top.

5. For this title, see Hal 1978, 7.

6. For the former, see Ali 1993. For the latter, see Husain 1960; and Hunt 1966, pp. 62–65, for arguments that Misra ‘Abd al-Rahim is the most likely candidate. There were those who asserted that Misra ‘Abd al-Rahim secretly followed Shi’i tenets, though he was not a Shafi’i.; see also catalogue of a sale at Sotheby’s, London, March 1990, lot no. 461, where a pair are illustrated.

18. Of the three known to be of this design, two, including 204.1970 (cat. 49), had inscriptions in gold that is now very faded, while cat. 40 has the Arabic script written in gold enamelled over enamelled with red. The other known example is in the British Museum, London, Department of Oriental Antiquities, inv. no. 1697, unpublished.


20. On the four known examples of this type of porcelain magic-medical bowl without the magic square, the scripts and the foliate scrolls were all painted in gold enamelled and empha- sized by overlaid red lines, while the flowers were painted in gold enamelled and the details and outlines highlighted in red enamel. The flowery stamens are rendered in fine lines in black enamel. These all appear to have been produced by the same workshop, probably the one that made cat. 40, where the inscriptions are painted in a similar style: it is clear that several of the workshop’s artificers were employed in producing the wares, and that some took more care than others with the scroll design and when copying the Arabic inscriptions, as they evidently did not understand.
known examples of
ceramic magic medicinal
the magic square, the
drawn scrolls were all
decorated and empha-
sed red lines, while the
inked in gold inked
and outlined highlighted
the flowers' stamens
fine lines in black
appear to have been
same workshop, prob-
ably that made cat. 40,
inscriptions are painted in a
are clear that several
of artisans were
producing the wares, and
more care than others
design and when
the inscriptions, which
would not understand.
Magic-medicinal bowl
China, late 6th century or early 7th century
Porcelain
height 8.1 cm diameter 20.4 cm
accession no. 70.2171

This large, saucer-shaped dish, which rests on a low foot, is the finest recorded example of ‘Swatow’ ware made for export to the Islamic lands. The fully-vocalized Arabic inscriptions have been carefully written by someone who knew the language – a most unusual feature on Chinese–Islamic magic-medicinal bowls. There are no inscriptions that would indicate that the vessel was intended for Muslims of the Shi’i sect, nor is it inscribed with the nearly ubiquitous ‘Throne Verse’ from the surah al-Baqara (2), verse 255.

The text is composed entirely of Qur’anic verses. In the centre of the bowl are the surahs al-Qalid (59) and al-Fatiha (1). A band of inscriptions with the surah al-Falaq (113) encompasses the central disk. Six roundels, divided by a thin ring of green enamel outlined with black, contain further Qur’anic verses: reading anticlockwise from the top, the surah al-Talibin (92) occupies the first four roundels, and al-Hijr (139) the last two. The shahadah is repeated in the spaces between the roundels. The surah al-Humazah (91) is inscribed immediately beneath the rim, followed by ‘God protect me from Satan, the rejected one’, a variant of verse 38 from the surah al-Naml (26).

All the Arabic inscriptions are painted in copper-red enamel except for those in the band encircling the central disk, which are dark green over-enamelled with black. Two thin copper-red lines circumscibe the design at the rim, with additional lines enclosing the central disk and its surrounding ring of inscriptions. The outside of the bowl is decorated with three bands of cloud scrolls of Chinese design painted in red enamel.

40–42
Three magic-medicinal bowls
China, circa 1790–1850
Porcelain
height 4.1 cm diameter 20.2 cm
accession no. 70.2171
Porcelain
height 3.9 cm diameter 20.4 cm
accession no. 70.2158
Porcelain
height 6.7 cm diameter 14.2 cm
accession no. 70.2156

These undated bowls were all produced during the middle of the Qing Dynasty period (1644–1912), between about 1750 and 1820. Cat. 40–42 are undated saucer-shaped dishes with the central 4 x 4 magic square typical of this type of ware. The content of the inscriptions on this example is consistent with other porcelain vessels with magic squares made in China for export to Shi’i communities in Iran, although the quality of the calligraphy and the delicacy of the foliate scrolls is outstanding.

The Shi’i formula, ‘There is no conqueror except Ali and no sword except Dhu’l-Faqar’ is written around the four sides of the square. Nine concentric bands outlined in black enamels contain, alternately, foliate scrolls in blue enamel and Arabic inscriptions in gold enamelled over-enamelled in red. The same treatment has been given to all the inscriptions and numerals in the magic square, and the black cells of the square have also been highlighted in gold. The inscriptions in the four outermost concentric bands consist of the ‘Throne Verse’ from the surah al-Baqara (2), verse 255, followed by the invocations and affirmations of faith found on all Chinese–Islamic porcelain magic bowls and slates of this type. The innermost concentric ring has the matratical Shi’i prayer beginning, ‘Call upon Ali, through whom miracles are made manifest’. The outside of the bowl is undecorated.

Cat. 41 is a saucer-shaped dish which has no magic square in the centre, but instead, a very poorly formed two-part inscription of the shahadah. Black enamel lines separate the nine concentric bands in which Arabic inscriptions alternate with foliate scrolls separated at intervals by small flowers. The inscriptions comprise the ‘Throne Verse’ and the two following verses from the surah al-Baqara (2), verses 255–257, concluding in the innermost ring with the matratical prayer calling upon Ali.

All the writing and the foliate scroll design have been painted in gold enamelled emphasized with red enamel. The delicate flowers placed at intervals in the scrolling design are in gold enamelled, with fine details overpainted in red. Although the rendering of the Arabic is quite corrupt due to lack of understanding on the part of the painter, the quality of the decorative work and calligraphy is very fine. The outside is black. A virtually identical bowl, also undated and evidently from the same workshop, is now in the British Museum.

Cat. 42 was apparently intended as a companion piece to cat. 40, with which it shares elements of design and the manner of executing the inscriptions and decoration, in gold enamel overpainted with red enamel for emphasis. On the inside, beneath the rim, a band of foliate scrolls separated at intervals by flowers is enclosed by two concentric black enamelled lines. At the bottom of the bowl there is a very neat attempt at copying the shahadah, and two more black enamelled lines enclosing a band containing virtually illegible attempts at copying Arabic. When compared, however, with a bowl in London, which is identical in design but with more carefully executed Arabic inscriptions,2 it is evident that the hand was intended to carry the matratical Shi’i prayer beginning, ‘Call upon Ali, through whom miracles are made manifest’.

On the outside of the bowl, black enamel lines demarcate seven concentric bands containing, alternately, corrupt Arabic script and foliate scrolls with flowers placed at regular intervals. A comparison with the London bowl suggests that the inscriptions were intended to represent the ‘Throne Verse’ and following verses from the surah al-Baqara (2, verses 255–257), which is in keeping with the text on cat. 40.

While this bowl is probably a product of the same workshop, the two pieces would appear to be the work of different artisans. Although heavily repaired, the London bowl is certainly from the same workshop as cat. 42, but was painted by an artist who took more care in copying the unfamiliar Arabic script and rendering the foliate scrolls.

1. British Museum, London, Department of Oriental Antiquities, inv. no. 60.620; unpublished.
Talismans, charts, and talismans

The Khalil Collection includes no less than seven talismanic charts of a type that has been generally overlooked in the scholarly literature. Some were folded until they were of a convenient size to be carried about the person; others were perhaps placed on a wall to serve as a household amulet, or integrated into household objects, in one instance attached to the interior of a halequered ivory case (cat. 45). All recorded examples are from the 18th and 19th centuries, and are of either Ottoman or Qajar workmanship. The examples in the Khalil Collection include one late Safavid, five Qajar, and one early 18th-century Ottoman example.

The letter, cat. 45, completed in 1750 AD, by Mustafa ibn Ibrahim, is notable for its unusually informative text about the construction and use of the talisman. The 99 names of Allah (Beautiful Names of God) play a central role for, in the band near the periphery of the chart, all of them are repeated 18 times, with further repetitions surrounding the central ring. It is also stated that the 99 Names of God, the Prophet and his description (shdhil), and the 144 verses of the Qur'an—presumably only their titles—are written according to the numerical values of the letters composing them. It has not been determined whether this is in fact the underlying principle for the placement of numerals swirling about the broad ring surrounding the central inscription. The head (literally, "crown") of the Prophet consisted of short statements about the Prophet’s physical and moral qualities, and its veneration was particularly widespread in Ottoman Turkey. The Ottoman chart, backed by a silk lining, has clearly been folded and unfolded for carrying in a case, in keeping with the instructions given on the sheet itself. These go on to assert that a person who carried the talisman at this side will be protected from numerous afflictions and misfortunes.

Four of the Qajar charts are very large in format and all show signs of having been folded so as to be portable. Three of them are undated, and one of these states that it was printed to protect the owner from disease, plague, the evil eye, the devil and other misfortunes. The fourth chart was made in AH 1357 (AD 1939) for someone named Riza Khan in order to protect him while travelling. The fifth Qajar chart is much smaller and was not intended to be carried on the person, being attached to the inside of a mirror case (cat. 48). It was made in AD 1892—3. The belief that simply gazing at a talismanic design is efficacious — rather than carrying it about — underlies its layout.

The design at its centre is the "Seal of Prophecy" (in Persian, ma‘ani-nawwurat; in Arabic, al-nawwurat-al-mutlaq), which is said, will provide protection from sudden death if it is looked at after each of the daily prayers. The Seal refers to a special mark borne by Muhammad which is unanimously described by all the sources as a type of aams or flyshy pro-tuberculosis located between the Prophet’s shoulder blades. It was by this mark, according to those sources, that the Christian mossi Bahira in cartouche simply containing an affirmation of faith, "God is one, He has no partner, Muhammad is His messenger, indeed You are victorious." On either side of this device is the statement that it is an example of the "Shaham al-mawwurat" which was between his shoulders" and that it was copied from a poem. The uses of the chart are listed beneath: whoever looks at it before the morning prayer will keep safe until sunset and whoever looks at it at sunset prayer God will preserve until dawn. Similarly, whoever looks at it in the morning prayer will be saved from many diseases as he, in the afternoon prayer, from many other diseases as he, in the evening prayer, from many other diseases as he. In the midnight prayer, whoever looks at it will be preserved from all.
looking at a magic square, understanding the illogic underlying a principle chart created for the community, possibly in a period (ca. 1065). This was found on the first folio of a large-format manuscript bearing the name Imam, the chart had different talismanic squares containing four corners the square contained the letters "al-dal, "al-dal, and "al-ha," each square became known as the "buddah square." So popular was this magic square, the name itself was assigned talismanic properties. In subsequent years, Islamic writers developed a variety of methods for forming magic squares of higher order, with 4 x 4, 6 x 6, and so on, squares being particularly popular. By the 13th century, the art was highly developed, and numerous designs can be found in manuscripts such as those by the 13th-century authority on magic, al-Busi, although the largest magic square that he produced was only 10 x 10.

Some left that the centre cell in a magic square of uneven order, such as 3 x 3, 5 x 5, or 7 x 7, is particularly symbolic, representing God at the centre of the universe. Consequently, this centre cell was occasionally left blank or filled with names of God. There are two 5 x 5 numerical squares with the centre cell filled with invocations to God on ca. 1045.

Latin squares

Two of the Qajar papier mache charts (cat. 44 and 47) have, in addition to the magic squares, designs known as Latin squares (in Arabic, mawqif mughaz). A Latin square is one in which each row and each column contain the same set of four letters, but no two rows or columns have the symbols in the same order. The four letters forming the word Allah might be used, for example, to form a 4 x 4 Latin square, in which each row and each column contains just those four letters. Latin squares have been used in the "crowning words" or mystical links that begin some of the Qur'anic suras appear on both the Qajar charts, while on cat. 44 there are also Latin squares using some of the "amal al-baum," one name per cell. Because this type of square often uses Qur'anic phrases or the names of God, they were considered of great protective value.

The verse square

A third type of square occurs on the composite chart, cat. 166, and on the Safavid talismanic stir, cat. 169, described below, both of which appear to have been made for members of the Twelver Shi'ite community. This type of magical square we might term a "verse square." The cells of such squares are filled with words but are not arranged as they would be in a Latin square. Rather, in each consecutive row one word is dropped on the right side and a new one added on the left side, so that an entire verse from the Qur'an is worked into the square, and can be read in its entirety by reading across the top row and down the left-hand column of the square. The size of such a square is determined by the length of the verse selected.

One of the large Qajar talismanic charts, cat. 43, has no magic square, but is nonetheless closely related to cat. 44 in design. The smaller sheet in the lacquered mirror case also lacks such squares. All of the talismanic charts, both Oram and Qajar, have the "Three Verses" from the surah al-Baqara (11, verse 255) inscribed upon them, sometimes several times.

3. Schimmel 1981, p. 54. The "khattam al-mawjud" is to be distinguished from the Prophet's seal or signet-ring (khettam), which tradition says he had made in order to write to the Byzantines, who, he had been informed, would only read a letter if it had a seal; see Allan Sourdell 1978, p. 105.
6. The undated, unsigned talisman, 20.5 x 15.5 centimeters, was acquired in 1987 and appears to have been recently printed. It is reproduced in a small facsimile by Fodor (1990), pp. 103, 102, and 106.
7. Shirazi 1908; and Philibot & Shirazi 1926.
8. University of St Andrews, University Library, Islamic ms. 353 (16th-17th century), 15 x 20.5 centimeters; it is reproduced in colour in Savage-Stirling 1993, p. 162.
9. A 30 x 30 square was previously stated to be one of the largest ever produced; see Cammann 1960, p. 207; 10. See Macdonald 1981 and Graefe, Macdonald & Plessner 1965.
11. For al-Busi, see the discussion of cat. 2 and 22. The anonymous traktat on the subject based on another authority, al-Bistami (d. 1474), also has no magic squares larger than 10 x 10; see cat. 21. For a 12 x 12 magic square by al-Tunjarra (c. 1350), see Senosi 1969-71 (1981), part 2, p. 299. 12. For the magical use of these letters, see Canaan 1937-8, pp. 94-95; Bell & Watt 1977, p. 53-5; and Bellamy 1973.
13. For the incidence of this verse on items in the Khalil collection, see Table 1.
Talismanic chart
Turkey: dated Rabbi 1122 (April-May 1722)

Paper over a loose, dark green, silk backing, 46.2 x 34.3 cm, written in naskh and Ishad scripts
scribe: Haaj Musa
account no. 596.719
published: Geneva 1995, nos. 181; Safwat 1996, no. 47

This large talismanic chart has been folded many times to form a small rectangle with dimensions of 8, 7.9, 7.9 centimetres, so that it might be carried on the person, probably in an amulet case. Today it is too worn.

The central globe encloses an inscription in Turkish that is unusual in providing detailed information about its composition and intended use. It reads as follows: 'It was begun at the hour of the Moon, and it was completed at the hour of Venus in the year 1724, on a Sunday in the month of Rabbi [April-May 1722]. There is a tradition by the Nabot, or noble companions, May God be pleased with him, that God, May He be praised, and may He grant 100 different wishes of anyone who copies out this firkân talisman in the following manner and carries it with him: 70 of them for the next world and 30 for this. What is more, He will keep him safe and protect him from all diseases and misfortunes, because of His benevolence and generosity, for all 1999 Beautiful Names are included in it seven times over. Furthermore, the Noble Names, the name of God's messenger, his noble description, and the 194 surahs of the ancient word are written in letters with numeral letters according to jamali al-kabir. But he must be diligent, and he must hold it in his heart with respect and reverence and unalloyed credence. For if this talismanic document is not someone's side, his difficult affairs will be made easy, and his bad affairs will turn to good, with God's permission - May He be praised and benighted! If someone does not believe, he will have bad luck, and he will be a hypocrite. - We take refuge in God from such! For the angels will be the guardians of the man who carries this talismanic document upon his person; disaster, misfortune, and trouble will not befall him, if God so wills, May He be exalted! So, do not do anything to men who do not know this power, nor to hypocrites, and do not let them copy it, so that they do not become the victims of extreme treachery. It is not something that should enter their possession; let there be no negligence. For someone who carries this talismanic document on his person will not be one whom God does not see the blessed beauty of God's messenger or his own place in paradise. He will be free of the punishment of the grave and the fire of Hell. If God wishes - May He be exalted!

Moreover, God, May He be exalted - will protect the person who carries this talismanic document at his side from the evil works of Jinn and Satan, from the misdeeds of his enemies and oppressors, from brigands, from water, from fire, from snakes, from scorpions, and from animals that bite. In addition, He will protect him from maggots, from biting insects, from snakes, from scorpions, from animals that bite. He will protect him from the malicious looks, from the [wagging] tongue, from the evil eye, from a ruined reputation [halaq-ayma], from plague, from paralytic stroke, from the simoom, from the fury of the thunderbolt, from sudden death, and from all misfortunes and disasters. He will make him honoured and respected among His creatures, an object of awe and blessed by good fortune; He will bless his life and livelihood; at his last breath He will bring him to an end in true belief; and He will make him a benefactor and intercessor of God's messenger - all this because of His benevolence and generosity, concern, which there can be no doubt of his inheritance.

What is more, if a slave carries this talismanic document, he will be soon manumitted, if a prisoner of war carries it will be freed, and if a pregnant woman carries it, she will give birth quickly and safely; if a friar carries it, he will be safe from fear, with God's permission - May He be exalted! Furthermore, God, May He be exalted - will cause a person who carries this talismanic document on him to attain the path of righteousness, good fortune, and virtues, and (in addition) advantages in this world and the next will be forthcoming.

No one knows the end of the explanation of this talismanic document: apart from God - May He be exalted! I fear many particulars have been listed. From day to day, of course, they become better known. If a person wishes to obtain eternal good fortune and felicity, he should not allow it to leave his side while he is alive. In a short time its advantages will become apparent. These are among the blessings of this talismanic document, with God's permission - May He be exalted! If he recites one of the names of God - the name of God which is in conformity with his own name - and reads it every day after the five canonical prayers for the rest of his life, God, May He be exalted - will bless his life and livelihood and [will reward] him with good fortune in both worlds, if He wills - May He be exalted!' The ting surrounding this central inscription has a repeated Arabic prayer for Muhammad and his family, with lines of numerals filling the swirling spaces. Above and below the central circle are two medium-sized circles formed of gold lunar crescents. The upper one gives the description of the prophet in Arabic andTurkish. At the bottom of this circle the scribe has written his name. The text in the lower circle concerns the name of the prophet, written in Arabic and Turkish around the garment al-salw or footstep of the prophet drawn in gold. Three smaller circles, also formed by a gold lunar crescent, are arranged about the central large circle, and written in each one is the name of the four orthodox caliphs, Abu Bakr, 'Umar, 'Uthman and 'Ali.

In each of the four corners of the central rectangular field there are square diagrams composed of 15 smaller squares. The inner nine squares have diagonal bands of numerals, mostly the numbers 7 and 8, on a dark gold ground. The remaining sixteen squares, forming a border and written mainly in red, are filled with repetitions of invocations. In the square diagram in the lower right-hand corner, however, the name of the prophet is written in black ink at top left: 'The owner of this great and precious Qur'anic talisman is the noble prince Mustafa ibn Ibrahim. The ground of the central rectangular field is filled with vegetal decorations painted in gold and framed by a narrow band of writing in irregularly spaced groups of three pentil decorated fillets decorated filled with gold. Filling the spaces between these decarations are seven repetitions of the "Corneous Verse" from the surah al-Raqibah inscribed with invocations to God using the asma' al-husna.

The periphery of the talismanic chart is occupied by a broad band of inscription, written in the miqyas; thus, in this band alone are to be found 1783 of the 1999 'Bountiful Names of God' mentioned in the central inscription. The use of the 99 names several times elsewhere on the chart brings the total close to that specified by the calligrapher. 1. The term firkân talisman, trated and below as 'talismamic document', is not used in the literature regarding amulets and talismans. The word firkân means proof or evidence or any criterion that distinguishes between truth and falsity, and is also a name for the Qur'an. In the statement in Arabic giving the patron for whom this piece was made, the talisman is called al-aslâm al-qa'îm al-ṣâ'îm al-kârim (the great and precious Qur'anic talisman). There is, however, only one verse from the Qur'an written on this talisman. 2. The asma' al-husna, the divine names or epithets of God, are usually said to be 99 in number. In this case the number 1999 must refer to the total number of times they are mentioned on the chart. 3. A description of this and a discussion of bijahas as a calligraphic art form, see Safwat 1996, pp. 254-8 and n. 46-50. 4. In addition to the value given to letters in the abjad system of letter-numerals, a letter could also be assigned a numeral according to a system called al-jumal al-kubr. The name of the letter is written down and the abjad value of each component letter determined and added together to form the 'higher numerical value' of the letter. Hence the letter alif would have the value of 1 in the abjad system and a value of 111 in the system called al-jumal al-kubr. See Carzan 1937-8, pp. 128-29, 130-1.
in for whom this piece
alms is called.

'al-ahadah al-khârim
precious Qur'anic talisman;
however, only one
Qur'an written on this
alms, the divine
name of God, are usually
found in its number. In this
1-999 must refer to the
times they are men-
te text of this and a dis-
see as a calligraphic art
(1996, pp. 102-8) and
see the value given to
the system of letters
would also be
imal according to a
sâmi al-hamid. The
was written down
list of each component
and added together
the numerical value of
in the letter alif would
it in the abjad system
(see Cassen 1957-8,
plague or any peni-
tic disease; the word
al-jubub or as of the, which
as well as a devil or
al-ghul) means a paralytic
sitting on Kohl (1810,
but according to
it means a
talent dust-laden wind
is frequently given a
compound with other
ay, see Schimmel
the given here is by Tim
1983; the
and the impression of the
re Schimmel 1983,
Talismanic chart
Iran, dated Rajab 1337
(3 April–1 May 1919)

Parchment, perhaps gazelle skin, 76 x 48,5 cm, with texts written within an area 74 x 46 cm, in naskh script in black and red inks on natural and gold grounds within panels defined by gold and (faded) green lines and subdivided by gold, black, and red lines.

Accession no. ANS 775

The upper third of this talismanic chart is defined by a broad band with a gold ground set with a series of lozenges with scalloped edges and small discs, the latter containing invocations to God. The rectangular area enclosed by this band has a circular figure in each corner. The figures all have a border containing the 'Throne Verse' from the surah al-Baqara (21, verse 151), and the centres are divided into four regions, one containing 19 magical hexameter sigils and three containing corresponding alif-dal letters-numerals. At the centre of the top is a large, 10 x 10 numerical magic square, and in the left, a 10 x 10 square with two verses from the surah al-Tauhid (2, verses 28-29) repeated several times up and down the cells, every other word or phrase being written in red or black. These read: 'A solely anxious is He over you: the Believers is He most kind and merciful. But if they turn away, say: 'God sufficeth me. There is no god but He: on Him is my trust. — He is the Lord of the Thrones of Glory Supreme.' To the right is a 10 x 10 Latin square employing those names among the asma’ al-husna that begin with the letter qaf. Beneath each of the left two squares is a 4 x 4 magic square. Below them, two 16 x 16 magic squares flank a 10 x 10 Latin square composed of the 'growing words', that is, the groups of letters that begin some of the surahs of the Qur'an and to which mystic significance is attributed. The text serving as a ground around the circles and within the thin rectangles of the squares contains prayers and invocations. These are numbered from 1 to 104, beginning in the upper right-hand corner of the square containing the upper right-hand circle. After filling the ground between the circles and squares, they continue in the scalloped square lozenges in the frame, starting from the upper right-hand corner and proceeding anticlockwise. After completing the circuit the prayers then continue in the outer touches of the border that surrounds the whole composition on three sides, proceeding in a clockwise direction and ending in the upper left corner.

The lower two thirds of the talisman are dominated by a composite 100 x 100 magic square, with 10,000 individual cells delineated by gold lines. The overall square is divided into 25 sub-squares, each of which is 4 x 4 magic square whose sum is 20,002. The common sum of the rows, columns, and diagonals of the larger 100 x 100 square is 250,050. The positioning of the numbers in this gigantic square differs from that employed in the 100 x 100 magic square on cat. 46 and 47, although their common sums are the same. It would seem that the patterns created using gold grounds and red ink on cat. 46 were purely decorative, since they have no particular numerical significance in the overall magic square.

Beneath the 100 x 100 magic square there is a row containing eight smaller squares. The two at the right and left outside corners are Latin 10 x 10 squares, one repeating the asma’ al-husna that begin with the letter yyn and the other those names beginning with the letter fe. Next to these two squares are two 5 x 5 magic squares, with the centre cell containing invocations rather than a numeral. The middle four squares consist of three Latin squares using the asma’ al-husna that begin with the letters jim, min, and sin, and a fourth, verse square whose cells are filled with a poetic statement to the effect that a person will prevail over circumstances only if God wills it. The lobed figure at the centre of this bottom row contains the statement, "For the well-being of this blessed existence of his gracious lordship, the pillar of the virtuous [and] the noble, Aqa Bura'ish Haji in the month of Rajab 1337 (11 April–1 May 1919), Shams al-Dhikirin." The chart was at one time folded into a pocket measuring 6.7 x 10.5 centimetres and placed in an amulet case. A similar talismanic chart, made of gazelle skin and measuring 72 x 59 centimetres, was made for the Qajar ruler Muzaffar al-Din (reg. 1866–1909). It is likely that cat. 44 came from the same workshop.

A square is divided into smaller squares, each of which has a 4x4 grid. The sizes of these squares are 100 x 100, 10 x 10, and 1 x 1. The larger 100 x 100 square is the main focus. The smaller 10 x 10 squares are arranged symmetrically around the main square. Each of these smaller squares contains a magic square, which is a grid of numbers where the sums of the numbers in each row, column, and diagonal are the same. The magic squares are placed in a way that creates a pattern throughout the image.
Talismanic chart
Iran, 19th century

Parchment, perhaps gazelle skin, 63.5 x 44 cm, written in black, gold and red inks; text in naskh script on black, red and blue inks on natural gold grounds within panels. The chart is divided into two identical parts, each containing seven circular diagrams. These circles have the 'Throne Verses' from the surah al-Baqara (2, verses 255) written in red ink around the circumference, with four inner rings divided into 12 compartments: one ring has 19 magical lunette signs and the other three contain letters, all written in gold.

As the centre of the panel are five more identical circles, with the 'Throne Verses' written in blue ink. The text in black ink that fills the ground around the circles and the area within the rectilinear frames, as well as the text written in red within the narrow rectilinear frames and the four scalloped lozenges, consists of prayers and invocations to God.
Talismans chart
Iran, 19th century

Parchment, perhaps gazelle skin, 85 x 68 cm framed by blue, black, gold and silver lines; text in nasta'liq and nush scripts in black ink within panels defined by lines in blue, black, gold and red or black, gold and green, and subdivided by gold and blue lines accession no. 687.744

This undated talismanic chart from Qajar Iran bears creases indicating that it was once folded into a rectangle measuring about 17 x 11 centimetres and placed in an unaltered case.

The narrow upper panel, occupying about one-eighth of the chart, is framed by invocations and prayers. The circles at either end each consist of five concentric rings divided into 19 sectors. The outer ring has magical signs and the inner rings contain letters of the alphabet. The central circle has the "Throne Verse" from the surah al-Baqarah (2:255), the inner ring, with an inner ring of lunette signs and three rings of letters. In the centre of the circles the invocations Ya Allah or Ya husna (both meaning 'O God') are written.

Between the right hand circle and the nearby 4 x 4 numerical magic square are written the phrases 'There is no god but God' and 'O Rider, the Watching One'. Betrare are the seven magical signs, often incorrectly called the seven Seals of Solomon, representing the name of God, with the usual star represented here by the interlaced Lunettes near the lower corners of the magic square. Between the magic square and the centre circle there is a quotation from the surah al-Dhikr (151, part of verse 58), 'Who gives all assistance,' Lord of Power, Steadfast (forever) with magical letters beneath.

To the left of the central circle, an inscription reads, 'He is Living, the Eternal', beneath which there is a six-pointed star bearing magical letters. Between the left-hand circle and the second 4 x 4 magic square is the inscription, 'Only God, only God, only God, King of Kings, Possessor of Majesty and Generosity.'

The square lower panel, occupying the majority of the chart, has around the periphery a narrow band of prayers and invocations to God in which this talisman is referred to as hijab al-nasir ('the amulet of light'), probably because God is frequently invoked in the inscription by His divine name 'The Light' (al-nasir) and His light and guidance are sought.

The centre of the lower panel is filled by an enormous field containing a composite 100 x 100 magic square, containing numerals in each row and column, resulting in a field of 10,000 individual cells. The overall square is divided into 25 sub-squares outlined in blue ink. Each sub-square forms a 4 x 4 magic square. A random examination of a few of these sub-squares indicates that in each row, column and diagonal, the sum of the numerals equals 10,002. If this is indeed consistent throughout the chart, then in each of the 100 rows and columns and the two diagonals, the sum of the numerals equals 100,002.


This undated talismanic chart was probably made in the same workshop as cat.46. Creases on the chart suggest that it was once folded to a size of about 17 x 11 centimetres.

In the upper segment there are three circles with seven concentric rings: in the outermost ring some of the armå' al-Jawwâl are written, the two rings within it contain the 'Throne Verse' from the surah al-Baqarah (2:255), lunette signs fill the fourth ring and letters in the innermost three rings surround a gold central disc. The two squares in the upper segment of the chart are of the order 5 x 5, rather than 4 x 4 as found on cat.46; they are Latin squares employing the 'crowning words', the groups of mystical letters that begin the surahs Maryam (106) and al-Fâtimah (32).

Over each circle a lower hand has written a magic square and a surrounding magical text, which are largely illegible. The ground around the three circles and the two Latin squares has also been filled in by a later casual hand with additional magic squares, one of which is incomplete, and with densely written invocations to God, including the following statement in the right-hand corner: 'O God, protect the owner of this large chart (jâzyl) from all misfortune and diseases and plague (nadvâ'), from the evil eye and harm, and from the evil of the cursed devil.'

Around the outside edge of the chart is a lengthy prayer and invocation to God, while more invocations are written in an inner frame surrounding the lower panel. The lower panel contains the same composite 100 x 100 magic square that is found in cat.46.
Talismanic chart

Iran, dated 1310 (AD 1892–3)

Paper, 17 x 10 cm, written surface 14.7 x 7.5 cm, framed by blue, black, gold, and red lines; text in naskh script in gold, red and blue on blue and gold grounds within panels defined by black, gold, green, blue and red lines; intervening areas illuminated with stylised floral motifs in gold, orange, red, green and pale blue on gold and natural grounds

Published Khalili, Robinson & Stanley 1996, cat. no. 147

This illuminated talismanic chart is mounted on the inside of one of the covers of a double mirror case. The exterior of the case has fine flower- and bird-paintings by Muhammad Ali Shirazi, surrounded by poems extolling the mirror in quasi-religious terms.

The talisman has a title written in the cartouche at the top of the chart. It reads: 'The form of the Seal of Prophecy (muqawwad-in-nukhush) of the Seal of the Prophet' — 'May God bless him and his family'! A broad band forms a frame on three sides and encloses the 'Throne Verse' from the surah al-Baqarah (2, verse 255), followed by the date 1310 (AD 1892–3) written in the upper left-hand corner.

The enclosed rectangle is divided into two unequal fields. In the upper section there is a large disc filled with unciphered magic letters, which are apparently intended to be the 'Seal of Prophecy' referred to in the title of the talisman. Several talismanic designs were popularly associated with the Seal, which was said to be a form of molten or growth located between the Prophet Muhammad's shoulder blades.2 In the gold ring surrounding this disc there are inscriptions in two registers. The inner register consists of a circle of magic letters, with the expression Yā dafa' ('O Preserver!') at the base, while the outer register contains verses 51–52 from the surah al-Qalam (62:21) and verse 64 from the surah Yāsīn (36:1). A narrow green ring encloses these quotations. In the four corners of this upper area are devises with the names of the four archangels, Jibrīl, Mīkhā’īl, Isrā’īl and ‘Aqīl.

In the lower and slightly larger field, the blue scalloped medallion contains verse 33 from the surah al-Nār (24:44).

The four small medallions surrounding it contain invocations to God in the form of some of the asma’ al-husnī. This composition is framed by a band with a gold ground containing a Persian inscription which begins at the upper right-hand corner, reads across the top and then down the right side and around to the upper left-hand corner: 'It is reported in the documents regarding the Seal of Prophecy from the Commander of the Faithful, that whoever looks at the Seal of Prophecy after midday prayer will be as if he performed one thousand pilgrimages before Abraham, and whoever looks at it after morning prayer will be as if he had performed thirty pilgrimages before Adam, and whoever looks at it after the afternoon prayer will be as if he had performed two thousand pilgrimages before Jesus, and would be safe from sudden death and suffering in the grave.' This particular design for the Seal of Prophecy is not referred to in the published literature on talismans. The talismanic chart also contains several elements that are found in amulets invoking assistance, particularly from the prophet Muhammad but also from other Qur’anic prophets such as Adam, Abraham, Jacob, Joseph, Jonah and Jesus.

1. Khettar al-mubayyīn, i.e. the last of the prophets, Muhammad.

2. See above, p. 106.


Talismanic shirt

Clearly related to the parchment talismanic above (see pp. 106–113) group of talismanic sheets drawn by the same scribe may have been one of four distinct types of Islamic talismanic sheet, some dated to the 18th century, can be identified: Islamic, Safavid, Mughal, African. The Khalili Collection of examples of both the Islamic and Mughal types.

Ottoman talismanic:

Ottoman talismanic:

The earliest dated talismanic known is one produced in the Ottoman empire some years to make, from 1480. It is typical of the Ottoman type, referring to Būkhārī as 'the chief god of the thrones, polished cloth, neckline, narrow sleeves. It is, however, of note that the talismanic chart is covered with a large magic square of various which is larger than 100 symbols, and in other Qur’anic suras (al-ISRA' 17:20) one piece.

Grand Vizier Kara Mustafa Pasha (1556–1632)

In which he was belgrad in 1679, and

Ottoman examples: A group of sheets are furnished with a present magic square as well as squares and six-pointed with script Qur’anic verses, and other devises.

One of the most magnificently written talismanic examples is one of those probably Safavid Persian script with the names of the Prophet written on them. They are probably limited use of col.
Talismans and talismanic symbols

Talismans are amulets or charms that are believed to have magical properties. They are often created by use of an inscription from the Quran or the Holy Qur'an, and they are worn or carried for protection or to ward off evil. The use of talismans is widespread in many cultures, and they have been used in different ways and for different purposes throughout history.

In the Islamic world, talismans have been used by various groups, including scholars, merchants, and soldiers. They are often made of materials such as gold, silver, or precious stones, and they may be inscribed with verses from the Quran or other sacred texts. Talismans are also used in magic and witchcraft, and they can be used to protect against disasters, illness, and other misfortunes.

In addition to being used by individuals, talismans have been used by governments and other organizations to protect their territories and populations. In some cases, talismans have been used as symbols of power and authority, and they have been used to mark significant events or occasions.

The use of talismans is still prevalent in many parts of the world today, and they continue to play an important role in many cultures and traditions.
the magical treatise. For the rest, the verses were selected from those considered generally beneficial on a variety of occasions, including surahs al-Nisā ‘(4), al- Ṣafā’ (162) and al-Fātiha (7). While the fact that all or part of the surah al-Fātiha is found on many, though not all, of the Ottoman and Safavid manuscripts indicates a military use,21 it should be noted that the surah is found on other talismanic objects, including magic-medical bowls, and that in the magical treatises it does not play a large role in the design of talismans useful for defending enemies.22 On the talismanic sheets it is always one amongst a number of Qur’anic verses, all of them providing protection against life’s misfortunes and success in new undertakings, by laying the onus on the Ottoman and Safavid, the third-repeated line from the surah al- Saff (6), verse 13, ‘Help from God and a speedy victory’, found on the Safavid sheet cat. 49, and on the Ottoman one made for Cem Sultan, reinforces the hypothesis that the primary intent of at least these two sheets was to assure success in battle.

In the case of the Mughal sheets, on which all the verses of the Qur’an are included, text from the surah al- ‘Affār (6), verses 23–30 (see pages 15 and 14) is repeated before the asma‘ al- ḫamās, while text from the surah al- Nisā ‘, verses 2–41, is repeated in the larger cartouche on the back of the garment. These verses yield few clues, however, as to the intended use of the garment, being generally concerned with guarding and refuge. It is not unlikely that these sheets were considered useful for other objectives as well as protection from injury and victory in battle. It should be noted, for example, that the verses from the surah al- ‘Affār that are repeated on the Mughal sheets but lacking on the Ottoman and Safavid ones were commonly (though not exclusively) associated with talismans and amulets employed against disease. Consequently, it has been suggested that these garments had a medical application as well as providing general protection.23 Such a view seems reasonable given the medical uses, as well as being generally pro- tective functions ascribed to the amulets of the large talismanic sheets.24 An older tradition of using garments with talismanic writing on them for various purposes is recorded by al-Buni, for example, who mentions that a shirt (qamis) can be used to gain the affection of a person by writing a specified magical design on its collar and pronouncing over the design an invocation to God based on the asma‘ al- ḫamās, followed by the phrase ‘seek the heart of’ followed by the name of the beloved.25 In the case of the West African undergarments, it has been suggested that they were intended to obtain the love of someone or to gain political and social favour.26

1. Topkapı Palace Museum, Istanbul, inv. no. 13/1455; Istanbul 1959, no. 255. It was begun on 14 Dhu‘l- Ḥijjah 885 (March 1477) and work on it stopped on 16 Muḥarram 886 (29 March 1478), it remained unfinished and unused, for the neck was not cut out and it was not lined. It may be, however, that the初次 printing given this information is not reliable, for an extravagant claim over the time taken to produce the sheet may have been made to enhance its value. A similar claim — to a production time of three and a half years — is found on a 17th- century magic-medical bowl (see p. 77, above).

2. Topkapı Palace Museum, Istanbul, inv. no. 15/1455; Anil 1957, no. 133, p. 198, Rogers & Ward 1988, no. 111, pp. 171, 177. The maker or possibly the calligrapher is given as Derwiz Ahmed ibn Sulejman.

3. Collection of Therese Dam, Pope Joan, pl. 113, which coincidentally describes itself as ‘Safavid’ (p. 113). The sheet is in the Musée de la Ville, Vienna, but was lost in 1945, and its present location is unknown. See also p. 197, note 78, where the calligraphy is a lengthy description on the cartouche on the back of the garment. These verses yield few clues, however, as to the intended use of the garment, being generally concerned with guarding and refuge. It is not unlikely that these sheets were considered useful for other objectives as well as protection from injury and victory in battle. It should be noted, for example, that the verses from the surah al-‘Affār that are repeated on the Mughal sheets but lacking on the Ottoman and Safavid ones were commonly (though not exclusively) associated with talismans and amulets employed against disease. Consequently, it has been suggested that these garments had a medical application as well as providing general protection.

22. Rogers & Ward 1988, p. 137. These two sheets were published in Alexander 1995, cat. nos 53 and 34, but the first paragraphs of the two entries were exchanged in error, and the plates were mislabelled as a consequence. p. 79 shows Tekeli (nos. 30 and 31) and pp. 80–81 show Tekeli (no. 34).

23. See a unpublished sheet in the Bodleian Library, Oxford, no. Bodl. Or.1618, and those ordered for sale at Christie’s, London, 18 April 1992, lot no. 78; Sotheby’s, London, 22 October 1993, lot no. 108; and Christie’s, London, 24 April 1993, lot no. 58. Also see Fehervar & Safavi 1984, pp. 249–251, no. 164. The latter was catalogued as a 17th-century shirt made under the Delhi Sultanate, and a similar attribution was made in the catalogue of a sale at Spink & Son, London, 21 November 1985, lot no. 78. Comparison with other examples, however, suggests that it is also a Mughul product rather than an Ottoman.

24. Some esquiline cartouche, such as those on the shirts illustrated by Fehervar & Safavi and in the Bodleian (see note 8, above), have devices filled with a decorative design reminiscent of that used on the sleeves of the unusual Ottoman shirt offered for sale at Christie’s (see note 9, above). It is possible that this particular shirt, which lacks the magic squares that are otherwise typical on Mughul products while maintaining the flared cut and typically Ottoman calligraphic panels, may represent a transitional design.

25. The talismanic shirt in the Bodleian Library, Oxford, no. Bodl. Or.1024, was given to the Library by the London merchant Richard Daryidge in 1653, which provides a terminus ad quem for its manufacture. Since the shirt was never lined and worn, it is likely that it was purchased shortly after it was made.

26. The shirt is found, for example, on the inside of a Safavid magic-medical bowl, traditionally used for anointing childbirth, made for the Twelve Shi‘i community. Relau 1874, pp. 39–40. It is also on two non-sectarian magic-medical bowls in the Khalili Collection, cat. 37 and 39. See also Istanbul 1956, p. 83. In the 19th century, the first verse of the surah and verse 13 of the surah al-‘Affār were inscribed on strips of cloth applied to the forehead, neck and the arm, in the belief that inscriptions in the names of God, including the names of the Imams. The lower part of the back includes an inscription in angels.

27. On the front of this sheet, a large and immediate framing band, are two areas: the left-hand area is dedicated toCotations to God using the asma‘ al- āḥad, written in black ink, while the right contains additional inscriptions to God. The right-hand rectangular inscription contains an inscription of names of God.

28. Above the chest of the shirt, two large, 24 x 24 cm squares are inscribed with the names of the surahs of the Al-Balad (red ink using a pattern employed in the larger on the left-hand side a 24 x 24 cm square and the entire ‘Trone Verse’ (al-Ra‘d, verse 2), a similar pattern, while to the 8 x 8 square contains the text of the surah (verses 2 and 3).

29. Writer in red on the sheet, a large right-angle magic 4 x 4 square.

118 Talismanic shirts

Talismanic shirts

Probable: Iran, 16th or 17th century

Can.76,149.7.17, 7.18, 7.19 and 7.20 are signed and give the year 1692. This cotton shirt was two large rectangular shoulders, the four smallest triangles forming the two triangular pieces sewn to the arms. There is a clasp for the neck and a slit down the front.

The shirt itself, the left-hand area is dedicated to Cations to God using the asma‘ al-āḥad, written in black ink, while the right contains additional inscriptions to God. The right-hand rectangular inscription contains an inscription of names of God. Across the chest of the shirt, two large, 24 x 24 cm squares are inscribed with the names of the surahs of the Al-Balad (red ink using a pattern employed in the larger on the left-hand side a 24 x 24 cm square and the entire ‘Trone Verse’ (al-Ra‘d, verse 2), a similar pattern, while to the 8 x 8 square contains the text of the surah (verses 2 and 3).
49

Talismanic shirt

Probably 16th, 17th or 18th century

Cotton, 76 x 145 cm, written in kufic and nūṣrā‘ scripts in red and black ink; accretion no. TX77

This cotton shirt was assembled from two large rectangular pieces, joined at the shoulders, four small rectangular pieces forming the two sleeves and two triangular pieces sewn as gussets under the arms. There is a circular opening for the head and a slit about half-way down the front.

Each piece of material is framed by a wide band containing prayers, invocations and Qur'ānic quotations. At the top of the right shoulder there is a quotation from the surah al-Saff (XXXI, verse 33): 'Help from God and a speedy victory', written in red, followed by the name of Muhammad, Al-Fatimah, Hasan and Husayn. On the other shoulder the inscription reads, 'O He who opens, O Opener of the Gates, O God, O Help! O He who gives victory to the Victorious.' The entire text of the surah al-Fāth (XCVI) is written obliquely in black ink, beginning at the upper left corner of the rectangular panel across the front of both shoulders, filling the whole panel from one side to the other and then continuing in the upper right-hand part of the oblique inscriptions across the middle, finishing near the middle. It is followed by a lengthy profession of faith, including the names of the Imam. The lower panel contains a prayer that includes many invocations to angels.

On the front of the shirt, at the bottom and immediately above the framing band, are three rectangular areas: the left-hand area contains invocations to God using much of the 99 names of God, written horizontally in black ink, while the right-hand space contains additional invocations and supplications to God. The central rectangle, inscribed obliquely in red, contains rows of magic numerals intermixed with letters standing for the name of God.

Across the chest of the garment are two large, 24 x 24 square squares, the one on the right formed of repetitions of a text from the surah al-Nāṣr (XIV, verse 33). Inside the square, the central 8 x 8 square contains the entire text of the surah al-Tabligh (CVI) written in red ink using a pattern similar to that employed in the larger square. Similarly, on the left-hand side there is a 24 x 24 square inscribed with the entire ' Throne Verse' from the surah al-Magārūthad (XLII, verse 255), worked in a similar pattern, while the inner area of an 8 x 8 square has the entire surah al-Nāṣr (XXIX) inscribed in red.

Written in red in the narrow central panel across the front of the shirt are eight magic 4 x 4 squares. In each, the top line consists of words rather than numerals, but the numerical values of each letter forming the word supply the correct numeral for them to be true magic squares. The common sums produced by each square, reading right to left, are 161, 244, 213, 693, 598, 818, 1732 and 2233. The words forming the tops rows of the squares read, 'There is no god but God'; 'Muhammad is the messenger of God'; 'Ali is the sincere friend of God'; 'for a true path we hold fast to him'; 'possessor of majesty and honour'; 'Peace—a word of salutation' from a lord Most Merciful' from the surah Fā'ā-sūr (XXXVII, verse 51); 'Help from God and a speedy victory' from surah al-Saff (xxxI, verse 33); and 'Verily we have granted thee a manifest victory' from the surah al-Fāth (XXXI, verse 33). Between the squares are invocations using some of the divine names of God, with prayers and Shi‘i invocations enclosing the band of squares.

Both sleeves have 16 x 16 square squares in a pattern identical to that used in the large squares on the body of the shirt. The sleeve to the right has the opening surah written in black, but because the surah is short, letters have been used to fill in the extra space. The centre area, forming an 8 x 8 square, contains, written in red ink, the common Shi‘i invocation 'Call upon 'Ali, through whom miracles are made manifest. You will find him a help to you when misfortunes occur. All anguish and sorrow will be dispelled through your prophethood, O Muhammad, and through your close- ness [to God], O 'Ali.' The sleeve on the left has the complete text of verses 26–7 from the surah Al-‘Imān (III) written in black, while the central square has the phrase 'Help from God and a speedy victory' from the surah al-Saff (XXXI, verse 33) and the first verse from the surah al-Fāth (XCVI). Both sleeves also have a band of red inscriptions running inside the framing band at the open end; these consist of prayers to God, also invoking Muhammad and 'Ali, and, on the left sleeve, the first half of the Shi‘i invocation beginning 'Call upon 'Ali, in whom miracles are made manifest'.

The gauntlet under the sleeve on the right has invocations to God written in red, while that on the left also has some 'crowning letters' of the Qur‘ān and the line from the surah al-Saff that occurred on the left sleeve.

This undated shirt is probably a Safavid product of the 16th or 17th century. Both it and another Safavid shirt in the Khāsh Collection, TX77, show signs of wear and have preservation stains under the arms. The repetition of the line 'Help from God and a speedy victory' from the surah al-Saff (XXXI, verse 33), and the prominent role of surah al-Fāth (XCVI) suggests the support of a military use for this particular shirt.

1. The left side in the illustration.
2. There are in fact errors in seven of the eight squares, only the fifth from the right being correct as it stands. In the first four squares, and the last two, the numerals occupying the centre two positions in the middle row of numerals must be interchanged in order for the squares to be correct. For example, in the first square 20 and 58 must be interchanged. Because this is a consistent pattern at the centre of each diagram, it would appear that this was an intentional error introduced by the calligrapher or the creator of his exemplar. It was not an uncommon practice purposely to make amagie square imperfect. In the sixth square, however, the error concerns two numerals on the bottom row, 192 and 155, which are mistakes for 197 and 235. Because the nature of this error is different, and because the fifth square is correct as written, it is likely that this calligrapher did not intend a deliberate imperfection. Furthermore, in the seventh square the serif contacted one numeral but left the two central numerals in their incorrect position.
Talismanic shirt
Perhaps India, 16th-17th century

Cotton, 142 x 97.3 cm, written in naskh and kufic scripts in red, blue, black and gold
Accession no. 1879.7

This shirt was assembled from one large rectangular piece of cotton and two small pieces forming the arms. There is a circular opening for the head and the front is slit for three quarters of its length.

The main field of decoration on the garment contains the entire text of the Qur’an in a neat naskh script: 1.1-128. The rectangular compartments are defined by red lines with blue and red circular medallions; there are four-petalled white flowers at the intersections of the compartments, and everything is set within a thin blue frame. The Qur’an text also fills the rectangular spaces, ending in round, scalloped edges, that form the lower borders of the garment.

The first surah begins at the lower corner of the back of the right sleeve, with the first four surahs filling the main field of the sleeve. Surahs 1-2 are on the left sleeve; surah 3-43 in the main field of the left-hand side of the front of the garment; and surahs 41-47 in the right-hand side. Surahs 48-50 fill the main field of the back, while surahs 51-55 are in the right scalloped rectangles at the bottom of the front.

The edges of the sleeves, underarms and sides, as well as the neck edge, from opening and areas between the lower bands of scalloped rectangles and the main field, are delineated by a wide border of red speckled ground on which the first four lines of the surah al-Muhdi (126), followed by all the asma’ al-husna, are written in gold inside cloud bands. Following the Samudah, the text begins at the lower corner on the back of the right sleeve with most of verses 22-23 from the same surah: ‘God is He, than Whom there is no other god,—Who knows all things) both secret and open; He, Most Gracious, Most Merciful. God is He, than Whom there is no other god;—The Sovereign, the Holy One, the Source of Peace (and Perfection), the Guardian of Faith, the Preserver of Safety, the Exalted in Might, the Incomprehensible, the Supreme.’ This is followed by the asma’ al-husna, which recur clockwise round the garment, ending near the same corner.

On the front of the garment, two large roundels contain the profession of faith, the shahidah, written in gold thulth script on a ground composed of a small red circle set inside a pale blue one. On the shoulders are epigonal quartercrescents containing three circles, each with the word Allah written in gold on a red and grey or pale blue ground, surrounded in one case by 12 smaller circles containing white flowers on red or blue grounds, and in the other case by 16 such circles.

On the back of the shirt there is a large oblong lozenge outlined in blue and red; inside it, written in gold in cloud bands on a red speckled ground, are the last of two lines from the surah Ya’as (20, verse 62): ‘But God is the best to take care of (of him), and He is the Most Merciful of those who show mercy.’

This undated shirt is probably a 16th- or 17th-century Moghul product. It most closely resembles a talismanic shirt recently offered for sale at Christie’s and another, illustrated by Fehérvári and Safadi. On the latter, the nature of the same of the script differs slightly and the epigonal shoulder decorations contain some circles with chequerboard designs. In all other aspects of the design, these two shirts are identical to that, including the rectangular panels forming the lower borders which in these examples end in round, scalloped edges. Other known Moghul talismanic shirts have triangular points rather than the semicircular scallops on the edges of the compartments.

1. Christie’s, London, 18 April 1992, lot no. 74, a fully lined and well-worn shirt.
2. Fehérvári & Safadi 1984, pp. 247-48, no. 164, incorrectly catalogued as a 15th-century Delhi Sultanate product. This example remained uncult and was never worn as a shirt; earlier, it was folded and refolded to fit into an amulet case.
Talismanic mirrors and plaques

The Kholid Collection includes two circular metal talismanic objects, mirrors or possibly plaques, that were made for the Twelve Shi'a community in Safavid Iran or Moghul India. Only one comparable piece seems to have been published—a rather more elaborate item that lacks the prayers for the Twelve Imams and was made for the Murshid sulfur of Faris, Kirman and Isfahan, Jalal al-Din Shirazi, in 1487. Both examples in the collection are intended to be read aloud. On each plate one side is blank except for a narrow circular inscription containing a Shi'i prayer with the names of the Twelve Imams recognized by the Twelvers or Imami Shi'i community. In the centre of the other side is a 30 × 30 square of 900 cells. This is a Latin square, employing the 26 letters of the alphabet, in abjad order, with two additional characters—esseh and hamee—making a total of 30 symbols written from right to left in order of sequence across the first line of cells. The same letters are then rearranged in the subsequent cells so as to form a rather interesting overall pattern. Every 5 × 5 group of cells is demarcated by a slightly heavier inspired line. Each of these 5 × 5 groups forms another Latin square, each of five elements it represents five times in different arrangements. The six 5 × 5 squares across the top of the large central square are all different, each being formed from five of the 30-letter sequence. These six squares are then repeated in a pattern to form a large 6 × 6 Latin square, each element of this composite square consisting of a letter but of a smaller, 3 × 3 × 3 square of abjad letters. The result is a Latin square of order 36 in which the two diagonals as well as each row and column contain all of the thirty symbols, with no repetitions.

On cat. 53 and the Oxford plaque there are two small Latin squares mounted on the left side of the plaque, oriented in the same way as the 5 × 5 squares. These squares are each divided into nine quarters, forming a 9 × 9 Latin square, each element of this composite square consisting of a letter but of a smaller, 3 × 3 × 3 square of abjad letters. The result is a Latin square of order 36 in which the two diagonals as well as each row and column contain all of the thirty symbols, with no repetitions. Above and below the large square are two true magic squares. Numerals are used in the cells, and the 3 × 3 square at the top yields the sum of 65 for its columns, rows and diagonals. The lower 3 × 3 square yields the sum of 54. The surrounding squares differ on cat. 56, where the two small Latin squares are omitted while the 6 × 6 × 6 magic square is repeated four times. There are also four small squares containing unclassified magical ciphers and twelve small roundels of rosicrucian signs. The circular inscriptions ring the Latin and magic squares are quite similar on the three plaques, with only minor differences. The Qur'anic quotation from the surah al-Field (xxviii) is omitted from the Oxford plaque and cat. 56. All three state that their primary use is to invoke God's protection from the evil and deceptions of jinn and humans, both male and female, as well as protection from pain and illness. The Oxford plaque and cat. 53 add a request for protection from vermin and insects, while cat. 56 includes a prayer in the list of general infirmitarian from which God's protection is requested. The latter can only be read aloud.

Illustrations of circular talismanic plaques occur in two manuscript paintings in the Kholid Collection. Both were produced in India, and the latter was probably made in Kashmir in the early 12th century, at about the same time as cat. 35 and 56 and to the same Oxford plaque; see p. 213 (illuminated left and above, p. 241) from a manuscript dated 1181 (1171–1172). Both are from copies of Fadawi's Shabnameh. The first illustrates Kaykavus in his flying machine and shows an astronomer or magician holding a circular plaque by its handle so that the handle is at the top. The plaque contains a Latin square of order 36 that may also have been familiar to those at the Moghul court who had contact with Europeans. The other miniature, see p. 215, depicts the birth of Rustam, recommended the use of Hebrew letters for charms intended to help the owner walk on water or fly. In the 16th and 17th centuries, Hebrew letters were frequently incorporated into European magical and talismanic items that may also have been taken to India by those familiar with these concepts. The Kholid Collection, cat. 35 and 56, are undated and unsigned products of one workshop. A third similar plaque, also undated and unsigned, is now in the Museum of the History of Science at Oxford. The latter has traces of silvering still visible while cat. 56 is made of silver, which suggests that all three objects were originally intended as mirrors. One of the three, cat. 55, has additional holes that were apparently made to attach it to a wall.

All three plates have other holes—at the point where there is a blank space in the peripheral inscriptions—where a handle was once attached; the outline of the handle is still visible on the Oxford example. When the user held the plaque upright, with the handle turned, the inscriptions and magic squares could be easily read. The inscriptions are almost entirely vocalized, suggesting that they were 124 Talismanic mirrors and plaques

17th-century handholds used, the surface had lost its luster. As none of the letters used is uncertain, it began. The evidence suggests that cat. 35 and 56 are the earliest possible, on the other hand, the magical powers of the thought to be so inscribed on a mirror or object would be sacrificially transferred to the engraving, and plaques with talismanic inscriptions became widespread. Although the evidence provide no proof, it is possible that polished surfaces covered with mirrors, as well as non-Moghul examples, would occasion for some form of divination, by employing e.g. a 3 × 3 square of inscriptions that may have been tuned to the awareness of those familiar with some of the same talismanic concepts as are found in the Middle East. No similar piece has been reported. A small, circular mirror made c. 16th or early 17th century, found in Safavid Iran, was engraved with a talismanic design: in one handle allows the mirror to be used as a sword and in the other it is used as a pendant, as well as held in the hand. In this case the inscription can be read only when the mirror is suspended, rather than held, as was the case with talismanic items such as talismans.

Although the author provides no proof, it is possible that polished surfaces covered with mirrors, as well as non-Moghul examples, would occasion for some form of divination, by employing e.g. a 3 × 3 square of inscriptions that may have been tuned to the awareness of those familiar with some of the same talismanic concepts as are found in the Middle East. No such piece has been reported. A small, circular mirror made c. 16th or early 17th century, found in Safavid Iran, was engraved with a talismanic design: in one handle allows the mirror to be used as a sword and in the other it is used as a pendant, as well as held in the hand. In this case the inscription can be read only when the mirror is suspended, rather than held, as was the case with talismanic items such as talismans.

All of the mirrors or caskets here were made and all but two have provenance. The Twelve Imams or Sufis, members of the holy profession, were the Shi'i community. The Shi'i community seems to have been familiar with the mystical talismans and was characterized by the practice of Twelve Imams, and the designs of their talismans are still used today.
1. Soudavar (1992, pp. 46-7) makes only brief mention of the talismanic inscriptions on this item which, he suggests, was made in Israel while Shah Shuja‘ was planning the invasion of Tabriz.
2. Inv. no. 49-46, which is 18.1 centimetres in diameter, 0.2 centimetres thick. The notes on the Oxford plaque made by Professor G.L. Lewis have been of great use for this study.
3. For a general discussion of Latin medical-bowl plaques or other talismanic material.
4. For attitudes towards dementia and madness (jauzu‘) in medieval Islamic society, and magical approaches to its treatment or avoidance, see Dols 1992, p. 215 et passim.
5. Foster 1978, especially pp. 6-8. See also Doutté 1980, p. 273, for the use of Hebrew names in conjunctions intended to transport a person great distances.

'Verse square' inscribed on the flat side, see Riyad 1985, pp. 105-6, 108.
6. For a Chinese 'magic' mirror with an Arabic inscription on the reflecting side, dated 1221 (AD 719-80), see Berchem 1911, pp. 128-9.
7. Reinaud 1813, II, pp. 449-450, pl. IX. For other examples, see Allan 1876, i, pp. 361-41.
8. In the art of crystal gazing, termed dar al-mandal, the reflective surface might be water or ink as well as a mirror. See Doutté 1980, pp. 37-95; Worrell 1946; and Ullmann 1992, pp. 43-81. For a controversial account of divination using a mirror of ink, see Lane 1873, pp. 75-82; Thomas 1973, pp. 76-78; and Mangiullo 1991, p. 817. For theories regarding the function of Chinese 'magic' mirrors, see Tierer 1966; Murray & Cahill 1987.
10. Bibliothèque Nationale, Paris, Ms. arab. 2703 (formerly 1203), folio 21r, discussed by Reinaud 1813, II, p. 401; and Thomas 1905, pp. 96-7. The procedure occurs in the second anonymous, part of the manuscript. The first part is an autograph copy of a treatise on amulets by Ahmad al-Tarkhabushani, dated 818/1221 (AD 1635-6); see de Sane 1883-91, p. 469.

8. For example, Victoria & Albert Museum, London, inv. no. 441-1877 (see Melikian-Chirvani 1984, pp. 131-2, no. 159); British Museum, London, Department of Oriental Antiquities, inv. no. 1166 12-19, 77, from the collection of the Duc de Blacas and Museum of Turkish & Islamic Arts, Istanbul, inv. no. 5922 (see Istanbul 1983, no. 601). For illustrations of one in the Louvre and that in the British Museum, see Kühn 1991, p. 214, where some similarities in the inscriptions with those on talismans useful against drought of noted. The design engraved on the one in the British Museum, however, is very similar to designs engraved on early magic-medicine bowls which do not mention drought amongst the therapeutic applications inscribed on them. For a mirror of somewhat similar design, but with scalloped edges and an enormous square, see Besant 1880, p. 217.
King Kaykavus and the Flying
Probably Konya, 15th century

Miniature painting, in gold and col- 
our, mounted on an album page, 
28 x 21.6 cm, decorated in 
the usual manner; the painting is 
set of red, black and gold in 
the original page and on a 
acquisition no. 8938.735

The painting illustrates a scene from Firdaws's Shāh-nāma, 
probably part of a copy produced in Kashmir at 
the end of the 15th century. It shows the 
original page, with a Persian text on the reverse.

The scene depicted is that of Kaykavus, a king who has 
received a prophecy that he will die in battle. When he 
learns of the prophecy, he decides to fly to heaven to 
discover the secret of immortality. He builds a 
platform made of gold and rubies, and mounts a 
horse and a group of eagles. When the horse 
becomes exhausted, the eagles carry him to heaven, 
where he meets the angel who reveals the secret of 
immortality.

The artist has made the figures as important as the 
composition, with Kaykavus and his companions 
standing out against the gold background. The 
ornamentation is rich and intricate, with 
Talavakānī calligraphy and the 
figures depicted in a 
historical setting. The 
composition is balanced, 
with Kaykavus at the center 
and his companions 
surrounded by 
eagles and 
horses.
King Kaykavus attempts to fly
Probably Kashmir, circa 1650

Miniature painting, 10.4 x 18 cm, painted in gold and colours on paper, mounted on an album page of laid paper, 13.1 x 18.6 cm, decorated in gold and wash; the painting is framed by two sets of red, black and gold lines, one on the original page and one on the mount (accession no. 175253).

This painting illustrates an episode from Firdawsi's Shahnama and was probably part of a copy of this work produced in Kashmir about 1650. At some stage it was mounted on an album page, with a Persian ghazel on the reverse.

The scene depicted is the attempt of King Kaykavus to fly, using four eagles tethered to his throne. Firdawsi's text relates how an agent of the devil wished to tempt the King into an act that would lead to his humiliation. He appealed to his vanity by challenging him to discover the secret of the motion of the Sun and Moon: "You have acquired control of the earth, as was your ambition; now the sky should be submissive to your command." Kaykavus instructed that a group of eagles were to be fed for a year and a month on roast meat and whole lambs, until they acquired the strength of lions. Meanwhile, he had constructed a throne to which poles were attached at each corner. On the day he wished to fly, he ordered that a leg of mutton should be placed at the top of each pole and four eagles harnessed to the throne at the bottom of the poles. When the eagles became hungry they tried to fly toward the joints of meat, at the same time transporting Kaykavus up towards the clouds. The story concludes with Kaykavus's humiliation, for the birds become exhausted and plunge, with king and throne, into a forest in Chirina.

The artist illustrating the incident has made the figures at the bottom of the painting an important to the overall composition as Kaykavus and his flying machine. Of particular interest in the present context is the man seated in the centre right of the painting, who holds a circular ta'lismanic plaque.

'Talismanic symbols occasionally occur in manuscript illustrations to indicate that good fortune was being sought for the particular adventure depicted. The example shown here is notably similar to the two Safavid or Moghal talismanic mirror-plaques in the collection, no. 55 and 56. It is engraved with a grid of Hebrew letters arranged in a pattern that suggests that the artist was copying a Hebrew 4 x 4 magic square, though there was not enough room in the circular tablet for the compartments to be in their correct positions. It is also evident that the artist did not understand the Hebrew letters and formed many of them in a non-technical manner. Similar letters appear in the open manuscript lying on the ground in front of the figure. Hebrew letters were occasionally used in magical and eschatological talismans, and indeed al-Buni recommended writing certain names in Hebrew characters (in designs such as the rod of Moses engraved on amulets) when making a talisman for, among other things, assisting someone to fly, or to walk on water.

The artist may have confused a talismanic plaque with an astrolabe, for the manner in which the man is holding the plaque and the arrangement of the surrounding scholars suggests a group of astrologers and astronomers giving guidance to Kaykavus. In the text, Kaykavus sought from astronomers advice regarding the distance between the earth and moon. Nevertheless, while this particular incident in the Shahnama is often illustrated with a group of men looking up at Kaykavus in his flying machine, the depiction of an astrologer or magician with a talismanic plaque or instrument is highly unusual, if not unique.

2. Only two of the letters can be read with certainty, 'Sin' and 'Gemel' in the left-hand column of the top two rows.
3. The other letters are indistinct and might be either misunderstandings of Hebrew or letters taken from the Pahlavi or Devanagari scripts. For Hebrew amulets in general, see Budge 1961, pp. 212-213 and 218; Ford 1990, pp. 16-23.
5. This Shahnama miniature is the only one to illustrate such an instrument; compare the three other illustrations of this event in the Khaliqi Collection, ms 66666 (a detached miniature) and ms 446, folio 416b, both produced in Iran in the mid-16th century, and ms 144, folio 79b, painted in India and dated 1377; see 6092 (14 October 1662); and those in seven copies of the Shahnama in the British Library, ms Or.12,004, Or.12,683, Or.13,716, Add.27,457, Add.27,502, Add.18,388 and Add.16,020; in two copies in the Bodleian Library, ms Eliz 233 and Osney 169; cf. also Dickson & Welch 1981, pl. 70-97; Geneva 1853, p. 60. In the British Library ms. Add. 73157, folio 51a, 2 Safavid manuscripts of the late 16th century, there are three figures in the foreground observing the event, the one on the left holding by a string handle a rod purse, perhaps of leather, which may be a container for a large talismanic chart, a collection of prayers, or a Qur'an. In all other copies examined, where there are observers they are empty-handed. Similar flying devices powered by birds—entering upwards by legs of mutton attached to the tops of tall poles—are found in medieval European illustrations of Alexander the Great's celestial journey; see Cary 1956, pp. 134-5.

Talismanic mirrors and plaques 127
Mirror reused as a talismanic plaque
Iran or Anatolia, 13th century

Carb bronze, with black patination; diameter 11 cm; thickness of rod 0.4 cm; reflective surface engraved at a later date.

Acc. no. XWR 897

This undated mirror is an example of a type produced in some quantity in the late 12th or early 13th centuries, perhaps in the eastern provinces of Iran. 1 What distinguishes this example is the fact that the flat, reflecting, side was later engraved with a talismanic design. Other examples of this practice are known, though this is the most elaborate. 2

At the centre of the talismanic design is a 4 × 4 magic square whose common sum is 34. Surrounding this square are three rings of magic letters and numerals, with a similar ring running inside the edge of the mirror. Six large circles enclose the central square; each of these contains seven lines of magic symbols, and the spaces between are filled with similar symbols. The format of circles or other clearly delineated areas filled with lines of magic writing is typical of engraved magic-medical bowls of the 12th and 13th centuries (compare cat. 23 and 26). The nature of the magical alphabet employed on this mirror is, however, more in keeping with those found on items of the 14th or 15th century (cf. cat. 23). In the areas above and between the circles a large and deeply incised Kufic inscription in six parts reads, 'All your affairs by the truth of the veneration of Muhammad/Mustafa, by the truth of the four [alienated] friends, Ali and Fatimah, Husayn and Hasan; Abu Muhammad.'

The two spaces allotted to the names of Ali, Fatimah, Husayn and Hasan appear to have carried an earlier inscription that was obliterated. It is possible that they originally bore the names of the four orthodox Caliphs and that the mirror was re-engraved to give it a distinctly Shi'i character.

The order of the names of the holy family is most unusual; however, for rarely is Husayn named before Hasan. The last name given in the inscription, Abu Muhammad, is probably the person for whom the mirror was redesigned.

In the centre of the back of the mirror, decorated in low relief, is a pierced knob to which a cord could be attached. Around it are two addressed, winged and human-headed lions, also moulded in low relief. An encircling band framed by the raised edge of the mirror encloses the design, and contains a Kufic inscription in rhymed prose invoking good fortune for its owner: 'Power and long life, good fortune and beauty, high standing and praise, happiness and high rank, authority and prosperity to its owner forever.'

3. See Melikian-Chirvani 1982, pp. 130–31, no. 58, where a detailed bibliography is given for such pieces. See also those sold at Sotheby’s, London, 16 April 1977, lot no. 348; 23 April 1990, lot no. 95; 10–11 October 1990, lot no. 159.

For another example, see cat. 79, below. A third specimen of the type in the Khalili Collection, XWR 829 (ex-catalogue), is not in good condition. For others, see above, p. 123, note 8.

53

Mirror holder
Iran, late 16th or early 17th century

Casted brass; traces of a black compound in the engraving height including handle 6.7 cm; thickness 0.4 cm.

Acc. no. XWR 853; published Christie’s, L, 10 October 1969, lot 10.

Unlike cat. 52, this hole was probably engraved on the mirror holder, perhaps at the time of manufacture. It is undated; the engraving and general form of the handle suggest that it is a Safavid product of the late 16th or early 17th century.

Engraved on the flat top of the mirror holder there is a square formed from the word (Allah) in which is inscribed the names of the Four Imams: ‘Ali, Fatimah, Husayn and Hasan. The name of the Great One, You whose discerning are unable to describe (Allah) is inscribed on the space around this square, together with the names of the Four Imams.

A bevelled circular recess in the reverse would have held a rose, which is now missing. A small inscription, 'All your affairs by the truth of the veneration of Muhammad/Mustafa, by the truth of the four [alienated] friends, Ali and Fatimah, Husayn and Hasan; Abu Muhammad.'
Unlike cat. 52, this holder for a mirror was probably engraved with a talismanic design at the time of its construction. It is unadorned, but its style of engraving and general design suggest that it is a Safavid product of the late 16th or early 17th century. Engraved on the flat back of the mirror holder there is a 3 x 3 Latin square formed from the invocation, ‘O Great One, You whose majesty the discerning are unable to discover a way to describe!’ The Persian teztil filling the space around this square, in a compact naskh script, has no obvious beginning and consists of numerous prayers for protection and the annulment of spells. A bevilled circular edge on the reverse would have held the mirror, which is now missing. The interior surface of the received ground is unfinished, and has not been worked after casting. A protruding loop at the top served as a handle or as a suspensory device.

Silver sheet, engraved, the loops and frame soldered on 8.6 x 7.6 cm (including loops) accession no. MTR 1546

This mirror case was apparently made on the person as an ornament, a talisman and a looking glass. It was worn suspended by a cord passing through the two loops attached to the frame. The inscriptions on it are intended so as to be easily read when the mirror is held with the suspension loops at the bottom. The back plate, the frame and the loops all bear inscriptions. Those engraved on the back and outer edge of the frame consist of Qur’anic quotations such as surah al-Nur (16, verses 1–5) and surah al-Tahrim (2, verse 138), and prayers and invocations to ‘All. These inscriptions are framed above and below by a band engraved with a zigzag design, and the same mood—an inscription between two zigzag bands—recurs along the eight sides of the back plate, although this is now partially obscured by the frame.

The main focus of the design on the back plate is, however, the magical use of the ‘crowning words’ and letters occurring in the Qur’an. The central medallion contains 31 compactly written lines of these words and letters, many of them repeated several times. The medallion is enclosed by three rings containing inscriptions or decoration, engraved on stippled grounds. The innermost of the three rings is filled with a tree-like decoration formed of two triangles bisected by a vertical line. The middle ring contains prayers and invocations to God, including a variation on verse 5 from the surah al-Fatiha (1). The outer ring is filled with repetitions of the word ‘fateema’, which, in this context, means ‘the object or action that is being sought.’ These three concentric rings are themselves enclosed by a circular band filled with the same zigzag design as the border. The space between the border and the circular design is filled with two large inscriptions, reading ‘O Sufficient in difficulties’ and ‘O Judge of necessities’, both engraved in a large nasta’liq script reserved against a hatched ground. The two suspension loops are each faceted, and three faces of each are inscribed with invocations in a tiny script. No comparable mirror has been described in the literature. The nature of the metalwork is similar to some of the Qajar silver arm amulets, such as cat. 59 and 100. The arrangement of the Qur’anic ‘crowning words’ in the central roundel on this piece resembles that given in an Urdu treatise on talisman, Naqsh-o Sadaqatian, by an otherwise unknown author named Abu Suleyman Zahar al-Din Ahmad. In this treatise, Abu Suleyman states that if the pattern of words and letters is engraved on silver and worn on the person, the prosperity of the wearer will increase, his enemies will be subdued and his safety from the evil eye and spells will be maintained. Furthermore, if a woman wants an abortion, she should hang about her neck a tablet of silver on which the letters have been engraved.

1. For these letters and words and their magical associations, see Camain 1937–8, pp. 94–7; Bell & Watt 1970/1977, pp. 61–64; and Bellamy 1973.
2. Camain 1937–8, p. 89.
3. A revised version of this treatise was printed in Urdu at Lucknow in 1939; there is a copy in the India Office Library, London. An English translation, apparently by Khawja Us Afzar Ali Lucknowi, occupies part 3 (pp. 1–42) of Delhi’s 1955 edition. For this particular talisman, see cat. 59.

This flat, circular plaque was apparently made for a member of the ‘Twelver Shi’i community in Safavid Iran or Mughal India. On one side there is a large Latin 52 x 52 square filled with two x 3 magic squares. Both squares use ‘crowning words,’ that on the left from the surah Maryam (107), that on the right from the surah al-Shams (26). Above and below the larger square are two true magic squares, with numerals in the cells. The 5 x 5 square at the top yields the sum of 63, the 4 x 4 square at the bottom the sum of 34.

An Arabic inscription in naskh runs anticlockwise around the periphery, beginning at the upper tip of one of the small magic squares, where a hole has been drilled, with a break where the handles would have been placed. It reads, ‘O God, bless Muhammad the Chosen and bless, O God, me who ask Thee, by the [blame] right and their holiness and their distinction and their status and their reward with Thee, avert us from the evil of every evil one and the betrayal of every perfidious man and woman and the deception of every cunning man and woman and the machinations of every scheming man and woman. O God, I take refuge with Thee from the evil of demons (jinns) and humans, from the evil of every tempter, male and female, and every evil spirit, male and female. Protect us from every disease, distress, pain and ills.’

The text continues along another inner ring of inscriptions, beginning at the top right-hand corner of the large square and moving anticlockwise, with the small magic and Latin squares...
interpersed: and the anxiety of fears of jinn and men, and from the evil of every person, from vermin and insects, from the evil of oppressive, reaproachful and difficult people,/ [from] vainglorious men and women/ and profligate men and women, or/ “from the mischief of those who practice Secret Arts; and from the mischief of the envious one as he practices envy.” The last two lines are from the masb al-Falag (cXXII, verses 4–5).

The obverse is blank except for a circular inscription — an invocation to God asking His blessing on Muhammad and the Twelve Imams—near the edge, beginning opposite a blank space with two drilled holes where the handle would have been attached. Seven other bored holes, evenly spaced around the edge of the plate, were perhaps used to mount the plate on a wall.

1. See further details, see pp. 106–107.
3. Under magnification it is evident that some of the holes were drilled before the inscription was engraved. This applies to the two holes for the handle, and those three equidistant holes. The other four peripheral holes appear to have been drilled later and have the characteristic triangular shape of holes made with a bow drill.
SILVER, WITH TRACES OF RED COMPOUND IN THE ENGRAVING

Diameter 3.1 cm Thickness 0.1 cm

This undated and unsigned talismanic plaque is a more elaborate version of the type represented by cat. 55 and is probably a product of the same workshop. A handle was once attached to the base, and the inscriptions and magic designs would have been legible when the plaque was held upright, with the handle at the bottom.

On one side there is a large square inscribed with 30 Latin letters, but the surrounding small squares and circular diagrams differ from those on cat. 55. A pair of small squares appears along each of the four sides of the large square. One is a 4-4-4 magic square yielding the sum of 36, identical to that on cat. 55, and the other is a four-line formula of magical writing and numerals.

Interposed between these four pairs of small squares are roundels containing emblematic representations of the 12 zodiacal signs, three on each side of the large square, beginning with Aries at the upper right-hand corner of the large square and proceeding anticlockwise. These representations employ commonly accepted conventions, such as a two-headed bird sitting cross-legged for Gemini, a bearded man using a scythe to cut grain for Virgo, a cross-legged man with scales suspended over his head for Libra and a man drawing water from a well for Aquarius. Leo is shown as a lion mounted by the radiant disk of the Sun, indicating that astrologers thought the Sun most frequently associated with, or domiciled in, Leo. The sign of Sagittarius is depicted as half human and half-fish, shooting an arrow at the head of a dragon which forms the end of his tail. This design was a conventional way of alluding to the lunar node often associated with that constellation. Immediately above each group of three zodiacal signs and two squares there is an engraved Persian inscription, shah-af aflat / ишан-и афлат ('exaltation of the sun, seal of the sun'), the significance of which is not apparent.


THE OBEROVIE HAS ONLY A CIRCULAR INSRIPTION NEAR THE EDGE, BEGINNING AT THE TOP, CONSISTING OF AN INVOCATION TO GOD ASKING HIS BLESSING ON MuHAMMAD AND THE TWELVE IMAMS.

1. This is identical to the square on cat. 55. For further details, see p. 124.
2. Compare the figures on the exterior of the magic-medicinal bowl, cat. 179.

56

TALISMANIC PLAQUE
IRAN OR INDIA, 17TH CENTURY

57

TALISMANIC PLAQUE
IRAN OR IRAQ, 19TH CENTURY

COPPER OR COPPER-BRONZE PLATE, TINNED AND ENGRAVED, WITH TRACES OF A BLACK FILLED ENGRAVING

Diameter 15.5 cm Thickness 0.1 cm

THE PLAQUE IS BLANK ON ONE SIDE, WITH FOUR PARCEL HOLES, EQUALLY SPACED, NEAR THE PERIPHERY, INDICATING THAT IT WAS AT ONE TIME MOUNTED ON A WALL OR FASTENED TO A LARGER HOLDER. THE DESIGN ON THE FRONT CONSISTS OF 14 CONCENTRIC RINGS AROUND A CENTRAL AREA CONTAINING THE WORD ALLAH. THE THREE SMALL INNER RINGS OF TINY PSEUDO-INSRIPTIONS ARE FOLLOWED BY ONE RING OF NUMERALS WHICH CONSIST NUMERICALLY OF THE NUMBERS 7 AND 8, SURROUNDED IN TURN BY A BLACK RING. THE INSRIPTIONS IN THE NEXT RING NAME THE FIVE MEMBERS OF THE HOLY FAMILY RECOGNISED BY THE SHI'AH. THE NEXT THREE RINGS EACH HAVE 19 CELLS CONTAINING ABDAAH LETTERS-NUMERALS.
Amulets and related talismanic objects

by Emilie Savage-Smith

The Khalili Collection has a large number of Islamic amulets and related talismanic objects which permit an appreciation of the development, continuity and change in the use of certain talismanic motifs, the relatively early date of some of these items makes them of particular interest. It is not the intention of this chapter to deal at length with all the numerous varieties of amulet, but rather to illustrate briefly a few of the more common designs and then to concentrate upon four groups of amulets and related objects that are distinguished by very distinctive iconographic motifs: long-horned animals, lions with scorpions, fish and hands. Two groups of recent objects, each distinguished by a particular function—metal amulet cases and arm amulets—are discussed in conclusion.

The majority of published accounts of Islamic amulets are concerned with material produced in the 19th and 20th centuries, particularly in Egypt, Syria, Palestine and Iraq. The work of Tawfîq Canaan on the decipherment of Arabic talismans, based for the most part upon his own collection of amulets acquired in Syria early in the 20th century, is fundamental to any serious study of the subject. Most of the amuletic material selected from the Khalili Collection for discussion here, however, is not represented in these earlier studies.

The words 'amulet' and 'talisman' have been defined differently by various scholars. Some consider an amulet to be an object that is supposed to function continuously for as long as the object exists, while a talisman is something that is intended to be used only once and then discarded. Others have defined an amulet as an engraved stone, used either as a seal or worn as amuletic jewellry, and a talisman as a metal object, either engraved with a talismanic design or formed into a talismanic shape, over which a magical ceremony is performed. In the 19th century, Edward Lane gave the word *qism* the all-encompassing, but confusing, definition, 'mystical devices or characters, astrological or of some other magical kind; and a seal, an image, or some other thing, upon which such devices, or characters, are engraved or inscribed; contrived for the purpose of preserving from enchantment or from a particular accident or from a variety of evils, or to protect a treasure with which it is deposited, or (generally by its being rubbed) to procure the presence and services of a jinn.' What is evident is that the terms amulet and talisman are constantly conflated, used interchangeably or defined in arbitrary and differing ways. The applications and meanings of the numerous Arabic and Persian terms for amulets and talismans—which include *qaism*, *bîshab*, *hamshab*, *birz*, *maslah*, *ta‘wilah*, *tūsbar* and *ba‘ashed*—differed from region
talismanic objects change in the use of terms makes them of little loss of meaning. Since the words themselves are usually not part of the magical artefacts that are preserved, the terms by which we designate them are rather arbitrary.9

For the purposes of this chapter, the term amulet is used for any relatively small object intended to be worn to ensure protection and well-being. Such objects are usually made of long-lasting materials and were apparently meant to function continuously over a long period.10 In the case of the examples catalogued here, only those intended to ensure love between a couple were designed for the use of a single person (see cat. 94 and 95 in Group 6, illustrated below); it would seem that in the other circumstances the beneficial powers were passed on to whomsoever possessed the amulet. It should be noted, however, that it is often difficult to distinguish between amulets intended to be generally efficacious and those which were believed to prevent or cure a specific condition, such as the evil eye or infertility, since the intended use is almost never specified. The term talisman has generally been employed here for the more ephemeral forms of amulet, such as those written on paper or parchment, while the adjective 'talismanic' has been used broadly to describe any object on which there is a magical design.

The use of stones and other materials as amulets was a common practice throughout the ancient Near East and in the Graeco-Roman and Byzantine worlds, and the literature on amulets in these earlier cultures is vast.11 Comparable studies of Islamic amulets have not been undertaken. It is evident, however, that certain features of Islamic amulets distinguish them from those of earlier societies or of contemporaneous Europe. Islamic amulets very rarely invoke a demonic force, but instead address their supplications to God through Qur'anic quotations and invocations employing the Beautiful Names of God, al-asma‘ al- busnāt.12 With the exception of some recent practices at Shi'i religious sites, there is no Islamic tradition of leaving votive amulets at a shrine to ask for health or to give thanks when health has been restored. Moreover, Islamic amulets were not employed in any magical ceremonies.13 They are objects worn to ensure well-being and success.

Seals, or more precisely seal-matrices, can have talismanic properties as well, for they are also small objects (carved from a gem or made of metal or glass) on which a talismanic inscription has been engraved in reverse or 'mirror image'. They are not, however, true amulets as defined above, for while a seal may be worn, either suspended on a cord or set into a ring, its magical power does not take effect until its inscription has been stamped onto a surface where it can be read in the correct sequence.14

Also included in this chapter are household objects whose talismanic designs are closely related to those of the amulets under discussion. A ladle of high-tin bronze and two bone spoons of the 9th or 10th centuries, for example, have talismanic designs and inscriptions written in early Kufic that are strikingly similar to those on amulets of the same period; all these are illustrated in Group 1 below. A mirror included in Group 2 also demonstrates the continued use of a distinctive talismanic design on both personal and household amulets.

Magic squares, which are totally lacking from pre-Islamic amulets, are a prominent feature in the talismanic designs of Islamic amulets made from the 13th century onwards.15 On the other hand, certain pre-Islamic motifs greatly influenced early amuletic designs in the Islamic world: these include the rampant lion, the scorpion, a long-haired, oryx-like animal, fishes and the outline of the human hand, all of which are represented in the first four groups of objects described here. The magical combination of the radiant Sun with a lion is another pre-Islamic motif evident on Sumerian, ancient Egyptian and Graeco-Egyptian artefacts, and is found on many Iranian amulets, both old and new.16 Numerous
Pendant
Iran, 14th century
Copper alloy, sheet and engraved, 2.6 x 4.7 x 0.16 cm
accession no. T15 1939

This tablet-shaped pendant is from the same workshop that produced cat. 64. On one side are four lines of talismanic numerals and letters, with the word Allah written at the "handle" of the tablet. On the reverse, an inscription written in large, well-formed childh
reads, 'Perpetual glory and prosperity'.

Pendant
Iran, 14th century
Copper alloy, sheet and engraved, 2.5 x 4.4 x 0.3 cm
accession no. T15 1939

This tablet-shaped pendant has the suspensive eye set at right angles to the "handle" of the tablet. On one side there is a lion, with the face of a roaring man beyond, and on the reverse a Kufic inscription.

examples of Islamic metalwork show a lion surmounted by the radiant disk of the Sun, following the astrological attribution of the Sun to the zodiacal house of Leo, where it was considered to be domiciled. In a magical context, the combination probably lost its precise astronomical significance, but rather referring obliquely to the intensity of heat at the height of the summer in northern latitudes. Magical writing composed of letters, numerals and, occasionally, lunette sigla sometimes formed the entire design of an amulet. Pseudo-Kufic writing was also frequently employed for talismanic decoration.

Included among the amulets catalogued here are a number of amulet cases. Some are small boxes intended to be strapped to the arm and often containing a miniature Qur'an (masghaf); because every Qur'anic verse is believed to possess a force that can counteract evil and disease, this would be the most desirable protection possible. Others are cylindrical tubes suspended horizontally about the neck and containing scrolls of prayers or Qur'anic quotations. The cases themselves usually have Qur'anic verses or magic squares engraved on them and, when filled with their proper talismanic contents, also functioned as an amulet providing protection to the wearer. All the examples of this type discussed below are probably from Qajar Iran or Ottoman Turkey.

1. Only a selection of the amulets in the collection are catalogued in this volume. For additional amuletic jewellery, see Wenelt 1953.
3. Canaan 1937–8. His collection of amulets is now at the Pitt Rivers Museum, University of Oxford, where it forms part of the Welcome Collection of Amulets on long-term loan to the museum.
4. For example, Budge 1964, p. 14.
7. The term atrif occurs on the talismanic scrolls contained in the Qajar cylindrical amulet case cat. 88 (in Group 1).
8. A talismanic shirt does not qualify as an amulet, by virtue of its size.
9. For example, see Bonner, 1950; Delattre & Derchain 1954; Vikan 1984; Kotansky 1951; Spier 1951; and Andrews 1994.
10. The invocation of demonic forces recommended in magical manuals is not reflected in the preserved amulets made of permanent materials, though an occasional ephemeral talisman of paper or parchment might employ them, see Canaan 1937–8, pp. 4–6; and Rahmat 1979, pp. 312–13. Even in the popular "Charm of the Seven Sleepers" it is God who is primarily invoked, and the "sleepers" are merely intermediaries, see Stevenson 1907.
11. Andrews 1972, pp. 288–91. On the other hand, many paper or parchment talismans, such as those carried in the amulet cases shown in Group 3, are either prayers to God or extensive quotations from the Qur'an, and sometimes even an entire Qur'an in miniature.
12. Amulets employed today in zaf ceremonies in Egypt and the Sudan must be considered in a different category; for the zaf cult, see Boddy 1959; and for zaf amulets, see Krist & Krist-Heinrich 1982, figs 115–117; Bachinger & Schienel 1974, p. 86.
13. For the extensive collection of seals in the Khalil Collection, many of which are talismanic, see Kahan, forthcoming.
14. For the various types of magic squares, see the essays on talismanic charms above, pp. 166–167.
15. For material from the ancient Near East, see Vollgraff-Boes 1935; for ancient Iranian parallels, see Fodor 1979, p. 1242; for Skandar, and other female deities depicted with these attributes, see Andrews 1972, p. 142; see also Bonner 1950, figs 211, 216 and 255.
16. For examples in the Khalil Collection showing the Sun domiciled in Leo, see cat. 29 and 56. See also Harter 1978.
17. For these distinctive magical symbols, see Canaan 1937–8, pp. 143; Douret 1908, pp. 158–9, 244–8 and 288.
Group 1: amulets and related objects with long-haired animal motifs

Certain Iranian amulets and other amuletic objects of about the 4th century, all of which bear Qur'anic verses or pious phrases written in an early form of Kufic, are also engraved with the representation of an animal with very long horns extending over its back, resembling an ore. The amulets in the Khalili Collection that fall within this group display the motif in various permutations. On the engraved limestone amulet cat.66 only the head of the long-haired animal is depicted in conjunction with a scorpion. An amulet of jet, cat.67, shows the whole animal and a second creature of such indistinct form cannot be identified. Both the horned animal – as a full figure – and the scorpion are combined with a bird on a bone spoon, cat.68, while a stag's head and a bird are found together on a smaller spoon, perhaps of ivory, cat.69. The inscriptions on this are particularly difficult to read but include invocations to the five members of the holy family especially revered by the Shi'i community, Muhammad, Fatimah, Ali, Hasan and Husayn. Two cylindrical bone amulets (cat.70 and 71) show identical long-haired animals, each surrounded by Qur'anic verses. The latter is also inscribed with the same Qur'anic passage as that found on a curved amulet of stone (cat.73), and in an identical Kufic script with the same epigraphic peculiarities. Closely related to these amulets in terms of their overall design and the early Kufic script of the inscriptions are three objects of uncertain function, all of bone or tusk, cat.73-75. Similar inscriptions and a full view of a stag, as well as an unidentified animal, can be seen on a 9th- or early 10th-century laddle of high-tin bronze from Persia. On all these amulets and related items, the early form of Kufic script argues for a very early, possibly 5th-century, date. It is likely that the association of magical properties with the long-haired animal depicted on the objects derives from pre-Islamic traditions.

66 Amulet
Perhaps Iran, 5th century.
Limestone, 4.9 × 6.6 × 0.6 cm accession no. TLE 1976
The calligraphy employed on this roughly circular limestone amulet is typical of early Islamic scripts of the 5th century, as seen, for example, in the form of the final wa in its short extension to the left. The suspensory eye is set parallel to the face of the amulet. On one side the text of the surah al-İkhlas (cxix) is engraved around a schematically rendered scorpion; the last line of the surah is repeated at the bottom, for the form of the scorpion interferes with some of the words on the row above. The head of an animal with very long horns, resembling an ore, is engraved on the obverse and around it is written the text of the al-Fasl surah (cxix).

67 Amulet
Jet, carved; pearl and gold pendants and chain are later additions. 6.7 × 2.2 × 1.3 cm accession no. TLE 1920
This octagonal faceted amulet has tapered ends. On one of the two wider flat faces there is a long-legged quadruped animal with very long horns, resembling an ore. Words are written in Kufic script on three sides around this animal, while to either side a decorative design of six cells is formed from an ornamental Kufic. On the other large face two lines of Kufic script surround the image of another animal, possibly a scorpion, whose form is indistinct. Four of the other elongated faces bear a line of Kufic script. The remaining two are blank except for bored holes through which the chain and the pendants are attached. The faces of the tapered ends are incised with triangular designs.

68 Spoon
Bone, carved
length 13.1 cm maximum width 5.2 cm accession no. TLE 2610
The spoon handle is carved with a bird in silhouette at the top. In the bowl of the spoon there is the figure of a four-legged horned animal enclosed by an inscription which contains the shahâdâ or affirmation of faith. 'In the name of God, the Merciful, the Compassionate, there is no god but God, Muhammad is the messenger of God.' On the back of the spoon the image of aorpion is surrounded by the phrase 'God over everything is all-powerful' and Qur'anic quotations from the surahs Yâ'âsî (xiii, verse 9), waqâ' (verses 1-4), and al-Anfâl (ix, verse 46), 'For God is with those who patiently preserve'.

69 Spoon
Bone or ivory, with a gold band
length 8.7 cm maximum width 1.9 cm accession no. TLE 2622
On one side of the rounded end of the spoon handle there is a stag's head surrounded by the Kufic inscription 'In the name of God, the Merciful, the Compassionate'. On the other side the figure of a small bird is surrounded by an inscription that reads, 'I submit to God and I submit to the messenger of God.' The central part of the handle is inscribed with the invocations 'O God! O Muhammad! O Allah! O Hasan! O Husayn! O Fatimah the radiant one!' The invocation of Allah is also engraved beneath the gold band. The inscriptions on the outside of the bowl of the spoon are very difficult to read, though the phrase wa dâ'âr can be discerned. On the inside there are quotations from the surahs al-Baqarah (ii, verse 153) and al-Anfâl (ix, verse 46), 'For God is with those who patiently preserve'.

Amulets 135
Amulet
Bone
length 3.4 cm
diameter from 2.4 to 0.9 cm
accession no. TL2615

This hollow amulet bears five lines of text from the surah al-Dā'ifāt (cxii, verses 1–5). Some textual and orthographic peculiarities occur in this Qur'anic passage, which is written in an early form of Kufic and has no diarrheal dots. At the end of the fifth line of text are depicted two quadrupeds with very long horns extending over their backs.

Amulet
Bone
length 2.3 cm
diameter 0.3 cm
accession no. TL2614

This solid, four-sided bone amulet has six lines of text from the surahs al-Ikhlās (cxii, verses 1–2) and al-Fātihah (i, verses 1–7). As in the case of cat. 70, there are textual and orthographic peculiarities in the Qur'anic passage, which is written in an early form of Kufic, without diarrheal dots. On either side of the final line there are the heads of two long-horned animals. A short incantation has been drilled into one end of the amulet while the other end is rounded.

Amulet object
Tusk
9.4 x 1.6 x 0.9 cm
accession no. TL2246

This amulet bears six lines of Kufic script with text from the surah al-Fātihah (i, verses 1–7), followed by the phrase 'With God the Compassionate I take refuge from scoundrels.' There are textual and orthographic peculiarities in the Qur'anic passage, which is written in an early form of Kufic, without diarrheal dots. A hole has been bored in the amulet for the attachment of a chain.

Amulet object
Tusk
diameter 1.1 cm
accession no. TL2246

The irregularly formed, disc-shaped piece of tusk has holes bored through the centre. On the convex side, the text of the surah al-Fātihah is written in 11 lines of Kufic script radiating out from the centre like the spokes of a wheel. On the concave side, two heads of animals are incised near the central hole with the word Allāh written above them and the text of the surah al-Ikhlās (cxii) incising them.

Amulet object
Bone
diameter 1.2 cm
accession no. TL2246

This circular object is flat on one side and curved on the other, and has a hole drilled through the centre. Near the middle of the flat side there is the figure of a four-legged horned animal with the phrase 'For God over everything is all-powerful' written above it. The central design is enclosed by two concentric rings with text from the surah al-Ikhlās (cxii, verses 1–4) inscribed around the edge. The curved side shows the head of a stag, with branching antlers, surrounded by the phrase 'O Judge of Necessities, God, Muhammad'. The ring of text surrounding this design contains two lines from the surah al-ʿAlḥājāt (cxii, verse 5.7), 'There is no god but Thou. Glory to Thee. I was indeed wrong!' The purpose of the object is uncertain, though it might have served as a spindle whorl.

Ladle
Iran, 9th–10th century
High-in bronze
length 4.2 cm
diameter of bowl 1.1 cm
accession no. MWF 815

At the top of the handle of the ladle, the inscription ya Allāh is engraved over the figure of a stag. On the upper part of the dish handle there is a Kufic inscription of 13 short lines, beginning, 'In the name of God, the Merciful, the Compassionate, I trust in God and his sovereignty and His revealed scriptures and the Surahs of the Qur'an and for constant guidance and good fortune from God...'. Beneath the inscription there is the image of the front half of an animal. Text from the surah al-Ikhlās (cxii, verses 2–4) is written alongside a row of dotted circles running leftright, down the lower portion of the handle. On the other side of this row is inscribed the text of the surah al-ʿAlḥājāt (cxii). Clusters of circles with central dots decorate the bottom of the handle and the inside of the bowl.
Amulets and related objects with lion and scorpion motifs

Some early Islamic amulets display a distinctive talismanic design consisting of a rampant lion facing a scorpion under a canopy of three stars each formed by two overlaid triangles, the entire composition surrounded by pendants found at Nishapur and now in New York. The design continued to be employed virtually unchanged, but more crudely executed, during subsequent centuries. A small mirror (cat. 77), possibly of the 12th century, has the same design engraved upon the reflecting surface, but reversed right to left — that is, a mirror image that, when reflected in the reflecting surface, would be the right way round.

1. A related amulet in the Metropolitan Museum of Art has three 'crossed compasses' formed by two overlaid vi instead of six-pointed stars formed by two overlaid triangles (Jenkins & Keene 1983, p. 21; Allain 1982, p. 70, no. 61).

2. See Gundel & Böker, cols 112-8 and 694.

3. A small silver pendant 2.9 centimetres in diameter and 0.8 centimetres thick, and a cast bronze pendant 2.38 centimetres in diameter (New York, Metropolitan Museum of Art, inv. nos. 40.170.246 and 40.170.245 (Jenkins & Keene 1983, p. 21, nos. 79, 82; Allain 1982, pp. 68-70, nos. 60, 61).

4. On a mirror now in the British Museum, London, the lion, scorpion, three stars and surrounding frame of talismanic inscriptions have been carelessly engraved in the same 'mirror image' manner, but a circular face of the Sun has been added to the composition, along with a curvilinear talismanic inscription that is written the right way round (Kahle 1993, p. 204, figs 74, 78). A similar rectilinear talismanic design, crudely executed and the right way around, is inscribed with other talismanic designs on the reflective surface of another 12th-century mirror in the Victoria & Albert Museum, London, inv. no. 442 (1878) (Mckhann-Chirvani 1983, p. 131, no. 59). On a third mirror, in Istanbul, the rectilinear talismanic frame is engraved with other magical designs, but the figures of the lion and scorpion are replaced with pseudo-writing (Istanbul 1983, pp. 72, 73, nos. 0-0.131; Ergünoğlu 1978, p. 315, fig. 187).

77

Pendant
Iran, probably Nishapur, 12th century

Base metal, cast and moulded diameter 5.6 cm thick 0.8 cm accession no. TLM 1609 published Sotheby's, London, 10-11: October 1990, lot no. 592.

On one side of this casted circular pendant there is a moulded decoration consisting of a bird sitting under the branch of a tree and looking backwards. The flat side is engraved with a rampant lion confronting a scorpion, with three stars overhead, framed by rows of talismanic writing simulating the repeated Arabic phrase 'There is no god but God'. The suspensory loop at right angles to the pendant has been broken off.

78

Pendant
Iran, probably Nishapur, 10th–11th century

Copper alloy, cast and engraved diameter 1.7 cm (0.6 cm including suspensory ring) thickness 0.2 cm accession no. TIS 114

The circular pendant bears a design of a lion, scorpion, three stars and talismanic inscription very similar to that on cat. 77, but more crudely executed, and the reverse side has seven rows of the same repetitive talismanic formula. The suspensory eye is set at right angles to the pendant.

For comparative items, see the essay on this page, note 5.
Amuletic object

Copper alloy, engraved
2.9 x 2.1 x 0.1 cm
accession no. TL 3.11

This square amuletic object has a schematically rendered version of the lion, scorpion, and star design, and rectangular writing. The reverse is blank.

Group 3: fish-shaped amulets

Three fish-shaped amulets
Perhaps Iran, 19th century

Copper alloy, cast and engraved,
5.9 x 3.2 x 0.1 cm
accession no. TL 3.11

Copper alloy, cast and engraved,
3.1 x 1.3 x 0.1 cm
accession no. TL 3.9

Cat. 81 is a flat pendant cast into the outline of a fish, which is accentuated by engraved edging and fins. There is a large, bored hole through the head. On one side, across the upper body, there is a 4 x 4 magic square whose common sum is 37, 43, and (if the numeral in the upper left corner is corrected from "6853" to "6859"). The face and lower body are inscribed with non-Qur'anic magical inscriptions incorporating numerals and a five-pointed star. On the reverse, the compact inscriptions covering the face and body are so worn that they are nearly illegible. Magical numerals are engraved along the narrow sides of the pendant.

Although very badly worn, cat. 83 is evidently very similar to cat. 81. The outline of the fish is emphasized by both a single thin line and a line of dots. On one side there is the square of a 4 x 4 magic square and rows of magical numerals. On the reverse, the head is marked with serpents indicating gills or "ears", while the body bears horizontal rows of indistinguishable magical inscriptions.

The outline, fins, tail, and "collar" round the neck of the fish on cat. 84, a much smaller amulet, are crudely delineated. There are diagonal rows of magical numerals on the body.
Amulet

Perhaps India, 16th or 17th century

Sard, point-engraved and wheel-cut, 5.1 x 7.8 x 0.9 cm
accession no. TLE 166

On one side of the amulet there is a central design showing a hand with the three names Allah, Muhammad, and 'Ali written in an 'Two quadrupeds with lion-like bodies and double tails stand on either side of the hand; their heads are indistinct, but the word Allah is inscribed on that of the animal on the right and Muhammad on that of the animal on the left. The phrase 'There is no god but God; the King, the Truth, the Manifest One' written on the right-hand animal's body and the complete text of the asbab al-aqida on that of the left-hand animal. Surrounding this central design there is a narrow, heart-shaped band containing the 'Throne Verse' from the surah al-Baqara (2, verse 255). Near the rim of the amulet a broader band contains the text of the surah al-Raf' (59) followed by that of the surah al-Mukted (60) and ending with the surah al-Fath (40). Between these two bands of Qur'anic verses there is a ring of 16 cartouches containing inscriptions.

Reading articles wise from the top and largest cartouche, this text is as follows: (1) the 'khatamah'; (2) 'O Muhammad'; (3) 'Help from God and a speedy victory', surah al-Saff (31), verse 13, line 21; (4) 'O Allah'; (5) the One near to God'; (6) 'O Forgiving One'; (7) 'authority belongs to God'; (8) 'O Guardian'; (9) 'O God'; (10) 'O Owner'; (11) Muhammad the Prophet of God'; (12) 'The Eternal One'; (13) 'O the Merciful! O the Compassionate!'; (14) 'God is Most Great'; (15) 'the one committing himself to God'; (16) 'O Ali'. The numeral 1728 or 1787 is written in many of the cartouches, and 1787 also occurs once in the hand of Qur'anic passages near the edge of the amulet; the significance of these numerals is unknown.

On the other side of the amulet there is a 4 x 4 magic square whose common sum is 1266. Written across the sides of the square is the text from the surah al-Ma'asir (16, verses 3-4): 'Whose will be the Dominion that Day? That of God, the One, the Irresistible.'
A manuscript
11th century
14 x 11 cm, of a
laid paper with no
written surface
in blue, black and
red, text in naskh
and surrounding
red with gold
770, folio 177

A chart is from an
Arabic and
Persian (la'savat) com-
munity in the 11th century. The chart contains diagrams of hands, with text surrounding the diagrams. The chart is dedicated to Muhammad ibn Shafi al-Tabrizi. Two hands are shown, one
pointing north and the other
pointing south. Each hand is divided into eight sections, each containing a number.

The left hand is divided into eight sections, each containing a number. The right hand is divided into eight sections, each containing a number.

The text surrounding the diagrams is written in naskh script. The manuscript is laid paper with no written surface, in blue, black, and red, with gold surrounding the diagrams.

The chart is dedicated to Muhammad ibn Shafi al-Tabrizi. The left hand is pointed north, and the right hand is pointed south. Each hand is divided into eight sections, each containing a number.

The chart is dedicated to Muhammad ibn Shafi al-Tabrizi.
The Islamic amulet cases in the Khlili Collection are of two basic types: cylindrical tubes to be suspended from a cord around the neck, and small boxes with two brackets or lugs for strapping a cord by which they can be bound to the arm. The latter are a form of arm and leg case that will be discussed as Group 6, below.

Cylindrical tubes for preserving talismans have a long history. Pre-Islamic amulets include ancient Egyptian and Carthagian cylindrical containers, which were carried vertically, and Roman and Byzantine amulet cases of the same shape, which were suspended horizontally. 3

No systematic study of Islamic cylindrical amulets cases has been undertaken, nor a typology of forms developed. 4 The first published example is an unpublished case from Nishapur that is of silver, partially gilded, with relief decoration consisting of a Bactrian inscription giving the text of the surah al-"Al-i (cix). 5

Several specimens from Iran attributed to the 12th to 13th centuries have been published, all of them in silver with elaborate decorative motifs in niello and gilding. 6 When compared with the more fully decorated pieces in the Khlili Collection they are remarkable in that they lack any Qur'anic passages. One published example from Khorasan or Afghanistan of about the 12th century is a six-faceted silver cylinder with niello designs of birds, running dogs and hares, again without any Qur'anic texts. 7 Five late 13th- or early 14th-century unfurcated examples from the Yemen are recorded, all with applied granulated filigree or strips of twisted wires, these too have no Qur'anic texts. 8

All the examples in the Khlili Collection are faceted except for cat.9, a very large case possibly from Ottoman Turkey. 9 This piece and an unusually small example, cat.92, also lack prayers or Qur'anic verses. All the others in the Collection, probably from Qajar Iran, have inscriptions on some of the faces.

The prayers on cat.9 are identical to those on a pair of long-necked-shaped amulets in the Khlili Collection, and cat.90 may be from the same workshop, though it bears a different text and is slightly curved. In Qajar Iran, these cylindrical cases were occasionally threaded together in pairs. 10 The cords are all missing from the Khlili examples, and it is not clear if some were intended to be worn as a set in this manner.

All Islamic cylindrical amulets cases were intended to hold either scrolls of prayers or Qur'anic verses, sometimes enhanced with talismanic inscriptions.

88 Amulet case

88.1 Amulet case

7.5 cm diameter 1.3 cm

The case is inscribed with the text of the surah al-Nas (cixxx). It is a talismanic scroll of parchment with prayers written in gold, red and black inks. An inscription on this scroll reads that the talisman (ahrot) was dedicated to the Imam, suggesting that it was written for a Shi'i or Sufi adherent.

The ground of the case has been darkened with a black compound and there are triangular areas enamelled in green. The sides with the suspension loops is decorated with a flower-and-leaf design.

90 Amulet case

90.1 Amulet case

8.5 cm diameter 1.8 cm

The six faces of the case are inscribed with the following prayer: 

O Renowned in the skies, O Renowned on the ground, O Renowned in this world and in the next / even though tyrants and rulers work hard for the suppression of Your light / and the extinction of Your word, so let it be, nevertheless, that Your light will persist / and Your word be disclosed, even through the porosity may detect it surah al-Tauhid

This amulet case is larger than usual and has three suspension loops. A further six loops on the opposite side were intended for the attachment of ornamental pendants. The case is not faceted and has no inscriptions. It may be an Ottoman product.

91 Amulet case

91.1 Amulet case

Silver, engraved length 7.9 cm diameter 1.5 cm

The long cartouches on the sides of the case contain the "Throne Verse" from the surah al-Baqara (2, verse 55), lines 1-6, with the last word written with a knot design. At either end of the cartouches the name of Muhammad alternates with that of Ali. The side with the suspension loops is simply hatched.
16th century

Quarter 1.3 cm

The leaf, or whatever part of a leaf was used, was placed on the side of the
mosque or house of worship. An inscription was written on the leaf. A stylus
was used to make small dots in the surface of the leaf, which were then
connected to form the desired letters. The inscription was written in Aramaic
script.

16th century

Quarter 1.4 cm

The case is decorated with gold, and has no inscription.

16th century

Turkey

Quarter 1.3 cm

The case is larger than usual and has no inscription. The case is a
 eru, a type of wooden box used for the storage of precious items.

16th century

Turkey

Quarter 1.3 cm

The case is larger than usual and has no inscription. The case is a
 eru, a type of wooden box used for the storage of precious items.
The production and use of Islamic arm amulets seems to have been restricted to the eastern provinces; their style and the composition of their inscriptions indicate that no pedants the 9th century, though all recorded examples are undated. This Khlilat Collection has 15 examples, all of which owe a reflection are catalogued here. Most appear to have originated in Iran and the majority of these are Qajar products. Now has overtly Shi'a features. Although a few arm amulets in another collection of 156 pieces are described as Qajar recently in Iraq, they have been published, such objects have otherwise received little scholarly attention. Both in Iran and Iraq arm amulets are referred to by the Persian word bázkhand, meaning 'amulet' or 'amulet'. They are made of silver or a copper alloy and have two circular lugs, either on the back of the plate or at the edges, through which a cord can pass so as to fix the amulet to the upper arm. They are often worn in pairs, one on each arm. Arm amulets may be circular, lozenge-shaped or octagonal. Magic squares play a prominent role in their design, and 2512 has, in addition to four standard magic squares, an interesting variation of the himbalh square. The sigil of the Holy Name (sometime known as the Seven Seals of Solomon) also occur on several examples in the collection, such as cat. nos. and 212. Some of the known arm amulets (represented here by cat. nos. 94 and 97) bear a quotation from the surah Al-Fatimah (11, verse 14). Fair in the eyes of men is the love of things they covet: women and sons; heapsaped hoards of gold and silver; large flocks; castles and well-tilled land. Such are the possessions of the world's life, but in nearness to the Lord is the abode of the virtuous. This prevalence of the sigil suggests that these amulets were intended to help the wearer gain worldly goods and joy. In the case of others, for example, the set cat. no. 102, a military use might be implied by the occurrence of terms from the surah al-Šaff (33, verse 13, line 2, 'Help from God and a speedy victory'), and surah al-Qur'ān (25, verse 5), 'Verily we have granted thee a manifest victory'. The lozenge-shaped arm amulet, cat. no. 94, portrays a woman and a man on the front, with an inscription on the reverse stating that its owner was one Musa. The silver pendant dated 1426 (AD 1607-8), cat. no. 134, is a fine example of an arm amulet apparently meant to ensure a husband's continuing love and fidelity. It shows another couple, with the male named Musi, and it is possible that the arm amulet was intended for Musá while the pendant was for his wife whom he married, perhaps in 1426-7. The two busts of human figures depicted on the octagonal amulet, cat. no. 42, are rather different from those on cat. no. 94. Their sex is less clearly differentiated; above one the word nār ('fire') is written near the place. Have a word that could be interpreted as 'qāf' ('call') is written twice. Similar figures would also be found on other amulets and on magic-medical bowls and have been interpreted as a reference to ancient symbols of the Sun and Moon, though a different interpretation of the figures, as residual elements of an early tradition of cosmic twins, has also been put forward. Two fishes, often symbols of fertility and prosperity, also occur on this amulet. The Qur'anic verses inscribed on it, from surah al-Taubah (9, verses 118 and al-Nār (20, verse 53), are associated with general protection and divine concern for believers, and provide few clues as to the intended function of the amulet. Arm amulets that are intended to be worn on the arm are also called bázkhand and, like the simple arm amulets, they are reserved to members of the Shi'a branch of Islam.
94

Arm amulet
Iran, probably 19th century

Silver, engraved
width 6.9 cm height 5.1 cm
accession no. T 50.11

This single arm amulet could be worn vertically or horizontally; it originally had four loops on the back (one is now missing). In the central panel a man and woman are shown above two columns of diagonal inscriptions that contain the first part of the surah Al-Imran (3, verse 14), concluding in the vertical lines of text at the left and followed by some invocations. The four right-hand vertical lines of text contain further invocations and the phrase and translation: 'To owner of Musa.'

95

Pendant
Iran, dated AH 1724 (AD 1873–74)
Silver
width 6.1 cm height 8 cm
accession no. T 51.22

This silver pendant was apparently intended to ensure lasting love. On one side two figures, a man and a woman, are shown embracing. The woman wears an elaborate headdress, suggestive of wedding attire, and the man wears a crown. The disk of the radiant Sun appears behind his head and the date AH 1724 (AD 1873–74) is written between their waists. Near the edge of the seated male figure the name Musa is written, and it is possible that this Musa is the same as the owner of the arm amulet cat.94. The invocation at Q. 46 ("O Creator!") is repeated 42 times around the figure. On the reverse of the pendant the man is shown standing with his left hand behind his back and his right hand raised. Another radiant Sun appears behind his head and around the figure there are engraved prayers and Qur'anic phrases, including text from the surah Tawbah (9, verse 33).

96

Arm amulet
Iran, 19th century

Silver, engraved
height 6.4 cm width 6.7 cm
accession no. T 50.20

This arm amulet has a fat-length representation of two human figures, not easily distinguishable as male and female, in the middle top square of a nine-cell central design. Around these figures magical numerals, the word Narr ("true") and the letter lamed are written. In the cell at top left are two words that could be interpreted as a 'false' ('false'). The central cell has text from the surah al-Tawbah (9, verse 128) surrounded by magical numerals. Two fishes, labelled haš ("fish"), appear in the lower middle cell; magical numerals and letters fill the ground and the two adjacent corner cells. The rectilinear border is filled with text from the surah al-Nâr (24, verse 33). On the back, a large hand has inscribed text from the surah Yâusuf (36, verse 34) between two hujj. On the back, a large hand has inscribed text from the surah Yâusuf (36, verse 34) between two hujj.

99, 100

A pair of arm amulets
Iran, 19th century

Silver
width 6.2 cm height 4.4 cm
accession no. T 50.09

These lozenge-shaped arm amulets consist of a set, with the text that begins on one figures on the other. A quotation from the surah al-Qabûl (28, verses 1–4) is engraved on cat.99, with verses 4–5 from the same surah and al-Saff (31, verse 13, line 3) engraved on cat.100.

101, 102

A pair of arm amulets
Iran, 19th century

Silver
width 6.4 cm height 4.5 cm
accession no. T 50.10

The back of the amulet is blank.

103, 104

Pair of amulet cases
Iran, 19th century

Silver
maximum diameter 6.6 cm width 2.7 cm
accession no. T 50.34, T 50.45

This pair of octagonal amulet cases, made to be worn on the upper arm, are engraved with the "Throne Verse" from the surah al-Baqarah (2, verses 255, lines 1–7), which begins on the lid of cat.103 and finishes on the lid of cat.104, where it is followed by a quotation from the surah Yâusuf (36, verses 64, lines 3–4).

On the bottom of each case there is a 4 x 4 square whose cells are filled with numerical squares. The square is surrounded by the names of the four Archangels, and the whole design is framed by two octagonal zigzag bands enclosing another band of magical numerals in which I 24 x 15 is endlessly repeated. On four sides of each case the inscriptions are engraved with the "Throne Verse" from the surah al-Baqarah (2, verses 255, lines 1–7), which begins on the lid of cat.103 and finishes on the lid of cat.104, where it is followed by a quotation from the surah Yâusuf (36, verses 64, lines 3–4).

Amulets
Divination
by Emilie Savage-Smith

Of the numerous practices employed in the medieval Islamic world to foretell future events or discern hidden things, astrology was by far the most popular. Its primary application was in the preparation of horoscopes. These were intended to indicate the influence of the stars and planets on a person either at birth or at other times in his or her life, though horoscopes were also commonly used to determine the wisdom of undertaking a particular course of action.

Innumerable treatises and practical manuals were compiled to help astrologers remember the complex procedures and copious information necessary to interpret a horoscope. Another type of aide-mémoire took the form of an implement that superficially resembles a celestial globe. The type, of which there are two examples in the Khalili Collection (cat.113 and 114) has not been previously recorded, but all the known examples are unsigned and undated, and inscribed in a mixture of Arabic, Persian and Urdu, indicating that they are products of a recent workshop in north-central India.

Another item from an even more recent Indian workshop, cat.112, bears astrological decorations that imply its use by astrologers and divinators. It may have been an astrologer's ceremonial standard or perhaps a badge or symbol of his services, but its precise function is unknown, and no comparable piece has been recorded.

Of all divinatory practices used in Islamic cultures, it seems that only astrology was more popular than that known in Arabic as 'ilm al-zamān ("the science of the sand"), which came to be known as geomancy in medieval Europe. The origin of the distinctly Islamic art of geomancy is a matter of speculation, but it appears to have been well established in North Africa, Egypt and Syria by the 12th century. Unlike astrology, geomancy did not require astronomical observations and calculations. Instead, divination was accomplished by forming and then interpreting a design, called a geomantic tableau, consisting of 16 positions, each occupied by a geomantic 'figure' (fig.5). The figures occupying the first four positions were determined by marking 16 horizontal rows of dots on a piece of paper or a dust board (takhr), a tablet covered with fine sand on which numerical or other calculations could be made and then easily erased (fig.6). Each row was examined to determine if it contained an odd or even number of dots, and it was then represented by one or two dots. The first four lines of dots determined the first figure, the second four lines the next, and so on. Each of the four figures is a vertical column of four marks, each mark consisting of either one or two dots. From these four figures the remaining twelve positions in the tableau are produced according to set procedures.

Geomancy had its own distinctive literature, with numerous manuals written as aids to remembering the multitude of alignments and attributes necessary to interpret a geomantic tableau. Various interpretative methods were advocated, and the significance of each of the 16 possible geomantic figures varied depending upon the nature of the question asked. The practice tended to give answers to more specific questions than astrology, and was used not just to prognosticate the future—popular questions included those concerning the course and seriousness of an illness or the outcome of a pregnancy—but also to learn about unseem events or objects, such as the fate of distant relatives, the location of lost or buried objects or a person's unspoken thoughts. Many of these questions could also, of course, be addressed to an astrologer, who employed different procedures to arrive at a prediction.

Astrology and geomancy were often combined. In one of the stories in The Thousand and One Nights, for example, Qamar al-Zaman, pretending to be a fortune-teller to gain access to the palace and the king's daughter, carries as tools of his trade a set of instruments, as well as a [geomantic] divination tablet and an astrolabe of gold. He calls out, 'I am the scribe, the calculator, the astrologer. I am he who calculates, who knows what is hidden,
null
18th to 20th centuries. While they vary in small details, such as the shape of the two end-pieces holding each set together or whether or not the markings are enclosed by circles, they are all fundamentally identical. Each of the four dice in a set has four sides bearing dots: one face has two dots, two faces have three dots each and the remaining face has four dots. There are no sides with a single dot. This is in contrast to the description given by E.G. Browne of his encounter with a geomancer or namâl in the Iranian village of Khuy on 26 October 1887:

This votary of the occult sciences, Mirzá Taḵí by name, was a native of Kirmânshâh. So far as I could see, he never quitted his cell, dividing his time between opium-smoking, tea-drinking and casting the four dice-like brass cubes pivoted together whereby he essayed to unravel the mysteries of the future. After offering us a share of his tea, he proceeded to cast his dice and tell me my fortune, scribbling on a piece of paper the while, somewhat as follows: — "Three, two, one, two" (counting the numbers uppermost on the dice), "Praise be to Allâh! thou wert born under a lucky star. One, one, three, four; thy journey will be a long one, and seven months at least will elapse ere thou shalt again see thy native land. Two, two, four, two; I take refuge with Allâh, the Supreme, the Mighty! What is it that I see? Thou shalt without doubt incur a great danger on the road, and indeed it seemeth to me that one will attempt thy life before thou reachest Tabûriz. Four, three, one, four . . ." 10

One of the leading Iranian artists of the 20th century, Mirza Muhammad Ghaffari, usually known as Kamâl al-Mulk (d. 1940), produced an oil painting showing a fortune teller using a similar set of brass dice strung together, which he has thrown onto a flat circular plate. Unfortunately, it is impossible to see if the dice are of the same form as those catalogued here, that is with two faces of three dots and none with a single dot.

Two examples of an unusual form of brass lot-casting piece are also in the Khalili Collection (cat. 111). They are of solid brass with cryptic letters engraved on the four faces. Each face also bears a numeral from 1 to 4, in addition to three letters or symbols that differ on each face and one letter, ghâyn, that is constant.

Rectangular, bone lot-casting pieces closely resemble the ivory rectangular dice used for game playing that have been excavated in Fustat and assigned to the 9th to 11th centuries.12 The lot-casting pieces, however, differ from the gaming pieces in the number of dots inscribed on each of the four faces. On the elongated sides there are either one, two, three, or four carved circles, yielding the sum of 10 for the four sides of a die, with no constant sum for opposite faces. In contrast, opposite faces on rectangular gaming pieces, which also have only four dots, have 1 or 6 dots and 2 or 5 dots, so that the sum of the opposite faces is 7. They were apparently used in the game of nard, which employed astrological concepts of day and night, days of the week, months of the year and zodiacal signs. Examples of ivory or bone rectangular lot-casting pieces with concentric circles arranged in a 1-2-3-4 sequence on the faces do occur in other collections, but there has been no comprehensive study of them.13 The Khalili Collection has one typical example (cat. 109) and one, more unusual and possibly older piece (cat. 110), on which one can detect traces of a bird design and scorpions carved within the circles.

One of the most popular forms of lot-casting was bibliomancy (fâl-nâmâh), which involved the random selection of a passage from a written text—usually the first the eye fell upon—and its interpretation in the context of a specific question.14 Collections of poems could be used, especially the Divân of Hafiz, or special treatises with charts or circular diagrams specifically designed for this type of divination. Most popular, however, was the use of the Qur'an itself, preceded by the reading of certain verses such as the 'Throne Verse'
from the surah al-Baqarah (11, verses 553) and special prayers. The Khaliqi Collection has a very large-format Persian treatise on bibliomancy (ca. 1066), which includes a chart showing the propitious times and days of the week for engaging in bibliomancy employing the Qur’an, according to the Imams of the Twelver Shi’i community.

Divination found widespread popularity amongst all strata of Islamic society, despite the condemnation of clerics. Lot-casting, particularly that employing dice, was the form of divination that was most accessible, both to would-be practitioners and to clients. It required the least learning to practice it, and for this reason there were no doubt more diviners practising lot-casting that any other form of divination. Lot-casting may also have had a large following because it was considered to have originated in pre-Islamic Arabia and hence Islamic jurists and clerics were not as disapproving.

Astrology was the form of divination requiring the greatest education, for the practitioner had to know astronomy and mathematics in order to cast a horoscope, as well as how to use astronomical instruments. The most learned of astrologers would also have been versed in the Aristotelian philosophy which underpinned astrological doctrines. Other forms of divination, such as geomancy, incorporated many of the astrological principles into their art, but did not require much knowledge of astronomy or mathematics to produce the forecast. Nevertheless, geomancy, in particular, was sufficiently complex to require extensive apprenticeship and aide-mémoires. Apprenticeship was probably the main method by which the divinatory practices were acquired and transmitted through generations, with divinators constantly striving to invent more convenient mnemonics for the numerous alignments and procedures that had to be recalled when constructing the final prognostication. There is considerable evidence that astrologers, and presumably other divinators, who were not court advisors or patronized by the wealthy, practised in the streets rather than in shops, markets or stalls, and women seem to have formed much of the clientele of the street diviners. The artefacts discussed in this chapter include instruments and aids of both the highly literate class of astrologer and divinator and the relatively uneducated street practitioner of lot-casting.

2. In addition to the two examples in the Khaliqi Collection, a similar object was brought into Christiaan’s, London, for examination in 1989 and later withdrawn from sale; its present location is unknown. A fourth example is in the collection of R. Kaplan in Los Angeles.
3. The term geomancy comes from the Latin geomantia, first used in Spain in the 12th century. The practice is to be distinguished from a totally unrelated Chinese form of prognostication based on land forms, unfortunately also called geomancy in English.
4. For geomantic figures and the practice of geomancy, see Smith 1979; Savage-Smith & Smith 1980; and Fahl 1979b.
5. Maddawy 1991, p. 157; for the Arabic text, see Al-fayyad wa-\lamad 31, pp. 18–19. See also the translation by Richard Burton (Al-fayyad wa-\lamad-Burton, pp. 117–20), who stresses that it is a divination tablet used in geomancy that is specified.
6. A detailed study of the design and function of this plate, as well as possible instrument-makers workshops where it might have been produced, will be published separately.
7. The illustration, from a copy of the treatise completed on 21 Shawwal 993 (7 November 1585), is reproduced in Geneva 1951, p. 149. It will be noted, however, that the subject matter of this particular diagram is different.
9. For example, see Browne 1893, p. 15; Donaldson 1938, p. 194; and Massé 1955.
11. Reproduced in Titley 1885, p. 139, fig. 30.
13. For an example in the Musée du Louvre, see Paris 1977, pl. 21, no. 478a.
15. For the role of astrologers in medieval Islamic society, see the excellent study by Saliba 1993. See also Sary 1966, pp. 48–49.

Divination 151
An illustrated text on cloth

Three pieces of cotton (96 x 75 cm) plain, and (49.5 x 66 cm) with a silk braid (3.5 cm wide) of perhaps originally grey edges, set 3.0 cm in from the cut edges, together to 111 x 97.5 cm, inscribed in black ink, with a hand-woven inscription in opaque watercolours.

This attractive painting known as the 'parallel'. The beam is essentially a 13th-century astrology, with some restrictions. It has been considered and then again, and it has been treated with some care and skill.

At the centre of the depiction of a crowned cross-legged in a halo of the lunar personification, the Moon. Surrounding it are seven concentric circles, divided into 30 compartments, the most inner circle, there are numbered 1 to 29. In the second ring, the outer circle, the dark period of the Moon, the space, another compartment, and the remaining 28, all brief statements about the phases of the moon in that period. In the third ring there is the alphabet and other related zodiacal signs, while in the fourth ring there are pictorial representations of the phases of the moon, and a list of actions for particular lunar phases.
An illustrated astrological text on cloth
India, 18th century

Three pieces of cotton cloth, one (56 x 76 cm) plain, and two (49 x 56 cm) with a single woven-in band (1.4 cm wide) of five stripes, perhaps originally green, with red edges, set 5.6 cm from the sides; the three sewn together to form a panel 311.5 x 507.5 cm, inscribed in naskh script in black ink, with rubrications, and painted with motifs in ink and opaque watercolours; there is a lacier note in naskh script.

Accurate no. TV27.15

This attractive painted textile has no known parallels. The Persian text is essentially a short treatise on astrology, with some geomantic elements. It has been corrected by the scribe and then again by a later user, much as it is done with a manuscript. A much later 'reader' has added an exten-

105, detail of monkey

Enclosing the circular design are seven concentric circles. The first six contain seated figures personifying one of the planets, and an accompanying Persian text giving the astrological attributes, physiognomic and symbolic associations of that planet, as well as its general significance when it appears in each of the 12 zodiacal houses.

Proceeding outwards, the planets are Mercury, who is shown as a scribe; Venus, portrayed as a lady playing a lute-like instrument; the Sun, who has radiant dark hair and is posed frontally, with hands resting on thighs and elbows turned outwards; Mars, who is shown as a warrior holding a severed head by the hair; Jupiter, depicted as a man in a turban reading a book; and Saturn, who is a bare-chested figure with a beard and long hair, and six or seven arms holding various objects. The outermost register contains emblematic representations of the 12 signs, arranged in an anti-clockwise sequence. Between the zodiacal signs are two or three animals, with given attributes. Each animal primarily represents a lunar mansion that is named first in each cell. Since there are 28 lunar mansions and only 12 zodiacal signs, the distribution of animals representing lunar mansions among the zodiacal signs is uneven. Beginning with Aries (on the panel immediately above the head of the central lunar figure), the sequence is: horse, an elephant, a sheep, Taurus, two snakes in succession, Gemini, a dog, a cat, Cancer, a mountain goat, a cat, Leo, two rats, an ox, Virgo, a buffalo, a tiger, Libra, a buffalo, a tiger, Scorpio, a gazelle, a deer, Sagittarius, three monkeys, Capricorn, a monkey, a dog, Aquarius, another dog, a horse, Pisces, an ox, and an elephant. The final, 12th, lunar mansion is illustrated by a leopard placed outside the final ring. On each of the 12 sides of the outer register there is a triangle enclosing general information on the zodiacal sign that is illustrated in the ring beneath and on how it relates to the lunar mansions and the planets. On opposite sides of the diagram there are two parts of a dark-skinned male figure seated at the waist. The upper half is to the right side and is shown drawing a bow. It represents the northern lunar node referred to as the head (na'ī), usually the head of a dragon. The lunar nodes are the northern and southern intersections of the Moon's orbit with the ecliptic. Every time a conjunction or opposition of the Sun and Moon occurs near these lunar nodes, a solar or lunar eclipse occurs. The southern node, called the tail (ahkā), is represented to the left of the main diagram by the lower part of the body. The upper portion of the dark skinned body is also associated with the geomantic figure called qiyāl al-khāliq and the lower half of the body with the one called 'ahdah al-bahr. The remaining 14 geomantic figures are written and labelled at points of the zodiac, with two given at both the house of Leo and the house of Cancer.

In the bottom corner, beneath the large 12-sided diagram, are two small circular ones. The smaller of the two is divided into 2 segments with the names of the zodiacal houses associated with certain types of people and livelihoods. The larger circle has the 12 zodiacal houses named, each on a small circle, and arranged along a diameter of the circle and coincident with the vertical axis of the zodiacal signs. Radiating from the 'poles' of this diameter are lines with the spaces between them filled with information on directions, elements and others astrological values.

Several additional paragraphs in the margins of the rectangular textile give basic astrological information and principles, including one on the significance of the lunar nodes and one on the rainbow (qarn al-qayn).

1. Some have maintained that whenever the tail of the centaur in the constellation Sagittarius is drawn with a knot and a dragon's head at the tip of the tail, as it is on this painted textile, the reference is also to the lunar node called the tail of the dragon, whose exalation was thought to be in Sagittarius. See Harnett 1918, pp. 114-5; Harnett 1986; Harnett 1993. For a counter-argument, see Rogers 1969, pp. 114-5, n. 15 (reading 'lunar node' instead of 'exalation of Draco').
A treatise on bibliomancy
Iran, 18th–20th centuries

8 folios, 10.5 × 31 cm, of a thin, highly burnished paper with five laid lines but no visible chain lines; text area 19.5 × 9.5 cm, bordered by black, green, red and blue lines; and containing 14 lines of an imposing naskh hand written in black with numerous rubrications, some in naskh; there is a larger gold and black frame; part of a title is written at the top of each page, in red nastaʿlīq within a gold frame of arbic elements; folios 78 and 80 are blank binding modern cloth covers accession no. 10021412

This anonymous and undated Persian manuscript opens with a tabliacmic chart of a Twelver Shi'i character (folio 1b, see p. 58 above). The title for the chart and the text on folios 1b–2a is Ra'īsāb-ī-hādīd ("Seeing the new moon"), and indeed the chart ends with taliims to be viewed under these conditions, while folio 2a and part of 3b give a fully vocalized Arabic prayer to be recited upon seeing the new moon.

Folios 1b–9a, entitled Fī ḥayān al-wa'af ("In explanation of passing"), contain a summary of the widely used system of Qur'anic recitation developed by Muhammad Ibn Tayfur al-Ṣugawi (d. circa 1165), in which seven types of wa'af, or passes, were employed, each designated by a letter of the alphabet. The next opening is entitled Fī artī al-azīzī ("attribution of wisdom"), or the method of bibliomancy. The term artīzītāt means entrusting to God the choice between several options, and is applied to divination through dreams as well as by selecting passages from the Qur'an at random, the sense employed here.

In the title of the subsequent opening (folios 5b–6a), the practice is also referred to as ṣaqīāt ("casting fortunes"), though the term artīzītāt is employed again in the title for the opening of folios 6b–7a and at the top of folio 7b. Several procedures are given, including one taken from the Rīśūz al-ṣaqīātītāt ("Book of bibliomancy") by an otherwise unknown authority ibn Tāmīs. According to his method, anyone wishing to tell their fortune by consulting the Qur'an should first read the ' Throne Verse ', then say a prayer for the Prophet ten times, then repeat the prayer specified in the text, and then open the Qur'an and note any of the aṣma' al-' lhsānr occurring on the right-hand page. Then he is to move to the tenth page after that page and look at the tenth line of the left-hand opening; therein will lie the revelation (tablīj). Other bibliomantic methods are given at the bottom of folio 7b, including one attributed to Ḥajjī Ṭayyib al-Ṣaḥīḥī, the great Emāmī Shi'i mujtahid who died in 1894.

The final page, folio 8a, has a different title in the carnesche at the top, atīqāt al-ṣaqīātātītāt ("The appropriate times for bibliomancy"); a list is given of the propitious times and days of the week for undertaking such procedures, as attributed to the Emāmī recognized by the Twelver Shi'i community.

These texts are all very carefully and elegantly transcribed by the same scribe in a continuous text. It is unusual for these three topics—taliims, Qur'ānic recitation and divination—to be deliberately combined in one volume.

1. I should like to thank Professor Wilfred Madelung for his assistance with the Persian text.
4. Ṭūṣī al-Saltānī 1365/8, 2, pp. 166–171, 75, 184. Ḥajjī Muhammad Haṣan played a major role in having the tobacco monopoly revoked in 1935–2 (see Lambron 1987, pp. 24–28, for example). My thanks to Manijeh Bayani for these references.

156 Divination

Thirteen sets of "geomantic" dice
Iran, 18th–20th centuries

Brass
12.5 × 1.8 × 1.8 cm
accession no. 221333, 8
12.0 × 1.9 × 1.9 cm
accession no. 221333C
7.3 × 1.3 × 1.3 cm
accession no. 221333D
6.5 × 1.3 × 1.3 cm
accession no. 221333E
7.5 × 1.3 × 1.3 cm
accession no. 221333F
7.9 × 1.3 × 1.3 cm
accession no. 221333G
6.1 × 0.9 × 0.9 cm
accession no. 221333H
6.4 × 1.0 × 1.0 cm
accession no. 221333I
6.8 × 1.0 × 1.0 cm
accession no. 221333J
3.9 × 0.8 × 0.8 cm
accession no. 221333K
3.9 × 0.8 × 0.8 cm
accession no. 221333L
3.9 × 0.8 × 0.8 cm
accession no. 221333M
3.9 × 0.8 × 0.8 cm
accession no. 221333N
3.9 × 0.8 × 0.8 cm
accession no. 221333O

Each of the sets consists of brass dice strong together in groups of four and held with two decorative brass lids. The components of the sets vary slightly in size and in the shape of the end-pieces, some of which are elongated and some spherical or knob-like.

Only four faces of each die are visible. The majority of dice are engraved with circles with central dots, but four sets have simple drilled depressions. None of the dice have faces with a single dot. On each of two opposite faces there are sets of three dots, while the other two faces have two dots and four dots; these are arranged in the following configuration:

3 | 3
2 | 4
3
Astrological geomantic plate
Iran, 17th or 18th century
Brass sheet, engraved
21.6 x 17.0 x 0.35 cm
acquisition no. 1933.1
provenance formerly in the collection of Alan Bowers, Paris

This carefully executed divinatory plate has a projection at the top reminiscent of the lid of an astrolabe. The front of this projection is engraved in Arabic with the exclamation, "Raise up my position, O Exalter of rank!" A small hole at the top would permit suspension by a wire hook or thread. The reverse of the projection is blank. At the bottom of the plate there is a smaller projection, which is blank except for a framing band, and there are two other, very small, projections placed asymmetrically at the sides of the plate. The plate itself is covered on both sides with numerous Persian inscriptions laid out in concentric circles and engraved on stippled or hatched grounds. In the centre of the front face there is a circular medallion with a finely engraved inscription, which may be a later addition. The significance of the inscription is not immediately evident and invites various interpretations. The top word might be read as sad ("year") with two numerals and three letters beneath. If these are read as a chronogram and the numerical values of the letters added to the numbers, then the inscription might be interpreted as sa'd an hit ("the year 1141 [AD 1728-9] 301").

Around this central circle there is a ring of seven medallions containing personifications of the planets. Proceeding anticlockwise, they are the Sun, Mercury, Venus, the Moon, Mars, Jupiter and Saturn. In the next concentric ring there are 12 zodiacal signs represented emblematically in medallions, proceeding anticlockwise from the top.

The concentric rings enclosing this central design are divided into two halves by columns of labels at about 100° and 360°. The column at 100° defines the contents of the five concentric half-circles in the top field. These constitute a gazetteer for 34 localities in the region of the Gulf of Persia, Iran, Iraq, Afghanistan, and India: their names are given in the outermost half-circle, followed by the longitude, latitude, "indirat" (that is, azimuth of the qibla), and distance from Mecca. The column at 280° describes the contents of the eight concentric half-circles in the lower field. Here the lunar mansions named in the outermost half-circle are shown aligned with the zodiacal houses and assigned degrees, minutes, letters of the alphabet, names, planets, and "limits" (hedalah). A band of swirling vases encloses the complete design.

On the reverse of the plate, the central circular area is blank and is enclosed by 11 concentric rings. Beginning with the inside ring, these rings contain information giving strengths/weaknesses, animal/herb/mineral, colours, planets, zodiacal houses, geomantic figures, letters of the alphabet, the ages in life, numerals, a band of graduations with no labels, and a band of numerals on the outside ring.

A detailed study of the nature and function of this plate will be published separately.

1. For this astrological property, see Asadullah Moxza—Elwell-Sutton 1977, pp.62-3.

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Two lot-casting pieces
Provenance and date unknown
Bone, 9.2 x 1.5 x 1.4 cm
acquisition no. 6501 172
Bone, 8.2 x 1.7 x 1.7 cm
acquisition no. 6502 105

The four faces of cat. 110 are inscribed with one, two, three and four large squares, each with a dot at the centre and traces of carved bird and scorpion designs. At either end there is a border of four inscribed lines. The piece is unusual and possibly somewhat older than the second example, cat. 109, on which the main circular devices consist of a deeper central dot surrounded by three concentric circles. The grounds between the main circles are decorated with small dot-and-circle motifs. On the faces representing three and four, these motifs are arranged in groups of three, while on the other two faces they are disposed in undulating lines. There is a border of two lines at each end.

Superficially similar rectangular dice, but with a different pattern of dots on the faces, have been excavated at Fustat and assigned to the period of the 9th to the 10th centuries.

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II

Two lot-casting pieces
Iran, 18th or 19th century
Brass, both 6.8 x 2.1 x 1.1 cm
acquisition no. T133 134

These two examples of solid brass lot-casting pieces are of rather unusual design. Each of the four faces bears a numeral from 1 to 4 in a separate compartment at the right-hand end, and four other letters and symbols whose significance is unknown. The four faces on each piece read:

gh b h 1
gh sh n b 2
gh sh s n 3
gh s n b 4

It will be noted that in each case the left-hand element, the letter ghayn, is the same.
h 1
h 2
a 3
b 4

that in each case the letter ghain, is
Astrologer’s globes and a standard

by Emilie Savage-Smith

"Astrologer’s globes" are a style of globe recently produced in India that has not previously been recorded in the literature. They are related to celestial globes (discussed below, see pp.168–75) but serve a quite different purpose. Though such spheres have constellation images, they are not true celestial globes, but were apparently intended as astrological compendia or aide-mémoire. Four examples are known, two in the Khalili Collection, cat.113 and 114, the remaining two in other private collections. All four are undated and unsigned. They are inscribed in a mixture of Arabic, Persian and Urdu, the use of the latter indicating that they were made somewhere in north-central India. All are constructed of metal hemispheres, but they employ techniques and alloys that are not associated with the class of celestial globe produced in India and discussed in Part Two, Appendix 1. The iconography on these astrologers’ globes is distinctive but, surprisingly, the stands associated with them are identical to those of an Indian globe with constellation figures based on a Sanskrit celestial map drawn in the early 19th century; this globe is also catalogued in Appendix 1.

A band analogous to an ecliptic is divided into segments which are labelled 0, 5, 10 and 15 up to 360°; the numbering runs clockwise beginning at the division between Aries and Pisces on cat.113 and between Scorpio and Sagittarius on cat.114. The numbering on both globes is incorrect and scrambled. Each segment is subdivided into four rather than five parts. A second band, similarly graduated and labelled, is placed at an angle of 15° on cat.113 and at 45° on cat.114.

The great circles at right angles to the ‘ecliptic’ divide the sphere into 12 gore-shaped sections in both the northern and southern hemispheres. Two such panels are assigned to each zodiacal sign, one in the northern and another in the southern half of the sphere. Each panel, beginning at the narrow point, contains material associated with that sign, such as letters of the alphabet, season of the year, part of the day or night, unlucky days of the month, the number of days the sun resides in that sign, associated temperaments, dejections and exaltations of the planets, associated lunar mansions, elements, direction of the compass, colour, sex and nocturnal or diurnal attributes. The information contained in the two panels allotted to a sign is essentially identical.

All this astronomical information is written around and within engraved constellation figures. The zodiacal figures are engraved completely within the northern hemisphere, and therefore are not even approximately accurate representations of those constellations. Also represented on the northern hemisphere, in addition to the zodiacal figures, are all the classical Ptolemaic northern constellations except Corona Borealis and Lyra. Missing in the southern hemisphere are the constellations of Crater, which should be on the ‘back’ of Hydra, and Corona Australis. Stars are inlaid and some are numbered within the constellations. The two halves of each sphere are differently aligned with respect to the constellations: on cat.113 Orion is beneath Aquarius and on cat.114 it is beneath Gemini. The band across the upper hemisphere on cat.114 also lies in a different position to that on cat.113.

Some of the constellations are of an aberrant size – for example, Perseus – and there are also some radical deviations from conventional Islamic celestial iconography. In the southern hemisphere, Cetus the sea-monster is depicted as a large fish, Hydra as a full-fledged dragon and the Southern Fish (Piscis Australis) as a crocodile. Eridanus is shown not as a river but as a sash flowing from the tunic of Orion, who appears more of a dancer than a fighter. The Ship (Argo Navis) is very European in style. In traditional Islamic iconography Virgo is usually portrayed as a woman standing, her right hand lowered and, on some globes, holding an object in her left hand. However, on both cat.113 and 114 Virgo is presented as a rather elegant rendering of the common depiction of Cassiopeia sitting on a
The throne, though she is not as well delineated on cat. 114. Gemini is unusual on both globes in that the constellation is represented by an embracing couple, seated and viewed from behind. The constellation of Auriga is shown on both globes as a crouching man, also seen from the back, with an animal on his shoulder. Other constellations, such as Serpens and Orion, are also viewed from behind; and Cepheus has the open-armed stance typical of Western drawings. These images were surely drawn from some early modern European star chart or globe.

The inscribed texts on these globes are a blend of medieval Islamic astrological doctrines and a very few Indian astrological elements, all presented in a mixed Urdu-Persian-Arabic vocabulary. Overlaid is an iconography representing several medieval Islamic elements, some early modern European elements and some distinctly Indian interpretations.

The stands associated with the globes have no allowance for a meridian ring and clearly the globes were not intended to be used in any way like a celestial globe. The rings have a padded frame set inside them which would allow the sphere to be rapidly turned for reading without being scraped or damaged by the stand.

It seems that a now unknown workshop of globemakers in north-central India devised, probably in the late 19th century, an entirely new concept of a celestial globe—one intended to help an astrologer remember the mutual alignments and attributes necessary to interpret a horoscope. These globes stand in contrast to the traditional celestial globe, which was not only a model of the universe but a means of calculating the positions of houses in a horoscope, and they represent an intriguing Indian innovation in globemaking.

From a different and more recent Indian workshop comes an item that may have been used as an astrologer's standard in ceremonies or perhaps as a badge or symbol of his services, cat. 112. No comparable object is recorded. Its astrological decoration implies its use by astrologers and divinators, but its precise function is unknown. Its general form is reminiscent of Indian steel maces with ribbed spherical heads. At the top there is an imitation sundial, while on the sphere itself a diagram illustrates the Earth's movements about the Sun, with the solstices (21 December and 21 June) labelled in English but written in Arabic script. The 12 zodiacal signs are represented emblematically on nested circles around a crescent moon and star. It is possible that the item was intended simply as an astrologer's sign, rather like the 19th-century European show-globes that apothecaries displayed in the windows of their shops to attract customers. A notable Indian feature of the piece is the representation of the zodiacal sign Capricorn as a crocodile. In the 11th century al-Buni noted in his treatise on astrology that Hindus called it magar (mugger or crocodile) which is the name of a marine animal; the survival of this tradition some nine centuries later is evident here.

1. One is in a private collection of R. Kaplan in Los Angeles; it has some additional features that do not occur on the other three examples. The other was brought into Christie's in South Kensington for exhibition in 1969 but was withdrawn from sale; its present location is unknown. A comparative study of these four objects will be published separately.
2. The globe in Los Angeles (see note 1, above) also has the names of angels and the Urdu names of the lunar mansions or Nakshatras.
3. The constellations on these globes do not follow in detail those in the Urdu translation of al-Qarawi's Alzâdî, Nugaha al-mubâhidât, which was lithographed in 1869, even with regard to Auriga (shown frontally wearing a Roman toga and holding a gut to his chest), so that the latter could not have served as an immediate source for the designs. See al-Qarawi.
4. The Indian influence can be seen particularly in some of the figurative images on the globe now in Los Angeles (see note 1, above) but they are also evident in the representation of the Southern Fish as a crocodile.
5. For an example, see Sotheby's, London, 15–16 October 1985, lot no. 431.
6. al-Buni, p. 79, sec. 195.
An astrologer's standard
India, 19th or 20th century

A brass globe 14.7 cm in diameter and a copper ring 11 cm in diameter, mounted on a thin iron rod 26 cm long and threaded for 1 cm at the base and for 4.5 cm at the top; an iron handle 15.5 cm long and 1.2 cm in diameter is screwed to the base, and a copper "mandril" 11.3 cm high and 12.8 cm in diameter is screwed to the top, overall length 58 cm.

Accession no. 59.213.46

This composite object, which is unique in the recorded literature, was probably intended for some ceremonial or decorative purpose.

The central element is the brass sphere, which is made of two hemispheres joined using an inner soldered band. It is decorated with various designs of no particular function but probably intended to impart a notion of the heavens and the changing seasons. On one side of the sphere there is engraved the radiant disc of the Sun with a human face. This is enclosed by an ellipse around which several diagrams of the earth are shown rotating at different angles. The two points furthest from the Sun are labelled in Arabic script (but in the English language) 23 December and 21 June.

On the other side of the sphere, 12 nested but not concentric circles enclose a crescent moon and a star. Inside each of the 12 circles are personifications of the zodiacal signs, beginning with Pisces at the innermost ring. On either side of this design there are six circular medallions, each containing a personification of a zodiacal sign. To the left, Aries through Virgo are represented beginning at the bottom and proceeding upwards. To the right, Libra through Pisces proceed downwards. In both series of zodiacal signs the positions of Sagittarius and Capricorn are reversed. Aquarius is drawn as a water jug with a spherical body and cylindrical neck. Most distinctive, however, is the representation of Capricorn as a crocodile.

As the bottom of the sphere are four concentric rings of unetched, uncut, shortening writing. The metal ring around the sphere is blank.

The rod passing through the sphere and the accompanying ring is attached to the handle at one end. At the other end a rounded nut rests against the ring. A circular plate is held secure at the upper end by two hexagonal nuts. The underside of the plate is blank, while a black triangular plate has been soldered at right angles to the upper side to form a sundial. The upper part of the circular plate has a graduated ring engraved near its outer edge, numbered 1–6 on one side of the "gnomon" and 7–12 on the other.
Two astrologer’s globes
India, 17th or 18th century

Each globe 20.8 cm in diameter, constructed from two hemispheres of high-zinc brass joined along the ‘eclipsic’ by an internally soldered strip; there are engraved designs with traces of a white filler, and the stars are marked by inlaid plugs of the same alloy (cat.125) or silvered plugs (cat.126); each stand 14 cm high and 16.6 cm in diameter (inner diameter 11 cm), constructed of seven pieces of headed brass, mostly soldered but with a brass screw securing the two semicircular under-pieces at the base; the stands lined with a brass frame wrapped with narrow strips of cotton cloth accession 905 912.3, 912.1

The globes have two graduated bands, one along the seam serving as a sort of ‘eclipsic’ and the other at an angle of 45° (cat.113) or 90° (cat.114). The two halves of each sphere are aligned differently in each case: for example, Orion beneath Gemini on cat.113, but beneath Aquarius on cat.114. The bands crossing the upper hemisphere also lie in different positions. Otherwise the designs are very similar. All the zodiacal constellations are engraved above the seam, as are all but two of the Ptolemaic northern constellations, some with unusual forms. In the lower hemispheres two of the southern constellations are missing. In and around the constellations are engraved rings of astrological information.

A structural difference between the two globes is that cat.113 has two short tubes inserted at the two holes bored at the ‘eclipsic’ poles, while cat.114 does not.

The stands, which are identical, are of a different alloy from the globe, being a very low zinc brass with considerable lead and some tin. The horizon rings are graduated in a pattern similar to the globe, but more carefully executed, with each five-degree segment subdivided into single degrees. Each unit of five degrees is labelled in abjad letter-numerals, in a sequence reading 1, 5, 10, 20, 30, 50, and so on up to 360, and each unit of ten degrees is also labelled with standard Arabic numerals. There is no accommodation for a meridian ring. The rest of each stand consists of two, crossed semicircular under-pieces, which are supported by four short rod-like feet. The inner edge of the horizon ring and the upper surfaces of the semicircular elements are cushioned by brass bands wrapped in cloth.
Mapping the Universe
Islamic celestial globes and related instruments

by Emilie Savage-Smith

The celestial globe is the oldest form of celestial mapping, for its origins can be traced to Greece in the 6th century BC. No celestial globes from antiquity have survived, if we exclude the Farnese globe which is part of a monumental sculpture and not a scientific instrument. From written evidence, however, it is clear that the basic principles of their design were maintained, with modifications and elaborations, in the Islamic world, where the earliest extant celestial globes were made. There are known to be over 200 Islamic celestial globes in public and private collections, none earlier than the 11th century. The Khalili Collection is not only among the largest holdings of such globes, but has one of the widest ranges, for it includes one of the oldest examples, some of the most recent, several of unique design, and others of exceptional beauty and precision. In this collection there are examples of different construction techniques as well as the major design types: globes with constellations, those with stars only, those without stars, and those with astrological imagery.

Globes with stars and constellations

On Islamic celestial globes the stars were perceived as though attached to the inside of a hollow sphere enclosing and rotating about the Earth, which was known from early classical antiquity to be spherical. Since this three-dimensional model of the skies presented the stars as if seen by an observer outside the sphere of stars, the relative positions of the stars on a medieval celestial globe are the reverse—east to west (or right to left)–of their appearance when viewed from the surface of the Earth. When the globe is viewed from above the north pole, the sequence of the zodiacal constellations is anticlockwise. This reversal can easily be demonstrated by comparing a group of constellations taken from a modern star map, showing Orion surrounded by Taurus, Eridanus, Lepus, and Canis Major with the same group of constellations as engraved on an Islamic celestial globe that is dated AH 1074 (AD 1663–4), cat. 134.

On all known Islamic globes there is a set of six great circles at right angles to the ecliptic. These six ecliptic latitude-measuring circles no doubt reflect the once common use of ecliptic-based coordinates for measuring star positions. When and where this convention arose is unknown, but it contrasts with the later European convention of indicating only meridians, or circles at right angles to the equator rather than the ecliptic. Moreover, on Islamic celestial globes with constellation outlines, the human figures face outwards towards the user rather than inwards, with their backs to the observer, as was apparently the case in the Graeco-Roman and Byzantine worlds, and later in Europe. Regardless of date, the stars represented on all Islamic globes, with a single exception, are those listed in the medieval star catalogues, and only the 48 constellation outlines recognized in antiquity are indicated. In addition to the celestial equator and the ecliptic, the Tropic of Cancer and the Tropic of Capricorn were frequently indicated as well as the north and south equatorial polar circles.

In addition to demonstrating celestial phenomena such as the visibility of stars at a given location, an astronomer or astrologer could use a celestial globe to determine a range of astronomical data. Like the astrolabe, the celestial globe is not a direct reading instrument, for the astronomer must manipulate and calculate the desired information, using the globe as an analogue computer for solving various astronomical and time-keeping problems. To function as an instrument, the sphere, with its representation of the heavens, needed to be placed in an assembly with meridian and horizon rings, allowing for adjustment to a particular location. Unfortunately, the rings and stands are often missing on the surviving globes, or have been replaced with modern, nonfunctioning elements. The Khalili Collection,
Celestial globes can be traced to the inside of a sphere, which was the common practice of early astronomers. The positions of the stars were represented on the map by the vertical height of their apparent altitude from above the horizon. This reversal can be traced back to a modern star map of 1174, which showed Israel with the constellation of Taurus facing outwards from the ecliptic. The Arabic language of the map was apparently the same as the language used in the Greek language of the map. Regardless of the language, the globes were those listed in the Islamic Golden Age, which was used in astronomy.

To determine the position of stars at a given time, astronomers used a range of instruments, including the astrolabe, which was used for measuring the position of stars in the sky. The globes were used to aid in this process. The globes were used to aid in the process. The globes were used to aid in the process. The globes were used to aid in the process. The globes were used to aid in the process. The globes were used to aid in the process.

The oldest globe in the Khalili Collection was made in AD 1284 (AD 1285–6) by an astrolabe-maker named Muhammad ibn Mahmud ibn Ali al-Tabari (AD 1213). There are only five globes known to predate this example, the earliest being from AD 473 (AD 1080). A sixth globe is contemporary with the Khalili globe, as it was made between 1278 and 1310 by Muhammad ibn Mu'ayyad al-Urdi, the son of a well-known astronomer who made instruments for the observatory at Maragha, about fifty miles south of Tabriz in Azerbaijan.

Al-Tabari states on this globe that he positioned the stars, with a suitable increment in their longitudes, according to the Kitab al-fawar al-kawakib al-thabitah ("Book of constellations of the fixed stars") by 'Abd al-Rahman al-Sufi, a 10th-century court astronomer in Ifsahan. This is the earliest known globe to state explicitly its reliance on al-Sufi's treatise as the model for constellation diagrams. In his treatise al-Sufi had discussed each of the 48 classical constellations, giving two drawings for each constellation, one showing it as it would appear in the sky to an observer on Earth and the other as seen on a celestial globe. In addition, there was an account of the traditional Bedouin star names and asterisms with a
Celestial globe
Western India or Iran

Iron alloy
diameter 11.67 cm weight 0.70 kg
(including rod)
acquisition no. SC2361
published Christie's, South Kensington, London, 27 September 1999, lot no.191

The globe is seamless, and solid except for a large bore about 2 centimeters in diameter passing through the sphere. Circular plugs of an apparently different alloy, each about 2 centimeters in diameter, have been placed at either end of the bore, with a small hole drilled in each for the rod that served as an axis. The alloy is most unusual in that it seems to be predominantly iron.1 Near the north celestial pole there are traces of a 'gilt' alloy which may reflect the use of a brass solder when inserting the plugs, and a few small traces of a silvery substance are evident elsewhere. The surface of the globe has a mottled dark brown patina with heavy overall corrosion. No stars or constellations are indicated on the globe. The celestial equator and ecliptic are indicated by simple ungraduated lines with the names of the zodiacal houses inscribed in Arabic along the ecliptic. Six ecliptic latitude-measuring circles at right angles to the ecliptic are also indicated by engraved circles, as are the two tropic circles and the polar circles. Within each polar circle there is an additional engraved circle. Both celestial poles are labelled, and there are Arabic labels indicating the two equinoxes, the tropic circles, and the point of the winter solstice. At the celestial poles there are drilled holes. The stand and rings are missing.

It is difficult to date such a product, for no similar piece has been recorded, but it seems likely that it is 13th century from western India or Iran.

The sphere has acquired a certain degree of magnetism which, curiously, simulates the orientation of the Earth's magnetic field.

1. Since iron is a non-homogeneous alloy, x-ray fluorescence is not a useful guide to its composition. X-rays confirmed, however, that the sphere lacks a strain.

catalogue of the stars, giving celestial latitudes, longitudes and magnitudes. Al-Sufi's star catalogue repeated, with only slight revision, that given in Ptolemy's Almagest for the year AD 137. Al-Sufi expressed the stellar positions in ecliptic coordinates, augmenting the longitudes given by Ptolemy by 12° 42' to correspond to the year AD 964.2 As stated on cat.123, al-Tabari had to further increase the longitudes by five degrees to have the star positions correct for the end of the 13th century.3 Indeed, a globe made for a given epoch would remain valid for only about three-quarters of a century.

The positions of the stars near the ecliptic on al-Tabari's globe correspond almost exactly to those on the contemporary globe by Muhammad ibn Mu'ayyad al-'Urabi.4 However, one finds that in moving away from the ecliptic the star placements on cat.123 become increasingly unreliable, an issue discussed in more detail in the catalogue entry below.

Al-Tabari's globe is of added interest since it can be shown that it was the model for a nearly exact copy, probably made in India, which has been in the collections of the Musée du Louvre in Paris since the end of the last century.11

Globes with stars only

Not all celestial globes have constellation outlines on them. Constellation images are merely mnemonics enabling the viewer to visualize and remember the positions of the stars. They are not necessary for the accurate placement of stars on a globe. In fact, makers of globes - particularly more recent craftsmen - often drew the constellation outlines first and placed the stars freehand within the outlines afterwards, without employing coordinates at any stage.

Gloves with stars alone are generally slightly smaller and indicate only the major or most prominent stars, which are often referred to as 'astrolabe stars' because of their occurrence on the rete, or open star maps, of astrolabes. A very fine example of the type is an unsigned Safavid globe in the Khalili Collection, cat.141. Surviving Safavid celestial globes are quite rare and, though today its rings are missing, both its metallurgical technique and calligraphy make this example one of the finest of those produced as functioning instruments.

Theartistic achievements at the Safavid court are well documented, especially during the reign of Shah 'Abbas I (1587-1629), and it is tempting to suggest that this globe was made for a member of his court.

Globes with astrological imagery

A globe made for Shah 'Abbas himself in AH 1012 (AD 1603-4) represents yet another tradi-
tion of celestial globe design, for it shows only the 12 zodiacal signs, and these not as con-
estellation outlines but as emblematic motifs inside medallions.\textsuperscript{12} Taurus, for example, is a
bull with a hump on his back and a bell round his neck, while Libra is a man sitting cross-
legged with scales over his shoulders like a yoke. Although the globe does have some stars
on it, they are casually positioned, and the zodiacal signs are not used as guides to the loca-
tions of stars near the ecliptic and are not derived from the illustrations of constellations
found in astronomical texts. There are also two very similar globes, both unsigned and
undated, with the same astrological motifs on them, with the exception of a large crescent
moon that is engraved on the globe made for Shah 'Abbas.\textsuperscript{13} This 17th-century Iranian
invention of an ‘astronomical’ globe combining features of a celestial globe with imagery
taken from astrological iconography is perhaps a forerunner of the later Indian ‘astro-
logers’ globes’ that are discussed above (see pp. 160–161). In general, the workmanship of
the Shah ‘Abbas astrological globe appears to be inferior to that of the Khalili globe, cat.143,
which is an instrument executed with considerable precision.

\textbf{17th-century Mughal workshops}

The most prolific Islamic globemakers of the 17th century were members of a family of
instrument-makers in Lahore spanning at least four generations. During the years from
1567 to 1692, this remarkable Mughal workshop produced numerous astronomical instru-
ments, of which 21 signed globes include ones with constellation images as well as those
with stars only. Although there are several astrolabes by this family in the Khalili
Collection, there is as yet no globe.\textsuperscript{14} The earliest of their globes dates from the 18th year
of the reign of Jahangir, that is 1622–23, and the last from AH 1096 (AD 1687–88),\textsuperscript{15} by which
date they had apparently moved their workshop to Delhi.\textsuperscript{16}

All of the globes produced by this family were seamless hollow spheres cast by the \textit{cire

\begin{figure}[h]
\centering
\includegraphics[width=\columnwidth]{image.png}
\caption{Haji Mires Agha\textsuperscript{17} presents
Muhammad Shah Qajar with a globe,
from a pair of lacquer book covers,
Tabriz, AH 1271 (AD 1854–55),
26.9 x 19.9 cm.
Khalili Collection, LG 239}
\end{figure}

\[\text{Celestial globes 171}\]
peraeae (lost wax) process, rather than constructed from two metal hemispheres. Present evidence suggests that the technique of casting seamless globes originated in north-western India towards the end of the 17th century, the earliest confirmed date being AH 998 (AD 1589–90) on a globe produced by ’Ali Kashmīrī b. Luqman.7 The production of seamless globes became a speciality of the 17th-century Lahore workshop, but continued to be practised in India after this family had ceased to make them. That the family did not, even in the 17th century, have a monopoly on this demanding technique is demonstrated by an outstanding celestial globe, cat.134, which was made in India in AH 1074 (AD 1665–6) by Muhammad Salīh Tātāwī.10

18th- and 19th-century workshops

If constructing globes in the form of a seamless, cast sphere is typical of northern Indian globemaking, it is interesting that it was used to produce a globe in AH 1212 (AD 1797), perhaps in Iran (cat.151). It is possible that its maker, Muḥammad Sharīf b. Muḥammad Rīzā, was a Persian artisan who had emigrated for a while to India and learned the local metalworking techniques. He was probably the son of the chief astronomer, Muḥammad Rīzā, of the Qajār ruler Fatḥ’ ’Alī Shah. The instrument was made in the year that Fatḥ’ ’Alī Shah acceded to the Qajār throne and with its unusual design, carefully and attractively executed, it would have been an appropriate accession gift. A lacquer painting in the Khalṣī Collection, LAC 29, shows a similar gift of a globe being presented to Fatḥ’ ’Alī Shah’s successor, Muḥammad Shāh Qajār.

Not all globes made in India were produced by casting a seamless sphere, as cat.138, which is made of two hemispheres joined along the equator by an internally soldered strip, demonstrates.19 It is dated AH 1217 (AD 1804–5), and from the signatory inscription it appears that the maker, Muḥammad Na’īm al-Dīn Muradābādī, copied an earlier globe. As the star positions on Muradābādī’s globe correspond roughly to those on Indian 17th-century globes, such as those from the Lahore workshop, the model may have been of 17th-century date. On the other hand, the stars are not placed with consistent precision, so it may be unwise to extrapolate from such details. Another Indian globe, made after AD 1856, was apparently also derived from the same model, and, like Muradābādī’s, was made from two hemispheres. Nevertheless, it cannot be presumed that the model, however similar in design, was identical in its method of construction.20

Three years after making the globe, Muḥammad Na’īm al-Dīn Muradābādī presented it to Muḥammad Amjad ‘Aḥā Shah, who had acceded to the title of Nawab of Oudh in 1842.21 The capital of the Nawabs of Oudh was at Lucknow, which suggests that Muradābādī’s workshop may also have been there.

Muradābādī’s activities were contemporaneous with those of the busy workshop of a Hindu metalworker named Lalāḥ Balhūmāl Lahūrī, which produced several works for both Indian and British patrons in the Lahore region in the 1840s. Not only was this workshop sited in Lahore, but it represents the continuation of the instrument-making tradition established there in the 16th and 17th centuries, and indeed all the globes it produced employed the cave peraeae technique of casting seamless spheres which is associated with the earlier Lahore products. The products of the Balhūmāl workshop are precise instruments, easily identifiable by their workmanship and several distinctive features.

Among the objects that can be attributed to his workshop are a celestial globe with captions in devānāgarī characters, and two globes in the Khalṣī Collection, cat.140 and 141.22 The former was made for, or at least later owned by, a Hindu astronomer or astrologer...
Globes without stars

Not all Islamic celestial globes had stars on them. There are a number, usually rather small in size, that have only some of the great and lesser circles. The type is not mentioned in any of the treatises dealing with celestial globes, and it is difficult to establish a date and provenance for it. The majority of examples are made with seams, but there are also a considerable number that appear to be seamless, although in most instances confirmation has yet to be obtained by X-ray. In general, it would seem that the type was of Persian origin of the late 17th or early 18th century, but that examples were also produced in India. Few are signed or dated, the only two known dated specimens both coming from the first quarter of the 19th century.

Cat. 115 is a celestial globe that has no representations of stars. This example is unusual, however, in that it appears to be made of iron. The sphere has acquired a certain degree of magnetism which, curiously, simulates the orientation of the Earth's magnetic field. Such a property brings to mind the small terellae that were popular in 17th- and 18th-century Europe. These spherical lodestones reproduced in miniature the magnetic system of the earth, for which reason they gained the name terella or 'little Earth'. Such natural magnets were polished and engraved with lines representing the ecliptic, equator, the tropics and polar circles, and sometimes lines of 'longitude' and 'latitude'. On such a terella, a fine needle would not only align itself with the direction of north, but would also 'dip' to indicate the magnetic equator.

While it is tempting to speculate that cat. 115 may have been a terella, the degree of magnetism does not seem great enough to have permitted the sphere to function as such, and it is more likely that the magnetism was accidentally acquired. Moreover, its size is considerably greater than any recorded terella.

Conclusion

The method of construction can sometimes provide important evidence for differentiating workshops. Available evidence suggests that seamless metal globes are Indian products, while globes made in hemispheres could have been produced in any region and at any period. Clearly the largest and most expensive celestial globes were those that had the full complement of stars as well as the constellation outlines, and the earliest preserved examples are of this form. To function fully, however, a globe did not need to have the constellation outlines but only required a reasonable selection of major stars and to be executed with
precision. Early astronomers do indeed refer to globes bearing only the major stars, and one globe that had stars alone was apparently made in the middle of the 14th century. Nevertheless, most of the globes preserved today of this design were produced in the 15th century and later, and all appear to have been made in Iran or India.

The globes that lack even stars, but have only the celestial circles indicated on them, are of more limited use than the other two designs. They served primarily as didactic devices to demonstrate basic celestial phenomena, such as the equality of day and night for any geographical location when the sun is at one of the equinoxxes. Starless globes are not mentioned in the medieval literature concerned with astronomical instruments, and available evidence suggests that they are quite a late, probably 17th-century, Iranian or Indian development in design. Astrological globes, both those of Safavid Iran with emblematic representations of zodiacal signs and the Indian astronomers’ globes discussed above, are not true celestial globes and served a different purpose. The influence of early modern European celestial cartography began to be felt in India and Iran from the 16th century, but is particularly evident in the 19th century. It is also evident in a group of globes (see Appendix 1), some of which are clearly recent fakes with dates and names added to deceive the buyer.

1. The marble sphere, 61 centimeters in diameter, is held by a kneeling figure of Adam. The date of the sculpture, now in the Museo Nazionale, Naples, is uncertain, and estimates range from the 4th century BC to the 1st century AD. See Volterra 1983, who argues that it is a 1st-century AD original; see also Savage-Smith 1965, pp.12 and 16.
2. This total includes those now in the Khalili Collection as well as an additional 14 that were not known when the history and catalogue of celestial globes was prepared by Savage-Smith (1984); see also Savage-Smith 1965 and Savage-Smith 1992a.
3. A globe made in 1812 by Muhammad Fadlallah ibn Muhammad Musa Ashraf, which has Caso Venutici visible on the available photograph, Hyderabad, The Salar Jung Museum, inv. no. 116.2656.
4. For further information on the design of Islamic celestial globes and ring ensembles, see Savage-Smith 1985, pp.61-65.
5. Florence, Istituto e Museo di Storia della Scienza, inv. no. 2712, dated 5 Safar 673/8 July 1276, Paris, Institut du Monde arabe, Destornelles Collection, made in 1812 by Yusuf ibn al-Husayn al-Asturlabi, Naples, Museo Nazionale, made in 1812 (AD 1253-6) by Qasim ibn Abil-
7. The epoch of al-Sufi’s catalogue is the beginning of the year 1276 of the Abjad calendar, which corresponds to 1 October 964.
8. It would seem that al-Tabari employed a value of 1” per 60 years, as al-Abri had earlier in his catalogue, for the precession of the equinoxes, and that al-Tabari must have intended the epoch of his globe to be about AD 1250.
10. Paris, Musée du Louvre, Section Islamique, inv no.6632; see Savage-Smith 1985, pp.220-221 no.6 and pp.27-29 and fig.6. A detailed comparison of the Louvre globe and the one now in the Khalili Collection will be published separately.
11. Chicago, The Adler Planetarium, inv. no. A.1121; see Savage-Smith 1965, pp.129-130, no 63, and fig. 20. The globe is unsigned, but has the date and patron’s name, Randah al-Shif-i Velayat ‘Abbas ‘dare of the Shah of Sanctity, Abbas [Shar ‘Abbas]’ engraved in a cartouche. A unique feature of this globe is a large crescent moon engraved on it between the north celestial pole and the House of Arieti.
14. The earliest was made by Qasim Muhammad ibn Yusuf al-Husayn al-Asturlabi Labari Humayuni, of the third generation, for a certain Navab ‘Uqba Khan, now in the library of Stonyhurst College near Blackburn, Lancashire, see Savage-Smith 1985, p.174, no 111 and illustrations on pp.37-38, figs 12 and 13 and p.173 fig.37. The most recent dated globe, which is actually a variant form of celestial globe from this workshop, was made by his son, Dhiy’ al-Din

174 Celestial globes
Muhammad, and is now in
Rockford, Illinois, The Time
museum, inv. no. 3406: see
Savage-Smith 1985, pp. 213, 261, 305.
Savage-Smith 1992a, p. 51, fig. 2.3. For a survey of globes
made by this family, see Savage-
Smith 1985, pp. 34-43. Since that
publication, two additional globes
have come to light: one made in
1634 (AD 1667-8) by Dāyāl al-
Dīn Muhammad, and one dated
1704 (AD 1681-2) made by his
cousin Hamid, both of which are
now in the Salar Jung Museum in
Hyderabad. Information on them
was kindly supplied by S.R. Sarma.
17. London, private collection; see
10 and illustration on p. 233 fig. 11
and p. 276, fig. 84. Nothing further
is known of this maker.
18. For a full discussion see the
relevant catalogue entry below.
19. This globe, and all the globes
in the Khalili Collection, have
been x-rayed so as to confirm
their basic method of construction.
20. The maker, Ghulam Husain
 ibn Fath Muhammad al-Karbalki
al-Jawuqri, stated on the globe
that the stars were positioned with
longitudes and latitudes that
were observed with the astrolabe
and other [instruments] on
7 Ramadan 1221 (11 November
1805). The globe is now in a
private collection in Aligarh.
This information is based on
photographs generously supplied
by S.S. Sarma, Jawuqri is also
known as an author of several
astronomical and mathematical
treatises, including one compiled in
AD 1249 (1835-6); see Storey
22. For further details, see
pp. 243-3.
24. See Blundell 1974, pp. 177-192;
Amari 1992. Earlier contacts in
the 16th and 17th centuries with
European celestial cartography
did not have much lasting impact.
For example, the planispheric star
maps based on the early modern
European star maps printed about
1620 by Melchior Tavenier and
engraved in Atlas 1665 (AD 1645-1)
on agate plates by instrument-
maker Muhammad Mahdi of
Yazd (see cat. 142) seem to have
had no further influence upon
Islamic celestial cartography or
instrument design; see Savage-
Smith 1985, pp. 45-6. Similarly,
the magnificently gilt-metal celestial
globes produced in 1579 in the
workshop of Girolamo Mercuri
and presented to Sultan Musa id
(1574-1593), appears to have had
no subsequent influence upon
celestial globe design in the
Ottoman empire or elsewhere in the
Islamic world; see the special
catalogue published by Christie's
London, The Mercuri 1579 Globe,
to accompany the sale held on 30
October 1991.
25. A globe now in Hyderabad, the
Salar Jung Museum, acc. no.
112/XXXI, was made in AD 1223
(AD 1607-8) by Muhammad
Fadlallah ibn Muhammad Mugafid
ibn Muhammad Muzaffar al-
Deen and depicts, for example, at
least one non-Prolemaic northern
constellation, the two dogs of a leash
held by Boesens (Canis Venatici),
one of the nine constellations
mapped by the Danish astronomer
Hevelius (d. 1687). The globe's
method of construction is
unknown. It is inscribed in Arabic
and Persian and states that the star
positions were marked according
to the coordinates given in the
Zīj al-Naṣīrī of Khwajah Bahadur
Husayn Khan. (For the latter
figure, see Storey 1972, p. 102.)
The nature of the inscription was
kindly supplied by S.R. Sarma in a
private communication, as was a
photograph of the instrument.
The inscription itself has not been
examined. Sarma states that
Muhammad Fadlallah is the only
globemaker known to have been
active in South India. The stand
holding the globe, with a mag-
nificent compass in the base, points
to European influences, while the
manner in which the constellation
labels appear suggests that the
whole globe was influenced by the
same source which served as a
template for the Prolemaic star maps
that occur in a Sanskrit manuscript,
Swaradvaidhastavatsvatradaimati
(Jewel of the Essence of all
Sciences) written sometime
before 1538 by Durgashankara
Pathaka, an astronomer of
Benares. The Sanskrit maps are
close representations of a
European model presenting the
new non-Prolemaic constella-
tions, with the faces of the human
figures drawn in the style of late
provincial Mogul artists. See
London, British Library, set Or.
5129, folios 592 and 601; for
details and reproductions, see
Lory 1982, pp. 230-5; Savage-
Smith 1992a, pls. 2 and 27, fig. 5.5.
27. An 18th-century English
terrella, 5.5 centimeters in diam-
ter, is now in Oxford, Museum of
the History of Science, inv. no. 57-
84/371 Billiet Collection. For
one 4.2 centimeters in diameter,
mounted in a 17th-century French
ivory globe stand with meridian
ring, see the catalogue of a sale in
Drouot, Paris, 18 April 1981, lot
104.18.
28. Tehran, Museum of Ancient
Iran; see Savage-Smith 1985,
p. 247, no. 59.
29. The recent copies are probably
made by the same workshop that
David King refers to in connection
with false astrolabes and
monumental Islamic astronomical
spheres when he speaks of 'one of
the favorite schools of fakers' in
Delhi'; see King 1995, p. 31.
Two fragments from the 
Almagest of Ptolemy
Spain or North Africa,
11th or 12th century

8 folios, 17.9 x 12.5 cm (preserved folios); text area 11.9 x 17.4 cm, with 16
to 17 lines per page, written in
maghribi, without catchwords, in
brown, red, green and purple ink on
vellum
acquisition no. 3601.57

These eight vellum folios consist of
two fragments from an Arabic transla-
tion of the most influential astrologi-
cal treatise prior to the time of
Copernicus, the Almagest, which was
written in Greek in the 2nd century AD
by the Alexandrian astronomer
Ptolemy. It was from its Arabic title,
al-Majisti, that Ptolemy’s work
received the name by which it is gener-
ally known today. Four Arabic ver-
ions of the treatise were prepared in
the 9th century, though only two are
exact: that by al-Hajjaj, completed in
AD 822 (AD 827–8), and that by Ibn
Humayn and later revised by
Thabit ibn Qurrah in AD 218 (AD 930).

The fragments in the Khalli Collection
are from the second version, for they
 correspond, with minor variant read-
ings, to passages in a manuscript pre-
erved now in the British Library, one
of only two recorded copies of the
second half of that Arabic version.2

On folio 24 it is stated that the text is
from the sixth chapter (jumâli) on the
demonstration of the size of the
epicycle of the planet Saturn; this is
immediately followed by a reference to
an observation made on the sixth
and seventh days of the month of
Machir in the Egyptian Calendar
(23 and 24 December 157) during
the first year of the reign of the Roman
emperor Antoninus Pius (reg. AD 138–
161).3 This heading and text precisely
openings to the sixth chapter of the eleventh book of the
Almagest.

The eight folios form two pairs of
two bifolios. The first pair (folios 1–4)
are from the centre of a quire, as they
presence a continuous text from Book
Eleven of the Almagest, beginning at
the end of the fifth chapter and con-
tinuing with most of the sixth chapter,
which is concerned with the determi-
nation of the size of Saturn’s epicycle.2

The second pair (folios 5–7) are, to
judge from the length of the missing
text, the two outer bifolios of an 8
-folio quire. Consequently, two bifolios
of text are missing between folios 6b
and folio 7a. The text for the entire
section is on the computation of the
’slit’ of Mercury and Venus from
Book Thirteen of the Almagest, section
eight, according to the Arabic version.6

It is difficult to date these fragments
precisely, but it seems likely that they
are from the 11th or 12th century. The
place of production is equally elusive.
The placement of diacritical dots on
the letters is typical of maghribi script,
though the descending curves of the
letters are less pronounced than usual,
the verticals are very straight and not
obviously ornamented with serifs, and
dal and dal al are written in the plain
fashion of a maghribi script. There is oc-
casional vocalization, and the undotted
letters such as daal or ‘aayn sometimes
have minuscule letters written under
them. The latter is a feature typical of
carefully produced early manuscripts.
No comparative study of
Andalusi and North African forms of
maghribi script has been published,
nor has there been an attempt to trace
chronologically the development of
differing forms of maghribi.7

An undated fragment of a Maghribi
manuscript with a rather similar script,
now at the University of Leiden, is
thought to be of 1oth–11th century
date and of Andalusi origin.8 A
manuscript with similar script, now in
Paris, was copied in AD 660 (AD
1166–7), possibly in Seville.9 Another
feature arguing for an Andalusi
origin for cat.16 is the fact that there
is some evidence to suggest that in
andalusi script, text was methodically
placed on the final dal and min, as is
found in maghribi script; these points
were often omitted.9 On the other
hand, a vellum manuscript definitely
copied in Andalusi in AD 470 (AD
1086) has the very curved and hooked
ascending and descending strokes gen-
erally associated with maghribi script,
but lacking in the Khalli fragments.10

Consequently, available evidence sug-
gests that a very curved and hooked
maghribi script could occur in Spain
as well as across North Africa from at
least the 11th century AD, but whether
the plainer version was restricted only
to Andalusi is uncertain.

Since only two complete manuscript
copies appear to have been preserved
of the 11th and 12th books of the
Almagest in the Ishaq/Thabit transla-
tion, those fragments are of great
significance. Furthermore, the
diagrams in these fragments appear
more carefully drawn than those in the
11th-century copy available for com-
parison. Since these vellum fragments
are closely a western product of about
the 12th century, perhaps made in
Spain, the possibility arises that these
fragments may represent the version of
Ptolemy available to the translators
and compilers who prepared the Libro
del saber de astrologia for Alfonso el
Sobrin ("The Wise"), crowned Alfonso X
of Castile in 1282.

2. British Library, Ms. Add. 2724 contains
the last seven books of the translation by Ishaq/Thabit.
3. This manuscript contains seven books, completed, acc.
colophon at the end of
in AD 670 (AD 1171–8).
4. See Kunitzsch 1974, pp. 85–96. For the Egyptian cal-
der, see Ptolemy’s. See Ptolemy’s.
5. Thabit ibn Qurrah in AD 218 (AD 930).
6. See the text for the entire section on the computation of
the ‘slit’ of Mercury and Venus from
Book Thirteen of the Almagest, section
eight, according to the Arabic version.6
7. It is difficult to date these fragments
precisely, but it seems likely that they
are from the 11th or 12th century. The
place of production is equally elusive.
8. See the text for the entire section on the computation of
the ‘slit’ of Mercury and Venus from
Book Thirteen of the Almagest, section
eight, according to the Arabic version.6
9. It is difficult to date these fragments
precisely, but it seems likely that they
are from the 11th or 12th century. The
place of production is equally elusive.
10. See the text for the entire section on the computation of
the ‘slit’ of Mercury and Venus from
Book Thirteen of the Almagest, section
eight, according to the Arabic version.6

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2. British Library, Add. 2737, dated Shaban 33 (October 1128), contains the last seven books of the Almagest in the translation by Ishag and Thabiti. Add. 2734 contains the first six books, completed, according to the colophon at the end of the fourth book, in AD 1486 (357 AH). No complete edition of either Arabic version has been published. Kanziach (1974) compares the two for many section headings, but omits Book Eleven.
3. For the Egyptian calendar employed by Proclus, see Proclus—Toomer, p. 91; for dated observations in the Almagest, see Pedersen 1974, pp. 408-22.
4. Folios 14a-46 of Cat. 126 correspond to folios 141a-141a, line 3 in British Library ms. Add. 7475. For an English translation, see Proclus—Toomer, pp. 317-40.
5. This is section four in the English translation; see Proclus—Toomer, pp. 613-71. Folios 34-40 of Cat. 116 correspond to folios 213b, line 14-217a line 11 in British Library ms. Add. 7475. Folios 79-86 of Cat. 126 correspond to folios 212b, line 17—folio 231a, line 9 of the British Library text.
6. The most recent dated parchment manuscript with maghribi script is from the year 1044 498 (3115) AD; see Khoury & Wittka 1993, p. 404.
7. The study by Brouzet (1989) is limited to 19th- and 20th-century North-African specimens.
8. University of Leiden, ms. nr. 14.539, illustrated and described by Wittka (1989—9 fasc. 1, pp. 66-70). The verticals are art as straight or pronounced as in Cat. 126; however, and the vertical stroke of the t is not as oblique.
11. Paris, Bibliothèque Nationale, ms. arabo 6390, completed by Ahmad ibn 'Ubayd Allah on 1 Shawwal 427 (27 January 1036); see Déroche et al. 1994—, fiche no. 68.
12. The two copies are the British Library manuscript cited earlier and a copy of all 13 books of the treatise in a manuscript in Tunis, Bibliothèque Nationale, ms. 2716; see Kanziach 1974, pp. 38-42.
An illustrated star catalogue

An illuminated manuscript containing an illustrated star catalogue derived from one source, illustrated with star diagrams from another. The tables were drawn from al-Zij al-adabi, an important compilation of astronomical data produced at the Samarkand observatory between 1410 and 1416, under the patronage of the Timurid ruler Ulugh Beg ibn Shahrukh. The relationship of cat. 117


Each table covers the stars in one constellation, and each star is identified by a number, given in a red alfabetical system in a right-hand column. The remaining six columns contain a description of the star's position, the name by which it was commonly known, if there was one; the longitude, the latitude, and the jahr (“direction”), that is, an indication of whether the star lay north or south of the ecliptic; and finally the magnitude of the stars on a scale of one to six, according to the 10th-century star catalogue of Abd al-Rahman al-Sufi. This latter treatise, known as the Kitab al-fawwar al-wadaiyya al-shababih (“Book of the constellations of fixed stars”), was also the source of the constellation diagrams that follow each table. In the original, al-Sufi provided two drawings of each of the 48 constellations he discussed, one showing the constellation as it would appear in the sky, the other as it would be seen on a celestial globe. In cat. 117, however, only one view of each constellation is presented – usually, but not always, the second. The diagrams were drawn with great care and follow a very traditional format, but they do not appear to have been copied directly from any of the published copies of al-Sufi’s treatise.

117, folio 8v, showing Auriga as seen on a globe

117, folio 27v, showing Argo Navis as seen in the sky

117, folio 13r, showing Orion
Celestial globes and their uses

To function as an instrument, a celestial globe must be placed in a ring assembly, allowing for its adjustment to a particular location. The horizontal ring, supported by a stand, defines the horizon. The meridian ring indicates the north–south points and the celestial poles, while the zenith ring, which is at right angles to the meridian ring, marks the East–West points and the point directly overhead. The sphere itself bears the celestial equator, the ecliptic, the Tropics, and the great circles passing through the ecliptic poles (the ecliptic latitude-measuring circles).

Arabic treatises on celestial globes present numerous procedures for their use. Three examples will be given here, demonstrating the use of a celestial globe to find the length of an unequal hour on a given day, to calculate the passage of time, and to determine the houses of a horoscope. In the illustrations of these functions that follow, the zenith ring has been removed from cat. 140, which still has its original rings and stand.

Islamic civil and religious time-keeping was based on the unequal hour. This unit was calculated by dividing the period between sunset and sunrise and the period between sunrise and sunset by twelve, the result being affected by three factors. Firstly, night and day are only of equal length on two occasions, at the equinox and autumn equinox, and night-time and day-time hours are therefore unequal on the other 352 or 353 days of the Muslim year. Secondly, night and day lengths or shorten as the seasons progress, so that unequal hours vary from one day to the next. Thirdly, the progress of the seasons varies from one latitude to another, so that unequal hours vary from place to place. For these reasons the precise length of an hour at a given place on a given day had to be obtained by an individual calculation, for which a celestial globe could be used.
old religious time-keeping on the unequal day was calculated by the period between sunset and sunrise, the latter by twelve, the former by three factors.

The unequal day are only of two occasions, at the equinoxes, and day-time hours are equal on the one side, unequal on the other 355 or 356, or 365 or 366 days. Secondly, when the days lengthen or shorten as the seasons advance or recede, so that unequal one day to the next. The unequal day varies from one another, so that a year at a given place on a year of the same age, for which a correction of the day must be made.

120. Showing parts of a celestial globe
Calculating the length of an unequal hour

Knowing the geographical latitude of a town, say, Lahore, which lies at 33° north, rectify the globe— that is, raise the northern celestial pole 33 degrees above the horizon ring (see 4, below).

1. Find out from a calendar where the Sun is located in the ecliptic for that day, say 13° in the House of Gemini, and align that point with the eastern horizon. Mark the point on the equator now at the eastern horizon (a).

2. Align the degree of the Sun on the ecliptic with the western horizon.

3. Mark the point on the equator now at the eastern horizon (b).

The angular distance between (a) and (b), 220°, represents the amount of daylight on the day in question, each degree being equivalent to 4 minutes of time. To calculate the length of the day-time hour, divide the angular distance by 22, giving 18° for each house, with a remainder of 4; multiply the number of degrees by four, giving 72 minutes, and multiply the remainder by five, giving 20 seconds. A day-time hour is therefore equivalent to 72 minutes and 20 seconds on that day.

The complement of the distance between (a) and (b) is 120°, which represents the time between sunset and sunrise. By the same procedure the length of a night-time hour on that day may be calculated as 44 minutes and 30 seconds.
Telling the time
To determine how much time has passed since sunrise, a celestial globe can be used as a spherical elevation or altitude dial:

1. Rectify the globe (see p. 184). Align the north point of the horizon ring with the direction of north at that location—the local meridian line. Learning from a calendar, the position of the Sun along the ecliptic for that day, for example, 5° Gemini, attach a pin at that point. In sunlight, rotate the sphere until the shadow is as short as possible. The altitude of the Sun is represented by the position of the pin relative to the horizon ring. The Ascendant is then the division of the ecliptic that is at the eastern horizon ring.

2. Should the local direction of North be unknown, and if the meridian ring has a sliding sleeve with a hole in it, another method can be employed. With the globe assembly placed on a level surface, lower the north pole onto the north point of the horizon ring. The assembly is then moved until the meridian ring casts no shadow to either side of the ring. The globe will then be oriented along the local meridian line. After placing a pin or gnomon in the sliding sleeve, the sleeve is then moved along the ring until the pin casts no shadow. The altitude of the gnomon can be read from the meridian ring, and is equivalent to the altitude of the Sun.

3. After rectifying the globe, the position of the Sun, for example, 8° Gemini, can be determined with respect to the horizon ring by transferring the angular distance read on the meridian ring to the position of the Sun in the ecliptic using a pair of drawing compasses and marking it off along an arc passing through the zenith. The Ascendant will be at the eastern horizon. Having determined the Ascendant, mark the division of the equator that is at the eastern horizon (C).

4. Rotate the sphere eastwards until the Sun is at the eastern horizon ring. Then mark the division of the equator which has reached the horizon (D).

5. Count the degrees between C and D. For the elapsed time in unequal hours, multiply by four to convert the time into minutes and then divide the result by the length of the unequal hour for that day as previously determined.

For example, if the Sun is at 8° Gemini, were at an elevation of 77°, then the angular distance between the two markers would be 8 1/3°, giving the elapsed daytime in unequal hours as 4 hours and 40 minutes, when the unequal daytime hour had earlier been determined to be 72 minutes and 20 seconds in length.
To determine the houses of a horoscope
Of interest to astrologers was the possibility of casting a horoscope without complex calculations. Given the altitude of the Sun at a given location, as described in the previous example, or the altitude of a certain star obtained by using an astrolabe, and given the length of the unequal hours on that day, a horoscope could be easily constructed in the following manner:

1. For example, the Sun at 8° House of Gemini was at a known altitude, the Ascendant — or the beginning of locus i of the horoscope — is the degree of the ecliptic at the eastern horizon. The 'Middle of the Heaven', or the point of the ecliptic at the upper half of the meridian ring, is the initial point of locus x of the horoscope.

2. With the sphere in the same position, the Descendant, or locus vi, is the degree of the ecliptic at the western horizon ring, and the 'Pog of the Earth', or locus iv, is the point of the ecliptic at the bottom or nadir of the meridian ring.

3. Having previously determined the length in minutes of the unequal daylight hours on that day, for example, 74 minutes and 20 seconds, then double that amount, giving 148 minutes and 40 seconds, or two unequal hours, and divide by 4 to find the equivalent angular distance of that time interval, for example, 36° 10'. For practical purposes, given the approximate nature of the globe, the equivalent angular distance of two unequal hours is rounded to the nearest half degree, which in this example is 36°. Then rotate the sphere westward from its initial position by that amount, that is, 36°, measuring along the equator. In this new position, the beginning of locus xi is at the northern meridian ring and the start of locus vi is at the lower meridian.

4. Rotate the sphere towards the east. The ecliptic point at the top ring is the bright point, and the opposite point

5. Figure 8 Horoscope map, showing the 11 Houses (East)

6. Rotate the sphere, eastward, clockwise equivalent hours of the previous amount 2°, that is 6° 10', the bright point on the ecliptic, and that for the meridian.
4. Rotate the sphere a second time westwards by the same amount, that is, 36°. The ecliptic point at the upper meridian ring is the beginning point of *Locus XLI*, and the opposite point is *Locus V*.

5. Return the sphere to its original position, with the Ascendant at the eastern horizon.

6. Rotate the sphere in the opposite direction, eastwards, through the angular distance equivalent to two unequal night hours of that day—that is, subtract the previous amount from 60°. For example, 24°, that is 60° minus 36°. In this new position, the beginning of *Locus XXI* is the point on the ecliptic at the upper meridian, and that for *Locus XI* is at the lower meridian.

7. Then rotate the sphere eastwards a second time by the same amount, for example 24°, and read the beginning of *Locus VIII* at the upper meridian, and *Locus VII* at the lower meridian.

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1. For these and further uses, see Kennedy 1989, Worrall 1944, Lorch & Kunitzsch 1985, and Lorch 1988. A celestial globe could also be used to determine the qiblah, or the direction of Mecca; see King & Lorch 1922, pp.201–2.  
2. When a 90°-arc is attached to the sliding sleeve, as occurs on some globes, such as cat.141, the sleeve can be moved to the zenith and the point of the ecliptic representing the Sun can be placed alongside the appropriate reading for the altitude. A separate 90° graduated arc made to fit the globe may also be used, and this rests on the horizon ring with its upper end extending to the zenith. Instead of a sliding sleeve, some treatises speak of using a hole drilled directly into the meridian ring and then rotating the entire meridian ring, with attached sphere; see, for example, Kennedy 1989, p.35.  
The planispheric astrolabe

by Francis Maddison

Six hundred years, a large geographical expanse, two linguistic families, and the scientific cultures of two religious traditions separate the comment made in the 10th century by the Ḥabūn al-Safāʾ ("Brethren of Purity"), a scholarly society centred on Basra, with connections in Baghdad, from the verses written in 17th-century Paris by the satirist Boileau. When the Brethren were compiling their epistle on the manual crafts, the astrolabe already had a transcultural history of 900 years, reaching back to Hellenistic times, in particular to Ptolemy of Alexandria in the second century of our era. Few astrolabes were made in western Europe after the 17th century; Boileau wrote at the historical end of a tradition, at a time when the activities which required the use of an astrolabe were better served by other, more specialized, instruments. This was not the case in Islam where, because of the particular needs of Islamic practical astronomy, the astrolabe continued to be of use, often in simplified form, until at least the second decade of the 20th century. Nearly 1200 years is a long period of time for the useful life of an expensive device of some technological and geometrical complexity, of which the classic type changed little during its history. Of the instrument's popularity, there can be no doubt: a total of over 1200 surviving Islamic, Byzantine, and European astrolabes have been recorded. They provide a diagnostic tracer of the transmission of Hellenistic and pre-Islamic Indian learning and instrumentation to early Islam, thence to al-Andalus and from there to medieval Christian Europe in the north, and to the Maghrib in the south; and, later, to Mughal India and to Ottoman Turkey.

The astrolabe '... est à lui seul le symbole de l'astronomie...', in western Europe, in medieval sculptures and manuscript miniatures, the astrolabe serves to evoke Ptolemy or the muse Urania. In Islam likewise, it is described as part of the paraphernalia of the astrologer in the stories of The Thousand and One Nights; it is depicted in Mughal, Persian and Ottoman paintings among the equipment of both the lone astronomer and observatories. In each culture, the prestigious origins of the astrolabe no doubt counted for something, as did its evident complexity and ingenuity linked with its portability. But clearly a wide nexus of associations contributed to its permanence as an icon. Beyond the mystique, it is sometimes difficult to discern the scientific users and the value of their practice, given the often serious errors in the data incorporated in some astrolabes. Nevertheless, the translation of texts from Hellenistic and Byzantine sources—and probably the copying of examples—provided early Islam with an instrument that solved problems related to the three main concerns of Islamic astronomy:

1. astrology;
2. finding the azimuth of the qiblah, that is the direction of Mecca;
3. the determination of the astronomically-defined times of Muslim prayer.

The first of these, astrology, was a Hellenistic inheritance, whereas both the latter were Muslim concerns not envisaged by the Hellenistic developers of the astrolabe.

An astrolabe is an analogue computing device, usable for the solution of problems connected with time-telling, and in the teaching of astronomy and in the practice of astrology. A star-map (in Latin, rete; Arabic ʾanḳabāt), bounded by the Tropic of Capricorn and including a graduated representation of the ecliptic—the apparent path, seen from the Earth, of the sun through the 'fixed' stars, as opposed to the 'wandering' stars or planets—is rotatable about a point representing the celestial North Pole. The star-map is the mirror image of the modern, widely sold, plastic rotatable star-maps, being the view of the stars as seen on a globe, not as seen from the earth. Generally, the position of each of the brighter stars selected for the star-map is marked by the sharp tip of a pointer, and the name of the
star is engraved at the base of the pointer. The star-map fits closely within the rimmed body (in Latin, mater, Arabic اسم), of the astrolabe, which is provided with a bracket (Arabic base), to which two suspension-rings are attached. Most Islamic astrolabes, where the larger suspension ring is too small to hold by putting a thumb through, originally had a suspension-cord (Arabic ٨٠٠٠٠), which was often elaborated and had a tassel.

The mater contains several circular plates, known in Latin as tympana, and in Arabic as سطح, the singular of which is سطح. Each plate was prevented from rotating by a lug projecting into a slot in the mater, or by a notch engaging with a lug on the inside of the rim of the mater. The plates were made for use in different latitudes, and were engraved with the horizon-line for a particular latitude and circles of altitude (altmecants) — drawn for every degree, every 3°, every 6°, and so forth as appropriate to the size of the astrolabe — between that line and the zenith at the particular latitude. The central hole, as on the rete, represents the celestial north pole. The latitude for which a plate is made is usually engraved in a crescent-shaped space in the centre between the horizon-line and a curved line at the top of the unequal-hour lines. This space is crossed vertically by the meridian-line, and the latitude is inscribed in abjad numeral notation on the right of this line, either just as a number, or preceded by the words, 'for latitude ...'. On the smaller plates, the latitude is marked just as a number representing degrees; on the larger examples, this is followed by another number representing minutes of arc. It is interesting that on a few of the more elaborate astrolabes the absence of minutes of arc is indicated by the symbol ر, derived from the columns of numerals in Greek manuscripts, where ر, an abbreviation of αύθί ("nothing"), signifies the absence of a numeral; in fact, abjad is not a place-notational system. To the left of the meridian-line, the number of hours and minutes in the longest period of daylight in the year at that latitude is given, for example '12 24', sometimes preceded by the word, 'hours' (see the illustration on p. 202).

On many Andalusian and Maghribi astrolabes, this information is supplemented by a brief list of places on the particular latitude and for which, therefore, the plate is suitable. Apart from those mentioned, other lines are variously engraved on plates: azimuths, usually above the horizon, sometimes below; the twelve astrological houses; lines of dawn and dusk, below the horizon; and hour-lines, below the horizon. Only the later European astrolabes have lines of equal hours (on the limb of the mater), because the peoples of Islam had no need of such hours. On the plates the usual hour-lines for a particular latitude are lines for unequal, or planetary, hours, that is, hours determined by dividing the time between sunset and sunrise into 12 equal divisions, six o'clock being midnight, and between sunrise and sunset into another 12 equal divisions, six o'clock being midday. Only at the equinoxes will the night hours equal in length the day hours, the former being longest and the latter shortest at the winter solstice, and vice versa at the summer solstice. Two other horary systems are sometimes drawn over the unequal-hour lines, especially on Mughal astrolabes, which often have very complex plates: lines for horae ab ortu solis, known in Europe as Babylonian hours, and horae ab occasu solis, known as Italian hours. In both systems the intervals between the starting and the ending points (sunrise to sunrise for Babylonian hours, sunset to sunset for Italian hours) are divided into 24 equal divisions, but owing to the different times of sunrise and sunset, the number of hours relates to different times in the day. Muslim prayer-times are astronomically defined, and lines for the prayer-times are usually marked by dotted lines on Andalusian and Maghribi astrolabes. To use the astrolabe in observation, it must be provided with a sighting-rule — an alidade — equipped with a pair of perforated sight-vanes. The sighting-rule is normally on the back
of the astrolabe, where it can rotate over a scale of 90°, in order to determine altitudes of a star or of the Sun. The back of an astrolabe is usually engraved with other useful scales. Centrally, in the lower half of the back, for example, there is usually engraved a 'shadow-square' (normally, in fact, a rectangle) of direct-reading trigonometrical functions for elementary surveying, and, on the limb, associated co-tangent scales. Another common scale was a sexagesimal sine-cosine (or just sine) quadrant. Another, on Iranian astrolabes, was the quadrant of a projection of the signs of the zodiac, with ingenious graphs of arcs of circles enabling the direction of Mecca to be found at various places (see below, p.272), by the altitude of the declining Sun. On Iranian instruments, in the same quadrant, there were often graphs of the meridian altitude, throughout the year, of the Sun in various latitudes. These graphs also took the form of arcs of circles on Iranian instruments, sigmoid on Mughal instruments, owing to the different nature of the projection. Iranian and Mughal instruments often included astrological tables correlating the 28 mansions of the moon with the signs of the zodiac, and the terms, faces, and limits of the planets. Andalusi and maghribi astrolabes have a zodiac/calendar scale correlating the signs of the zodiac with the Julian calendar, designated by Arabic transliterations of the Romance month-names.

The astrolabe is held together, while permitting the rotation of the alidade and the rete, by a pin passed through the alidade, then from the back through the mater, plates, rete, and rule. This was a simple pivoting ruler, useful for determining straight-lines, such as those from solar positions in the zodiac to hour-lines, and for declinations, but it was not always present. It was held in place by a wedge, in the same way that the wheels of some early wagons were retained on their axles. The rete and the plates were drawn in stereographic projection, a useful geometric technique which retains the true value of angles measured radially from the centre, though it distorts areas and shapes. Thus, for example, both rete and plates are bounded by the Tropic of Capricorn which, in the stereographic projection, is of much greater diameter than the Tropic of Cancer, and beyond it the distortions would become unreasonably great.

The early history of this geometric procedure is obscure, but was certainly known, in the second century of our era, to Ptolemy of Alexandria, who used it for his planispheric astrolabes. In the planispheric astrolabe as here described, the projection is from the southern celestial pole on to the plane of the equator.

It would be vitiose, in view of the number of descriptions of the construction and use of the astrolabe which have appeared, to repeat that information here. Instead, the illustrations on pp.202–205 show the practical use of one of the astrolabes in the Collection.

From Hellenistic and Byzantine sources, early Islam acquired the theoretical and practical knowledge to build astrolabes. The earliest surviving astrolabes are Islamic, and date from the 9th century AD. Many of the names of the first makers of astrolabes are recorded by Ibn al-Nadim in his Fihrist ('Index', a sort of bibliography of early Islamic writing), in the 10th century, and from this, and surviving instruments, it is possible to construct a 'genealogical' table of master–apprentice relationships. Sometimes these relationships are also familial.

Most astrolabes were made of metal, possibly a quaternary alloy of zinc, copper, tin and lead. Technically either bronze or brass, it is, for the sake of consistency and in the absence of systematic metallurgical analysis, always described here as 'brass'. Although metallurgical analysis may occasionally serve to identify modern fakes, particularly in the light of their high zinc-content, little may be expected from this procedure in the identification of instruments from particular workshops, or even regions (see p.173). Apart from the visible

188 Planispheric astrolabes
diversity of 'brasses' used in the construction of a single instrument, it must be recalled that a great deal of recycled metal, some of it far afield, was used. For instance, a Jew, Abraham Yiju, operated a bronze factory in India in the late 13th century, and copper, tin, and old bronze vessels from Spain were exported to him in Aden. In terms of construction, the rete and plates are of beaten sheet-brass (the rolling mill was first invented in 15th-century Europe for producing metal-strip for coins); the mater was cast in one piece, or else a sheet, to form the back, was riveted to a cast or wrought iron. A few astrolabes, mostly in Turkey, were made of wood and pasteboard, with the inscriptions drawn in ink, and there are a few didactic or pattern instruments of stone. The general use of metal, cast and beaten, and the associated decorative techniques – ornamental engraving, working à jour, 'damascening' (inlaying of precious metals) – suggest that makers of globes and astrolabes were metal-workers, and no doubt craftsmen specializing in various techniques were employed in ateliers, or sub-contracted, but in nearly all cases where something is known about an astrolabist, he proves to be at least an astronomer of sorts, such as an astrologer or a munsuqīt, whose task was to determine prayer-times in a mosque.

The point is confirmed in the long account of Safavid astrology and astronomy by the traveller and jeweller, Sir John (Jean) Chardin (1643–1713). Born in Paris in 1643, Chardin went to Turkey, Persia, and India between 1664 and 1670, and again between 1671 and 1675, and wrote: "The reason why astrolabes are so well made is because, they are made by the astronomers themselves; it is not that there are not professional artisans for mathematical instruments, but those that they make are not valued as much as those made by mathematicians, who are not so likely to make an error numerically, and who mark more accurately the numerals and diagrams. To that must be added that an astronomer is not considered a learned man, if he does not know how to make all the instruments himself, and if he does not work better than a skilful artisan."

The Superior of the Capuchin monks in Isfahan, with whom Chardin stayed, introduced him to 'the astrologer most famous for the making of astrolabes', Muhammad Amin, 'a man as learned as he was an excellent artist ... apart from knowing thoroughly his science, he had the surest possible hand for constructing mathematical instruments.' Among the techniques of manufacture observed by Chardin are the use of a ruler and dividers of iron and steel, a special plane, or protractor of brass, the dastā'īr: '... the principle instrument which they have for the true and accurate construction of their astrolabes ... this Persian plate ... with which the astronomers of the country make their instruments exact and precise, without much calculation or computation, as is done elsewhere.' The astrolabists also used, for the division of the mater, a large copper or lead bowl, in the centre of which the mater was carefully fixed with mastic, so that degree divisions on the limb of the mater could be laid off from those already divided on the edge of the bowl. Chardin describes in detail the nature and use of these tools, but omits any mention of the use of tables of almucantars in drawing the plates.

Astrolabes and other scientific instruments naturally partake of the styles of metalwork of the periods and places where they were made. The earliest Islamic astrolabes were made in the Syro-Egyptian region, and among the early astrolabists and astronomers of Islam, there are several whose nisbāb is al-Harrānī: Harran was a pagan Sabian city, a centre for translation from Greek and Syriac. From the late 10th century onwards astrolabes were also produced in Iran. The early style is simple: it consists of straight 'dagger-shaped' star-pointers, or ones which are slightly curved; essential lines only on the plates and...
The Jam'i al-mabādī' wa-l-ghayāṭ of al-Marrakushi

Iran or India,
dated AH 797 (AD 1459–60)

This careful and complete copy of the Jam'i al-mabādī' wa-l-ghayāṭ ("Compendium of principles and objectives") by Abu 'Ali al-Hasan ibn 'Ali al-Marrakushi was produced in Iran or India and is consequently significant to historians since it demonstrates knowledge of al-Marrakushi's treatise in the eastern Islamic lands. The treatise, compiled about 780 (AD 1180–81) in Cairo and its name suggests a Maghribi lineage.1

His extensive treatment of spherical astronomy and astronomical instruments is divided into four books (fāms) with numerous subdivisions and, in addition to the standard problems in spherical trigonometry and astronomy, includes illustrated discussions of sundials, armillary spheres, planispheric astrolabes, universal astrolabes, trigonometric sine/cosine quadrants and quadrants for determining time from solar altitude. No edition of the text has been published and only one other extant copy is complete.2

The author's name is given at the opening of the treatise (folio 10b, line 2) as Sharaf al-Dīn Abī 'Ali al-Hasan ibn 'Ali ibn 'Umar al-Marrakushi, with the title given on folio 11b, lines 24–25. From the scribe's name, Ibn Mir 'Abd Allah Mir Jan'ar al-Husayni al-Tabrizi, given in the colophon on folio 166a, it is evident that this is an eastern copy, and this provenance is confirmed by the style of illumination decorating the volume. On folio 1b there is an illuminated opening for the carefully written table of contents, which fills folios 1b–2a and is in chart format, keyed to small red numerals written in the margins throughout the volume.3

Illustrated openings also occur at the beginning of the treatise proper (folio 10b), the beginning of the second fām (folio 78b) and the fourth chapter (qism) of the second fām (folio 147b), the beginning of the third fām (folio 178b) and the beginning of the final fām (folio 265b). The calligraphy and the forms of the numerals are typical for manuscripts from 12th-century Iran and India. The colour tones of the carefully executed illumination also suggest an Indian provenance, though an Iranian one cannot be precluded. The script was executed in establishing a sound copy. According to a marginal note made by him on folio 146b, the copy was collated with a copy that had itself been collated with the autograph manuscript, and occasionally, as on folio 66b, the scribe copied a marginal note reproduced from the autograph. This magnificently produced copy is, therefore, important not only because it is the only recorded eastern manuscript but also because it is complete and textually sound. Most of the text is set within blue, red, black and gold rules, and on folios 10b–12a within-cloud bands set against a ground of pink hatching. There are rubrications and some interlinear notes in a later hand. Diagrams are executed in red, gold and blue ink, with illuminated section headings. Two pieces of paper were pasted over folio 11 during a modern repair, and a flyleaf was added after folio 166.4

1. Folios 174a, 179b and folio 266 are blank except for the ruled frame.
2. King (1900) says that the surviving manuscript copies are of Egyptians, Syrian or Turkish origin and that the work was apparently unknown in the Maghrib as well as the Islamic East.
4. See King 1986a, p. 59 for copies: a manuscript in the Topkapı Palace Library, Istanbul, no. 12443, was published in facsimile in 1974 by the Institut für Geschichte der Arabisch-Islamischen Wissenschaften in Frankfurt (series c, volume 2 in two parts). The first half of the treatise was translated into French by J.J. Sédillot (1843–5), while the second half was inadequately summarized by his son, I.A. Sédillot (1846), employing two incomplete copies in Paris.
5. The manuscript was later followed (with omissions) in very large Arabic numerais.
on the back; and a low, or medium high kursî, often pierced with two holes, symmetrically disposed on either side of the vertical centre line.\textsuperscript{57}

While retaining some aspects of the design of these early astrolabes, those made in the Ayyubid period become more complex, with zodiac/calendar scales (for Syrian Christian months), and sometimes with inlaid decoration. Though some naskh script is used as decoration on these 13th-century astrolabes, the basic script is in a simple, non-serifed, Kufic, known sometimes as ‘astronomical Kufic’, because of its use on astronomical instruments.\textsuperscript{58}

Astrolabes began to be made in Islamic Spain in the 10th century, shortly after those in the East. Andalusian astrolabes are characterized by the presence on the back of the Julian zodiac/calendar scale; by characteristic ‘wavy-flame’ star-pointers, springing from squarish bases, which are sometimes perforated, and usually ornamented with a silver knob; by notches, to facilitate use in dim light, at 10° intervals on the degree-scale of the altitude-quadrant on the back; and by the use of the fairly thick, heavily serifed, Andalusian Kufic script. Very few astrolabes were made in Islamic North Africa, before the fall of the Nasrid Kingdom of Granada in 1492 and the expulsion of the ‘Moors’ from Spain.\textsuperscript{59} The subsequent Maghribi astrolabes, nearly all from Morocco, in particular Fez and Marrakesh, continue in the tradition of those from Spain, except that the Kufic script, while remaining characteristically Maghribi, becomes lighter and less mannered. Astrolabes were made in North Africa, almost up to the present time. (For Andalusian and Maghribi astrolabes, see also below, p. 262.)

In Islamic India, there was a continuous history of astrolabe-making from the latter decades of the 16th century through to the end of the 17th. For the most part they were astrolabes and globes made by members of the same family at Lahore (see below, p. 219), the first recorded astrolabist of the family being Allahdad, who seems to have been officially attached to the imperial court of the Mughal Emperor Akbar (reg. 1556–1605).

The backs of Mughal astrolabes, as already mentioned, are usually engraved with astrological tables. Because of this, and because they are often equipped with more plates than usual, frequently elaborate ones, and have a full range of stars on the rete, Mughal astrolabes give the appearance of great complexity, despite the use of a generally clear naskh script. The kursî is fairly characteristic, being a high triangle worked a jour. Astronomical instrument-making continued in India, both Islamic and Hindu (where instruments are engraved in sanskrit in desenagtart script), through the 18th and 19th centuries and the beginning of the present century. Many of the maharajahs had their private astrologers, such as the Lahore astronomer, Lalah Balhumal, who was employed by the Maharajah at Kapurthala in the middle of the last century; they also made instruments, and some of their productions are large and novel.\textsuperscript{61}

Artistically the most elaborate astrolabes come from Iran, mainly from the Safavid period, in particular from the reign of Shah ‘Abbas II (1642–1666) to that of Shah Husayn I (1694–1724). On these Safavid astrolabes the rete is composed of elaborate foliate tracery, and the script, which is naskh or variations of the type, becomes an important decorative characteristic; it fills up available space, and is often engraved against an ornamental background. Quotations from the Qur’an and dedicatory inscriptions are engraved on the kursî, and a verse from the 13th-century poet Sa’î, contrasting the impermanence of life with the permanence of engraving, is popular, at the base of the back.\textsuperscript{62} Persian astrolabes often record the name of the decorator, as well as that of the maker, though these two activities are not distinct: the maker of one astrolabe may appear as the decorator on another. One 18th-century Persian astrolabist, Haji Ali (see below, cat. 149), recorded the ‘opus’
number of several of his astrolabes, and usually the date also.\textsuperscript{36} The language of all the Islamic astrolabes is essentially Arabic, because it is the classical language and the Arabic star-names and technical terms are loan-words in Persian, Turkish and Urdu, which are the main other languages used in places where astrolabes were made. Persian, however, is found where there are dedicatory inscriptions, or verse quotations, on Persian astrolabes, even though the Safavid court spoke (Azeri) Turkish.\textsuperscript{37} Not all astrolabes are signed, and not all signed astrolabes are dated. The signatures are usually on the back: numerous variations occur, but, commonly, examples can be found on the back, or around the edge of the lower left quadrant, on early astrolabes; above and on either side of the shadow-square on Mughal astrolabes; in a cartouche below the shadow-square on Persian astrolabes. The signatures usually begin with the verb and pronoun 'he made it' – sant\textsuperscript{a} (m.) (san\textsuperscript{a} would be used on a globe, because the Arabic word for globe is feminine) – or with one of the nouns meaning 'work, opus' – sant\textsuperscript{a} or am\textsuperscript{a}. On Iranian astrolabes, there is also sometimes the signature of the 'decorator', beginning namma\textsuperscript{a} (he decorated it). On a few astrolabes, further details are given; for instance, an Ayubidastrolabe gives the name of the 'designer / calculator', the maker, and the inlayer, and a Safavidastrolabe gives the name of the astronomical supervisor, as well as those of the maker and calligrapher.\textsuperscript{38} The dates are usually given only in the hijrah era, though other eras are sometimes recorded as well on Mughal instruments. The dates are nearly always written not in Hindu-Arabic numerals, but in abjad, that is, the Arabic alphabet used numerically. The numerals on the scales and in the tables, and on the plates, are also written in abjad.\textsuperscript{39} The engraving of the necessary scales on the astrolabe required great precision if the instrument were to achieve even the most rudimentary accuracy in use, and indeed, the engraving on the best astrolabes is of a high order. However well engraved, most astrolabes are in fact far too small to have provided very exact results. Sir John Chardin's unique description of methods used by the Persian astrolabists in designing and manufacturing their astrolabes has been mentioned above. How much of an astrolabe was marked out in themanner described by Chardin is not clear, nor indeed how universal this procedure was. On some astrolabes, the rete has lines scratched on the back showing that the design was first sketched out on one side of the sheet of brass and then cut out and engraved on the other side. There survives, probably from the 18th century, a Persian astrolabist's board for dividing the scales on an astrolabe, and this may be seen as a simplification of the procedure described by Chardin.\textsuperscript{40} Scales, drawn in ink on paper, are mounted on a wooden board, which contains a recess to take the mass of an astrolabe. The board serves as a protractor for laying off the meridian and east-west lines, the scales of degrees on the rim and around the edge of the back, the co-tangent scales and the shadow-square on the back of a small astrolabe, but can be used for only one size of astrolabe.

Treatises on the construction and the use of the astrolabe are common in Islamic literature. Perhaps the first was that written by Masha'\textsuperscript{a}l\textsuperscript{a}, a Jewish astrologer who died in about AH 200 (AD 815), and who, with the Iranian al-Nuhakht, directed the preliminary surveying for al-Mamun's foundation of Baghdad in AH 145 (AD 762–3). Another well-known early treatise is that on the use of the astrolabe by 'Ali ibn 'Isa al-Asturlabi, a maker of astrolabes as well as a practising astronomer, who made observations in Baghdad and Damascus in AH 114 (AD 829–30) and AH 217 (AD 832), and who took part in the expedition in the plain of Sinjar (between the Euphrates and the Tigris) on the orders of the Caliph

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1. Louisiana 1987, no. 87
2. Briscoe & Maddison, S.
3. 'Einland & al-Khujandi, A.
5. Destombes saw the astrolabe had been lost since 1923.
8. figs 158, 19.
Fake planispheric astrolabe

Probably Iran, 20th century

Brass, cast and sheet, cut and engraved
diameter 13.2 cm
maximum height: 17.2 cm
(excluding suspension ring)
acquisition number: 1952.10.2

This astrolabe is certainly a fake, for, among other errors, the tracer confusing the reverse direction and, although the four plates appear to have been inscribed for different latitudes, some are the same.

Some clues as to its date of manufacture may be made, paradoxically, by the maker’s inscription, which reads: “Muhammad ibn Khādī al-Asturlabī, made in the year 1357” (i.e., 1937). No almanacs called Muhammad ibn Khādī al-Asturlabī have been recorded, but the name recalls that of the famous astronomer, Hamīd ibn al-Khādī al-Khujandi (d. circa AD 1000), to whom one surviving scribe attributed the work. The maker’s inscription may have been made after 1937. It belongs to the first group of fakes discussed on p. 126, and better in some respects than several other similar fakes, apparently from the same workshop, the inscriptions on which are seriously garbled.

1. Louisi 1947, no. 43 and p. 166
5. Guthe 1932, p. 245, no. 117, figs 178, 19.

Fakes and forgeries

Although little has been published on the subject, the study of fakes and forgeries can be instructive in many ways; two such instruments in the Collection are described because they are fakes of characteristic Islamic astrolabes of different periods, and can serve for comparative purposes (cat. 110 and 134). They demonstrate several points of interest, including possible sources, makers and dates of manufacture.

A large proportion of astrolabes in the Iranian styles which have appeared on the market in the last few decades are fakes and, indeed, a photograph of a maker of such astrolabes at work has been published. Many of these astrolabes are of fairly crude manufacture, and would be unlikely to long deceive someone familiar with genuine Iranian astrolabes. They
are scientifically inaccurate, with unusable scales and alidade; signs of the zodiac on the ecliptic circle in the wrong order and even, occasionally, 24 signs instead of 12; useless plates with no lug and socket to prevent the plates from rotating in the mater, and astronomically meaningless inscriptions, often with a six-pointed 'Solomon's Seal' diagram in the mater containing the gazetteer; and a high, simple, triangular **kurst**. Much of the engraved script is poorly executed and sometimes illegible; and there is often a 'signature' and 'date' in the gazetteer. The name of the maker is often given as Muhammad Amin, the astrologist of the late 17th century, and the date, often placed unusually with the signature in the centre of the mater, at the beginning of the 18th century. No instruments of this type are found in the older collections such as that of Lewis Evans, and there was only one, untypical, in Henri Miché's collection; it may, therefore, be deduced from these and other facts that these fakes were probably made after the Second World War.

Though fewer in number than those described above, there are several other unsatisfactory Iranian astrolabes which are equally useless astronomically but are clearly the work of a skilful metalworker. Superficially, they appear to be Iranian astrolabes of the Safavid period; they are finely decorated and bear the signatures of well-known astrologists such as 'Abd al-'Afi' and 'Abd al-'A'mmah. Arguments that the **kurst** might be a copy of a genuine instrument do not address the problem of why a copy should incorporate the following characteristics: the signs of the zodiac on the ecliptic circle of the rete are in reverse order, starting from the right-hand side of the horizontal bar; the star-pointers are not named (though the existence of a misplaced pointer, perhaps meant for qulh al-usiad, Alpha Leonis, which should nearly touch the ecliptic at al-usiad, Leo, and the reverse order already mentioned, might suggest the reversal of a tracing), but unlike many instruments in this group the rete is not symmetrical; al-*mizān* (Libra) on the ecliptic circle is written, incorrectly, as al-*mālkhū* (both sound the same in Persian), as on the other fake astrolabes of the group; the ecliptic projection ratio is above 111.80, instead of 122.33. The outer, Capricorn band of the rete is engraved with a type of 'Greek key' pattern, familiar from fake, but not from genuine, astrolabes; the limb, divided by lines, is numbered wrongly in abjad (it begins, for example, /h/y/h/y/khu/ ... = 3, 5, 15, 31, 10, 5, 35), though the upper degree scales on the quadrants on the back are correct; the divisions on the shadow square are not radial; the alidade is not of Iranian type and has sights placed too far towards the centre for a plathemisic astrolabe; and no lug and socket is provided. In a cartouche below the shadow square on the back, the astrolabe is signed and dated, 'Abd al-'A'immah sana 1127 ('Abd al-'A'immah, year 1717'), but not preceded by sana'ahu ('he made it'), as is usual with this maker's signature. The **kurst** is of correct design and finely decorated, and in general the quality of the decoration and engraved script is fair.

Not all the astrolabes in this group are identical, or have the same faults, but there are many common factors. It has been suggested that they may have been made as early as the 18th century, but the 19th or 20th centuries seem more probable. Certainly the forgers were aware of the quality of the work by 'Abd al-'A'immah and 'Abd al-'Afi', whose names and, sometimes, also those of their illustrious patrons, were engraved on the fakes. In 1875, in Tehran, Křiží wrote that '... some ancient astrolabes bearing the names of renowned makers, such as 'Abd al-'Amin, still exist in Persia and are valued at the most extravagant prices'. He added that, circa 1875, '... the few remaining examples were sought by the greatest in the kingdom and were easily sold for 50 dacats, so much did they love to have one in their sight, although they could not understand one iota of it.'
1. This essay is solely concerned with ordinary planispheric astrolobes, because there are no universal planispheric, spherical or mariner's astrolobes in the Khalili Collection.

2. From an epitome of the Ikhtiyār al-Safā' (‘Brethren of Purify’); cited from Lewis 1945, Risāla (‘Epistle’) 8. At this time, three or four sewing needles cost one dinar; see Ashtor 1964, p. 66.


4. The astrolobe-quadrant is dealt with below, see pp. 238–70.
6. See note 10 below.
8. For example, the 17th-century astronomer, Nasir al-Din al-Tusi, in a 17th-century Ottoman Miletan, Ataba, Ethnographical Museum, no. 8457, folio 112; see Sayfi 1980, pl. 2.
10. Apart from the quotations at the beginning of this essay, we may note, in Europe, that Heloise and Abelard in the 12th century named their son Astralabe. Literary references to the astrolobe, for example, are found in lines 635–9 of the didactic poem ‘Makwamin’ (1565) by Maurice Sica (circa 1510–1574); in a moral fantasy for instruction (1564) by the printer and engraver Bernard Pallas (circa 1515–circa 1575); in the section about the fantastic bear in chapter IV of Miguel de Cervantes’ Segunda parte del ingenioso cavallero Don Quijote de la Mancha (1615), which may refer to mariners’ astrolobes because Cervantes was familiar with navigation, but he had also been a prisoner in Algiers (cf. Murillo 1971, pp. 39–40); and, more recently, in chapter V of the Soviet humorous novel (1918 [1966] 1970) by ITF & Petrov: Sama meraya… bylo li chto meruyat? ‘It measures by itself… provided you have something to measure’, but astrology in Russian can also mean a theodolite; and in the children’s novel by Byeye & de Vere Sterpe (1949) (a mariner’s astrolobe, but also a place, ‘Astrolabe Lake’), and Stewart 1977 (the name of a painting of the Virgin and Child, and the title of the novel). In Islam, the classic literary use of the astrolobe occurs in Al-fayal wa-uls-ayal (‘Thousand and One Nights’), in the Taylor’s Tale, ‘The Late Young Man from Baghdad and the Barber’, which is subsumed in the story of the Hound’s Back, where the barber refuses to shave a man’s head until he has made an astrological prediction, using his astrolabe, which, with details of the astrological data, is described as inlaid with silver; the date is AD 635 (1035–5) (see Madden 1990; Al-fayal wa-uls-ayal–Mahdi, 1, p.155; and the English translation of Mahdi’s text, Al-fayal wa-uls-ayal–Haddawy 1990, p.231. A second mention of an astrolobe, this time of gold, with a geomantic table, in The Thousand and One Nights, occurs in the Tale of Quamar al-Zaman and his Two Sons (quoted from Richard Burton by Irwin 1994, p.190); it was not found in the French translation by either Rene R. Khwair (1986) or J.C. Mardrus (1879) but is found in Al-fayal w-al-uls-ayal–Haddawy 1991, p.397).

11. Cf. the description by al-Biruni, circa AD 1050, of a geared calendar movement (later used by Muhammad ibn Abi Bakr in an astrolobe [circa 1080]), which derives from a Greek sundial (see Wright 1905, and Field 1993, and the references to their earlier work, and that of D.R. Hill, there given). See also Turner 1994, chapters 2 and 3, passim.

15. It must also be noted that medieval Christian Europe had no need to determine either, and to that, some extent, the transfer of knowledge of the astrolobe (and its accompanying astronomy) from Muslim Spain resulted in the acquisition of knowledge without a purpose, except for its astrological use.

16. See Table 3, below, p. 199.
17. A related project is seen in King 1935b and its useful bibliography.
18. Both the Planisphaerium, which corresponds to the type of astrolobe described here, and in the Anandrama, which constitutes a form of universal astrolobe.
19. Stereographic projection was used in the dials of Vitruvian ananorphic water-clocks of which fragments survive from the period of the 1st to 5th centuries of our era, also in the lid (frontispiece from the medallion of Antonius Pius, AD 140–4) of a portable sundial dueable to the late 2nd century, possibly within a few years of Ptolemy’s Planisphaerium, circa AD 160; see Turner 1981, pp. 10–11, and the works of Edmund Bucher there cited.
22. Cf. the table of the Lahore family of astrolobes on p. 27, below, and that of the family of the maker of astrolobes, and of cartwheels with combination-locks, published in Madden 1985, p. 129.
22. "Weathered brass"! On analysis, see Allan 1979, passim; see also pp. 168 ff., above, for remarks on globes. On trade, see Godinot 1973, esp. pp. 192–7, 20, 94. The Indian Bronze Factory of Abraham Vijn; new or repaired vessels would be sent back.


24. Ehren 1956, p. 21, wrote: 'The connection between astrologists and metal workers in general can be presupposed a priori, since ... most of them used to make their astrologers for themselves. This is confirmed by the apocryphal of the masters or those of their fathers. Leaving names like guanxi alone, we find some like al-Islam (the needle-maker), Ibn al-Naqshab (son of the engraver), Saffir (copper-smith) and Ibn al-Saffir, or Ibn al-Nahdah (son of the copper-or brass-smith), abounding even among those astronomers who are not known as inventors of instruments. This worked both ways, since we have also metal objects which are in no way connected with either astronomy or science in general, yet on the evidence of their inscriptions we know that they were made by astronomers (again using the word in a wide sense so as to include all "time-measurers") or their sons, such as the little bronze jug made by 'Ali b. musa'ab al-Islam (references given).

Similarly, we read that time-keepers (siyayat) in Yemen constructed an automation ... (details given). Since May 1960, we can add to the missal the family of Hamid ibn Mahmud ibn al-Inshâfi who, in the 12th century, made astrologers, strong-boxes with combination locks, and a pen-box, the maker of the last, known only from that one item, calling himself al-azhar (see Madsen 1981, pp. 149, 152) and Muhammad ibn Khurtikh (see below cat. 120), now known to have made, in the 13th century, a geomasonic table and an incense-burner.

25. Chardin 1871, iv, p. 332. Chardin left France as a Huguenot refugee. This and the following quotations from Chardin are taken from the French by the author.


28. See also Michel 1941, 1967, chapter v, passim.

29. Although pagan, the Hurrians became, by infiltration, accepted along with Jews and Christians as 'People of the Book', and were deeply concerned with astrological matters, especially the consideration of the planet, Mercury; and they were reputed to be skilled metal-workers. See al-Nadi: Dodge, 11, pp. 274 ff., esp. 275–3; and below, p. 366.


31. The purpose of these holes remains obscure. Perhaps they served to accept cords to hold the astrolabe (though an "spade is normally attached to the upper ring"); or perhaps they are relics of some earlier form of attachment, as ornaments. It is interesting that the word, kawd, used in Arabic to describe the triangular "bracket", means "chair", "throner", "base" or "pedestal", and is used for the stand of a globe; could the original astrolabes have been held by the kawd (or a handle attached to it) like an Etruscan mirror? Note that on an astrolabe, as normally held, the cardinal points are placed


33. The outstanding exception is the fine work of Abu Bakr ibn Yusuf, of Maraksh, known to have made at least three astrolabes in the early 13th century; see Mayer 1956, pp. 32, 33; Brieux & Madsen, forthcoming, 'Abu Bakr b. Yusuf'; cf. also the comments on Maghribi astrolabes-making in the catalogue of the sale at Hôtel Drouot, Paris, 9–10 October 1980, p. 38, nos 266–7.

34. On Buhlmann's globes, see below, pp. 247–7.

35. In the second quarter of the second q'a of the Gâ content; see also the introduction to Madsen & Brieux, forthcoming.


38. A large astrolabe, 96 centimeters in diameter, now in Dona Müzeü, Istanbul, made in Damascus in 1619 (Ar. 1222–3) for the Ayyubb Sudan, al-Malik al-Mu'azzam Sharif al-Din (reg. 1218–22) by 'Abd al-Rahman ibn Sani al-Bakr al-Nâjî, calculated by 'Abd al-Rahman ibn Abû Bakr, the muqarnas of Tâbiq, inlaid by al-Sâir al-Dinsâh (see Brieux & Madsen, forthcoming, 'Abd al-Rahman b. Sani al-Bakr al-Nâjî'; Madsen 1940, p. 351, where the date appears wrongly); and the astrolabe made for the Safavî Shah 'Abbâs II in Iran 1057 (Ar. 1647–8), by Muhammad Muqim al-Yazdi, in Damascus (or under supervision) of Muhammad Shâfi, the astronomer of Jânahad, and now in the Museum of the History of Science, Oxford; (Mayer 1955, p. 74; Muhammad Muqim al-Yazdi 1911; Brieux & Madsen, forthcoming, 'Muhammad Muqim al-Yazdi' 4).

39. See cat. 2, p. 249. There are few differences in the attribution of numerical values from 60 to 1,000 to letters of the alphabet, between the usage in eastern Islam, and that in the west (for instance, 60 is in the east, and in the west).

40. Museum of the History of Science, Oxford University.

41. Nasr 1976, p. 121, ps 279 is captioned, 'A contemporary master astrologer maker of Isfahan'. The photograph is also reproduced in Berg' 1978, p. 357.

42. The collection of astronomical and geomeric instruments formed by Lewis Evans (1853–1930) was the founding collection of the Museum of the History of Science, Oxford University, which began as the Lewis Evans Collection in 1924 and was opened to the public in 1926.
43. The collection of Henri Michel (1856–1941), Brussels, was mostly bought by J.A. Billon, and much increased by additions mainly from the collection of Nicolaus Landau, Paris. In 1937 it was presented by Billon to the Museum of the History of Science, Oxford University. The portion of the Billon Collection which came from Michel was described by C.H. Jostes (1937). The fake astrolobe was briefly catalogued as an ‘Arabic astrolobe, specially designed for astrological purposes’ (p. 14, no. 26); neither signed nor dated, it is now displayed in the Museum as a fake, inv. no. 17784/20.

44. Gingerich, King & Saliba 1972, p. 191 (on this group of fakes); p. 192 and table 2 (on the ecliptic projection ratio); p. 195 (the misuse of mīddat and its pronunciation). The much larger group of crude fakes mentioned above has not been discussed in any publication, but the ‘Fakes’ files in the series of Islamic instrument files in the Museum of the History of Science, Oxford University, contain numerous photographs, notes of such instruments and letters describing their imperfections. These files also contain material relating to the group of better-made fakes, and to types of fake. However, the number of fakes brought to the attention of the Museum during the last four decades became so great that systematic collating of photographs and notes was not pursued except in instances of particular interest.

45. On the astrologists whose names were used on the forgetten, see Gingerich, King & Saliba 1972, passim, and references given there; see also Mālikī Abu al-Faraj, forthcoming, ‘Abd al-‘A‘īm’ma’ and ‘Abd al-‘Alī.


Table 2

<table>
<thead>
<tr>
<th>Abjad letter-numerals</th>
<th>Eastern</th>
<th>Western</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 'ād</td>
<td>sīn 60</td>
<td>'alā 60</td>
</tr>
<tr>
<td>2 bā</td>
<td>'ain 70</td>
<td>'ain 70</td>
</tr>
<tr>
<td>3 jīm</td>
<td>fā 80</td>
<td>fā 80</td>
</tr>
<tr>
<td>4 dāl</td>
<td>sād 90</td>
<td>sād 90</td>
</tr>
<tr>
<td>5 hā</td>
<td>qāf 100</td>
<td>qāf 100</td>
</tr>
<tr>
<td>6 wāw</td>
<td>ra 200</td>
<td>ra 200</td>
</tr>
<tr>
<td>7 zay</td>
<td>dām 300</td>
<td>dām 300</td>
</tr>
<tr>
<td>8 bā</td>
<td>sām 400</td>
<td>sām 400</td>
</tr>
<tr>
<td>9 dā</td>
<td>dāl 500</td>
<td>dāl 500</td>
</tr>
<tr>
<td>10 tā</td>
<td>dāḥa 600</td>
<td>dāḥa 600</td>
</tr>
<tr>
<td>11 kaf</td>
<td>dāl 700</td>
<td>dāl 700</td>
</tr>
<tr>
<td>12 lam</td>
<td>dāl 800</td>
<td>dāl 800</td>
</tr>
<tr>
<td>13 mīm</td>
<td>dāl 900</td>
<td>dāl 900</td>
</tr>
<tr>
<td>14 nūn</td>
<td>dāl 1000</td>
<td>dāl 1000</td>
</tr>
</tbody>
</table>

On the use of the symbol ۰ for zero, see above, p. 187.
The parts of a planispheric astrolabe

The planispheric astrolabes employed in the Islamic world are known both from surviving examples and from illustrations in technical works. The first are represented here by cat. 114, a fine Iranian instrument made in 1690, and the second by cat. 118, an exquisite copy of an astronomical treatise produced in India ten years later. The work in question is the "Fama al-mubadi" ("Compendium of principles and objectives"), which was composed by Abu'Ali al-Marrakushi in Cairo in the early 13th century.

The planispheric astrolabe is a composite instrument made of metal, usually brass. The body of the instrument is the mater, shown here both from the front and from the back. It consists of a disc with a raised rim, or limb, into which the rate and one or more circular plates are fitted.

The five plates of cat. 114 are engraved with stereographic projections of the heavens for five latitudes between 22° and 40° north and with a tablet of horizons. This last gives the horizon at 32 other latitudes and could be used for calculations in which the position of the horizon was the only information needed. It may be compared with the layout for a tablet of eight horizons in cat. 118.

The rate is of the same dimensions as the plates, but most of its surface is cut away to produce a net-like celestial map on which a number of brighter stars are indicated by pointers: on cat. 114 stars can be located by reference to pointers in the form of stylized leaves. Many other rate patterns are known, as the diagrams in cat. 118 show (see also cat. 135), for a survey reta, for example.

The alidade, the sight used for measuring the altitude of the Sun by day and of a given star by night, is placed at the back of the mater. The alidade of cat. 114 is shown here with the pin that holds the instrument together, and the wedge, or horse, that holds the pin in place. An illustration in the Marrakushi manuscript shows an alidade (bottom centre), a pin (bottom left) and a horse (top centre), as well as a shackle (top left), a ring (top right), and a washer of the type often used to stop the alidade from sliding the surface of the mater (bottom right). The shackle and ring are attached to the roughly triangular bracket at the top of the mater, so that the astrolabe can be suspended during use.
The sight used for measure of the Sun by day or by night, is placed at water. The alidade of the instrument is shown (top centre), as is a ring (top right), a type often used to attach a ring to a regular bracket at the sides. The astrolabe is used during use of the instrument.
Using a planispheric astrolabe to tell the time at night

As with the celestial globe, the planispheric astrolabe can be employed in a large number of procedures, including those for telling the time by the Sun and by the stars. The second of these operations has been selected for illustration using cat. 132, an instrument made in Morocco, probably in the city of Meknes, at the beginning of the 18th century.

2. (above). Once the planes are in place, the rete is set over them, and the alidade is placed at the back of the mater. The pin is then passed through the hole at the centre of the alidade, the mater, the planes and the rete. Finally, the horse is inserted in the slot in the pin.

3. (left). The first stage of the operation is to observe the altitude of a given star, which is done by rotating the alidade, or sight rule, over the back of the mater. The altitude scale of 90° along the edge of the top right quadrant is here used to this end.

On cat. 132 the back of the mater is divided into four quadrants, and the upper two quadrants bear altitude scales of 90°, numbered at intervals of five degrees. A zodiac scale occupies the register immediately within these degree scales, with each of the 12 signs filling a segment of 30°. Within this again, and correlated to it, is a solar calendar scale divided proportionately into the months of the Julian calendar. Using these two scales it is possible to calculate the position of the Sun on the ecliptic from the date according to the Julian calendar.

The centre of the back of the mater is divided in two horizontally. The upper part is occupied by a diagram for unequal hours (unlike, in conjunction with the alidade, as a sundial) and a semi-circular band containing the signature of the maker and the date of manufacture. The lower section contains a shadow square which allows simple trigonometric measurements for surveying and gnomonic purposes.

1. The astrolabe is assembled for use by putting the planes in the mater, with the plane for the correct latitude on top. The plate selected here is for all towns at latitude 32° 50' north, according to the inscription at the centre.

Each plane is divided into four quadrants by a vertical north—south line, or meridian, and a horizontal east—west line. South is at the top, West is on the right. The central hole represents the celestial North Pole, and the concentric circles are the Tropic of Cancer, the Equator and, close to the rim, the Tropic of Capricorn.

The plane is occupied by a stereographic projection of the heavens. The base line of this projection represents the horizon at the latitude in question. Above the horizon, and parallel to it, are the almucantars, or circles of altitude, which rise at intervals of three degrees to the zenith of the relevant latitude. Also above the horizon, but perpendicular to it, are the azimuths, which are drawn at intervals of five degrees between the horizon and the zenith.

The area below the horizon is divided by curved hour lines into twelve sections, which are numbered clockwise and represent the unequal hours. The five barred lines show the times of the Muslim prayers.

4. To take an observation, the astrolabe must hang freely, in one of two ways, depending on the size of the suspension ring. The suspension ring is large enough, and in some cases long enough, for the astrolabe to be held freely by placing the thumb through the suspension ring. Astrolabes made in France, such as cat. 144 (see p. 192), usually have smaller suspension rings and are held by gripping a protruding arm.
4. To take an observation, the astrolabe must hang freely. This is achieved in one of two ways, depending on the size of the suspension ring. Where the ring is large enough, as in the case of cat.151, the astrolabe can be suspended by placing the thumb through the ring. Astrolabes made in Iran and India, such as cat.144 (see pp.200–201), usually have smaller rings and are suspended by gripping a strap or cord that passes through the ring.

5. One of the stars marked on the rete, say Alpha Hydri (Alphard), is sighted through the alidade; a more accurate reading of the star’s altitude can be obtained by taking an average of several observations. The alidade is equipped with two sight vanes, each with two holes. The larger holes are for observing the position of a star at night, and the smaller for taking the altitude of the sun by day. Stars may be observed by eye, but the sun cannot, and 10-day-time readings are taken by rotating the alidade until sunlight passing through one hole falls exactly on the other.

6. In this instance, the final position of the alidade gives the altitude of Alpha Hydri as 56°, according to the scale of degrees in the upper right-hand quadrant on the back of the mater.
The site is then rotated until the tip of the pointer for Alpha Hydra lies on the almucantar corresponding to the altitude observed, that is, the almucantar for 36°. As the site rotates, the star pointer touches this almucantar at two positions, one on each side of the meridian—the vertical line that divides the plate into two equal halves. Which of the two is correct is determined by the observed position of the star in the heavens. In this case, the star was to the west of the meridian, that is, to the right of the meridian on the plate.

8 Once the site is in the correct position, from the lines of on the plate, below the straight line in the rule, representing the position of the ecliptic, given by Pisces, and cut this hour. This indicates that have passed since the time remain till sunrise.
Once the rete has been set in the correct position, the time may be read off from the lines of unequal hours engraved on the plate, below the horizon line. A straight line in the form of a thread or rule passes from the centre of the astrolabe, representing the celestial pole, through the position of the Sun in the ecliptic, given here as 18° in the house of Pisces, and cuts the line for the seventh hour. This indicates that seven hours have passed since sunset, and five hours remain till sunrise.

A line drawn from the centre of the astrolabe through the notional position of the Sun, at 18° in the house of Pisces, cuts the line for the seventh hour on the plate beneath the rete.
The earliest astrologers

For many people, the astrologer must seem to be the characteristic scientific instrument of Islam. More astrologers survive than are other scientific devices; the distribution of astrologers-making, considered geographically and chronologically, is a trace of the diffusion of astronomy in Islam. It was an instrument to which many treatises were devoted and which Islamic mathematicians and astronomers used for particular purposes; and it was the particular scientific device of which medieval Christian Europe sought to gain knowledge. According to Ibn al-Nadim, who died probably in 930 (AD 628–639), after the first astrologers had been made in Islam, 'then the instruments came to be made in the Syrian city of Harran (ancient Carrhae). Later they were distributed, becoming common and increasing in number, so that the work became placed under the direction of the Abbasid period, from the days of al-Mu'tamid [caliph of Baghdad, 918–23 (815–820) to 932] in our own time.'1 Ibn al-Nadim says that the first person in Islam to make an astrologer was the astronomer al-Fazari, who lived in Baghdad in the middle of the second Islamic century, that is, the eighth century of our era.2 He further gives the name of a number of the early astrologers, several of whom have the nickname al-Harrani (meaning 'the man from Harran'). This nickname is found in the first astrologers who worked in the early centuries of Islam: the famous translator and astronomer, Habib ibn Quwas, who died in 839 (AD 650–651), was originally a money-lender at Harran, while al-Tabari, who died in 923 (AD 317–318), was called al-Tabarani (meaning 'the man from Harran'). Both men were Sabians, members of a religious group which was described as being a nation and which worshipped the planets, with particular attention to Mercury. It seems that the Sabians used Syriac as a liturgical language, and no doubt their religion was a stimulus to astronomical activity; certainly, the Sabians had Syriac translations of Greek astronomical and other scientific texts, and Harran was a center for their translation into Arabic, and their diffusion in Islam. The Harranians excelled in metalwork; the quality of their fine balances was proverbial. Here was an ideal place for the manufacture of astrologers; al-Hamadani, the historian, poet, and astronomer, who died in AD 1014 (610–611), could write: 'Harran is the place where the measuring (sc. observational) instruments were made, such as astrologers and others.'3 The only work known by Thabit ibn Qurra on the subject of the astro- labe is a translation of a treatise by a certain Abūnā al-Batirgī, who is mentioned by Ibn al-Nadim. The latter tells us, not without some ambiguity, that in ancient times astrologers were flat (masqal), that Ptolemy was the first to make them, that it is said that they were made before this time, but that one cannot be sure and, finally, that Abūnā was the first to make a plane astrolabe (sattāl al-ummi). Ibn al-Nadim further says that he thinks Abūnā lived just before or just after the advent of Islam and that among his writings was a 'Book on the construction of the planispheric astrolabe' (Kābul al-'umāl bi-‘al-farshī al-masqal). The position of Abūnā in the Greek astrological tradition remains obscure; the name, Abūnā or Abūnā, could be Greek in origin, or, else Copitē; 'al-Batirgī' means 'the Patriarch'. What is clear from his Pseudo- plagiarism, which only survives in a Latin translation of a lost Arabic treatise on a lost Greek original, is that Ptolemy of Alexandria, in the 1st century AD, already possessed the necessary theory for the construction of an astrolabe, but his instruments may have differed in important respects from existing astrolabes. Ptolemy may also have written another, more practical treatise on the construction of the astrolabe. In that case his work might be placed more firmly in the tradition of scientific astronomy, in the most common form which we know today. The first Greek treatises describing this form are a 'Memoir on the small astrolabe' (sc. the planispheric astrolabe) of Thoam of Alexandria, who lived in the 4th century AD. This work is lost, but referred to in a Byzantine biographical dictionary of the 10th century AD. This was followed by a treatise written towards the end of the 5th century by Ammosmos of Alexandria, which is also lost but is mentioned in the treatises by John Philoponus of Alexandria, whose teacher Ammosmos was. A third Greek treatise is John Philoponus. "On the use and the construction of the astrolabe and on the lines and scales on it", which was written between AD 370 and 375, and of which more than 60 manuscripts survive, dating from the 13th to the 19th centuries. To these Greek treatises must be added the 'Treatise on the planispheric astrolabe' by Severus Sabokh of Nisibis, bishop of Qemarbin, written in Syriac about the middle of the 8th century, and which belongs to the same tradi- tion as the treatise of John Philoponus. Al-Fazari may have been the first Muslim to make an astrolabe, and indeed the earliest surviving astrolabes (though not astrolabe projections) are Islamic and date from at least a century after his death, that is to say, not before the second half of the 9th century AD. From this time, the manufacture and use of the astrolabe spread throughout Islam, in the east as far as Hindu India, in the west as far as Christian Europe; in Muslim countries, its use continued until the begin- ning of the 20th century, such was its utility for the determination of the times of prayer and of the azimuth of the qibla. In Arabic the astrolabe is called astrolabah, which derives from the Greek keraunonlabe or keramhlobe (περικέφαλη), but has occasioned many epi- temological fantasies. Like a suitably mounted celestial globe, the astrolabe is an analogue computer which, by simulating the apparent rotation of the stars about the celestial pole, permits the solution of a number of astrological or astronomical problems. The provision of a simple sighting device enables the altitude of a star (or of the Sun) to be determined for the observation of certain problems. Ordinary astro- labe are not really suitable for serious astronomical observations, because even the largest are too small to provide accurate results. However, they were useful for finding the time by day or by night, for determining Muslim prayer times, for elementary surveying (by angular measurement), and for teaching by demonstrating the diurnal changes in the sky, the path of the Sun through the ecliptic, the rising and setting of stars, and so on. Astronomers found an astrolabe useful because with it they could ascertain the time and the ascen- dants; also, although the movement of the planets is not reproduced on an astrolabe, planetary tables enabled the astronomer to know the position of a planet relative to the astrolabe's frame or to the lines showing the astro- logical houses, sometimes engraved on the plates. The earliest astrolabes appear not to have had the shadow- square, though the cotangent scale is there. The inscriptions are in a simple, clear, Kufic script, entirely devoid of embellishment, which persists on eastern Islamic instruments until the 13th century. Those astrolabes made before al-Battani's Sabian Astronomical Tables (al-Zi-j al-Sabii) have the old Arabic term for Places (al-a'malah); later the translated Greek name, (α- στρολή), as found in the strongly Polemaic tables of al-Battani, is universal. An example of such an early astrolabe is that made by Abd al-Malak, at one time an apprentice of 'Ali ibn ' Isa for a son of the Caliph al-Muktafi (reg. AD 882–902 [902–907]). This astrolabe has a rate for 17 stars (al-umma for Places) and four plates for eight latitudes; it is now in the Département des Cartes et Plans at the Bibliothèque Nationale, Paris.1 The earliest astrolabe known to have a date is that signed by a certain Badrash (from the Greek Petros or from Naussus) in Naussus (in the Nestorian e. AD 727–747). The maker, an apprentice once removed of 'Ali ibn ' Isa, is men- tioned several times in the Flaviers of Ibn al-Nadim, but the garbled spelling of his name has obscured the identity of the reference; he was also referred to as abu-Busair as being concerned with a device for calculating eclipses and as the deviser of an unusual astro- labe type. The astrolabe, now in the Dar al-Athar al-Islamiyya, Kuwait, was a single plate engraved for latitudes 15° (probably for Damascus and Baghdad) and 36° (perhaps for Harran).1 1. al-Nadim-Dodge, ii, pp. 670–1. 2. al-Nadim-Dodge, p. 654, but compare the reference to Abūnā al-Batirgī (506, p. 670) which — probably wrongly — assigns Abūnā's represen- tation and contradicts the reference to al-Fazari. 3. Windmill 1967–8, pp. 151–2. 4. See Philoponus in the super edition by A. P. Segonds. 5. See above, pp. 297–8, note 18. 6. No.C.E.A., lii, p. 35, for Bruins & Maddison, forthcoming, 'Abhaib al- Khalaf'. 7. See Maddison & Bruins 1974; Maddisons & Bruins, forthcoming, 'Bustulai'. For the earliest astro- labe-makers, see Saliba 1991, esp. p. 111.
Suspension bracket
Perhaps Mosul or Damascus, 13th century

Brass, cast and engraved
maximum height 30.2 cm
maximum length 49.4 cm
maker Shaki ibn Ahmad
acquisition no. MET 8135

This large suspension bracket, or korsi, from a frame of foliate pattern and cast à jour, is very finely made. In the lower, centre part, a palm-tree-shaped cartouche is engraved on one side in a naskh-based script, with the signature of the maker, Shaki ibn Ahmad. The piece was meant to be seen from both the front and the back, because the finish on both sides is the same. The underside of the bar at the base of the bracket has a groove, 47 centimetres long, symmetrically disposed along most of its length between bevelled edges, terminating in a horizontally pierced flange at each end; in the centre of the groove there is a vertical hole. These features presumably served to attach the bracket to whatever it was designed to support.

The bracket's design recalls the very similar, but smaller, bracket on the geomantic plate by Muhammad ibn Khutulun al-Mawili, dated 699 (1299-1300), in the British Museum. Despite his naskh, and the style of the work, the geomantic plate may have been made in Damascus: an unattributed incense-burner by Muhammad ibn Khutulun, now in the Ash Collection, is signed by him as made in Damascus (... bi-Damashq). Indeed, before Mosul was sacked by the Mongols in 1261, several metalworkers had already left the city in quest of the patronage of the courts of the Ayyubid sultans (in Damascus until 1260). According to Rachel Ward, the geomantic plate and the incense burner 'suggest that there was a casting workshop in Damascus that was capable of unusual and complex work.2 In style, the bracket also resembles the pair of door-handles probably from Mosul, which are in a private collection in Kuwait.3 Private information has suggested that this bracket once supported a rectangular frame in which was suspended a censere, which, after its removal from the frame, was sold by a Persian dealer to a client in the United States of America; it has not proved possible to confirm this, but the suggestion is not implausible because the geomantic plate, which is 33.7 centimetres in length, has a bracket only 14 centimetres high, and a heavy globe in a larger frame might be expected to require a much larger bracket, if only for stylistic reasons. The corresponding globe, if indeed it does exist, would have to be of substantial size – not less than 30 centimetres in diameter – and similar in style and date to that made in A.D. 674 (A.H. 625-6) by Muhammad ibn Hishāl al-Munajjim al-Mawili, now in the British Museum.4 The list of globes published by Emile Savage-Smith in 1976 does not, however, include any such globe in the United States.5

The scientific content of the text on nearly all globes, and indeed other scientific instruments, made before the 18th century is inscribed in Koﬁ, not naskh, script, but the use of naskh on this Awared does not imply that the same script was used on an accompanying globe, and it should be recalled that the geomantic table by Muhammad ibn Khutulun has both.

2. British Museum, inv. no. 1888.3-36.15; see Savage-Smith & Smith 1976, passim, esp. pp. 11-12; Brière & Madding, forthcoming, 'Muhammad b. Khutulun al-Mawili'.
3. Ward 1993, p. 84; Allan 1986, no. 1, and Chapter Two, 'Muhammad ibn Khusruh's Incense-burner and the History of Incense-burners in the Near East in Early Islamic Times'.
5. British Museum, Department of Oriental Antiquities, inv. no. 71-3.31.
7. Savage-Smith 1984, passim.
Brass sheet, beaten and engraved diameter 12.6 cm
maker Muhammad ibn Abi Bakr ibn Muhammad Rashidi accession no. SCE 4375
Perhaps Isfahan, circa 1450 (AD 1417–18)

This characteristic astrolabe-plate is engraved with the usual stereographic projection of the celestial sphere on both sides. On the side of the plate drawn for latitude 31° (see below), the parts above the horizon-line (inscribed al-maghrib, 'west', on the right, and al-mahjar, 'east' on the left) are almucantes or circles of altitude drawn for every three degrees of altitude; on the other side of the plate, where the latitude inscription is illegible through corrosion, the part-circles are azimuths, that is, angles measured along the horizon, drawn for every five degrees. Below the horizon on the side for 30° are lines for determining unequal hours, whose whole length is calculated by dividing the interval between sunrise and sunset by three, or by multiplying the difference between sunrise and sunset by two, each of which hours are equal to each other during any twelve-hour period, their lengths varying throughout the year, and day and night hours are only equal at the equinoxes. On the other side, the hour-lines are for Italian hours (horae ad oras solas), equal hours numbered, although the hours are equal to each other during any twelve-hour period, their lengths varying throughout the year, and day and night hours are only equal at the equinoxes. The right of the meridian, the minutes to the left. These time give the length of daylight, on the longest day, in the latitude for which that side of the plate is drawn.

The al-jibad numerals are in a simple Kufic script, often found on the earlier eastern Islamic instruments, and sometimes called 'astronomical script'. Its slightly elongated form most resembles that on a number of Ayyubid or Mamluk instruments from the Syro-Egyptian region. Being in Kufic script, in which diacritics are rarely shown, it is necessary to distinguish between the al-jibad numerals d (i/q) and i (i/h); this is done by writing the former without a tail. This distinction occurs in the numeration of the hours of daylight in 30 degrees of latitude and in the numeration of the unequal hours, which begins below the words al-maghrib with elf = 1, and continues-wise towards i/h = 12.

At the bottom of the plate, on both sides where a notch for a retaining lug might be expected, there is a riveted knob, which was presumably a later addition.

2. See Maddison 1957.

Brass sheet, cut and engraved diameter 12.6 cm
maker Muhammad ibn Abi Bakr ibn Muhammad Rashidi accession no. SCL 41971
presentor Abû Ali Al-Susi, Lz V Hải

The rete is very unusual and may be unique among known Islamic astrolabes. The bounding circle does not represent the Tropic of Capricorn (it does not touch the ecliptic circle), but is a complete, and arbitrary, bend beyond where the Tropic would normally be (cf. cat. 146). This enabled the maker to cut his signature in silhouette, with some engraved detail along the inner edge of the band, beginning just below the knob for turning the rete, which was placed at the extreme right-hand end of the azimuthal band. The only other known rete with similar characteristics appears to be that of a Latin astrolabe of circa 1740, in the Museum of the History of Science, Oxford University. The edge of this latter rete is cut with 120 gear teeth, which have no function in relation to the astrolabe with which it is now associated but which suggest that it may have been as the rete of an astrolabe-clock. If Muhammad ibn Abi Bakr’s rete were not part of an astrolabe-water-clock, it seems at least probable that it was part of an astronomical instrument, the back of which provided no space for a signature.

The accompanying plate, notched to prevent it turning in some sort of manner or recess, is engraved on one side with a normal stereographic projection for latitude 31°, and on the other for latitude 31°. The azimuths are engraved below the horizon-line, and there are lines for unequal hours. To match the rete, the plate extends beyond the circle representing the Tropic of Capricorn, as does the plate of the Latin astrolabe in Oxford, mentioned above.

The maker has taken advantage of the extension beyond the Capricorn circle of both rete and plate to make the unusual inclusion, on the rete, of two stars outside, that is, below, the Tropic of Capricorn. There are 12 stars within the ecliptic circle, 35 outside but within the Capricorn circle.

The maker of these two astrolabe elements, Muhammad ibn Abi Bakr ibn Muhammad al-Rashidi al-Ibn provided, for many references, especially those cited in note 1 of the introductory essay on astrolabes, p. 159, above. He is sometimes wrongly confused with the astronomer, musician, and doctor, Abu‘l-‘Abbâd Muhammad ibn Abi Bakr al-Fazîl, who died in AD 1278 (AD 1277–9).
or taken advantage of the latitude of Capricorn or, that is, of the circle of Capricorn. There are 12 stars in the circle, 25 outside the circle.

These two astrolabes are not known by name. The one by Ibn Al-Rasid Al-Bari is in theHistory of Science, Mexico, 1957, p. 116. The other is in theHistory of Science, Mexico, 1957, p. 117.

This precisely executed globe, formed of two metal hemispheres, is the sixth oldest surviving celestial globe. The maker’s name is given twice on the globe, as Muhammad ibn Mahmud ibn ‘Ali al-Tabarai and as Muhammad ibn Mahmud al-Asturlabi. In the second inscription the maker omits the name of his grandfather as well as his nisabah, al-Tabarai, but emphasizes instead his trade as an astrolabe-maker. And indeed the globe—unfortunately missing its stand and rings—does reflect the work of a professional instrument-maker.

Nothing is known about the maker of the Khallī globe, though the name suggests an origin in Tabaristan, a province in northern Iran on the southern shore of the Caspian Sea. There is no town by the name of Talor, and most bears of the nisabah al-Tabarai came from the provincial capital of Anzal.

One other instrument probably made by the same man is known. It is a small, undated brass horary quadrant, with a radius of 6.5 centimetres, signed ‘Made by Muhammad ibn Mahmud.’ It was purchased by the Metropolitan Museum in New York in 1935 during the Museum’s excavations at Nahavand, but it is not clear whether or not it was found in the excavations. The quadrant is engraved on one side only, in Kufic script (like the globe), and its attribution to the same maker seems reasonable. It is one of the two astrolabes and Islamic quadrants so far recorded.

Two astrolabes made by the maker’s father, Mahmud ibn Ali, have been recorded, but are now lost. One, signed by Mahmud ibn ‘Ali ibn Yusha‘, al-Tabarai is dated 669 (AD 1270–1), and also bears equivalent dates in the Malakshah, Yezdegird and Alexander eras. It carries a dedicatory inscription to al-Haasan ibn ‘Ali al-Shudi. The second astrolabe was signed Mahmud ibn ‘Ali al-Tabarai, dated 675 (AD 1275–6), and dedicated to Sharaf al-Din Ushman ibn ‘Umar Rizgbadi, sovereign of learned men and geometers.

The globe is formed of two hemispheres of quite a pure brass, with a wall thickness of about 3 millimetres. The seam lies along a great circle perpendicular to the ecliptic—that is, the ecliptic latitude-measuring circle which passes between the Houses of Taurus and Gemini and between the Houses of Scorpio and Sagittarius. The ease with which the sphere has apparently been done would suggest that it was made from raised or beaten hemispheres rather than cast ones. Engraved on it are six ecliptic latitude-measuring circles, three isoclinal and three ecliptic equator, the latter two graduated by single degrees with every fifth degree labelled in Arabic numerals. The ecliptic repeats the numbers every 30°, while the equator is numbered in three segments of 10° and one of 60°. The gradations are very uniform and the great circles precisely executed. Holes have been drilled at the celestial poles, with smaller ones at the ecliptic poles. About 112 stars are indicated by small indented points or even just a simple dot. The stars are arranged at a distance from the ecliptic, however, so not as well placed and do not correspond to the positions stated or illustrated in the treatise by al-Sufi. In addition, the total number of stars on the globe is in variance with that in al-Sufi’s catalogue. The ‘overlooked star’ in the middle of the tail of Ursa Major, mentioned by al-Sufi but not included in his catalogue, is represented and labelled on the globe, while the six external stars of the Southern Fish (Pisces Aurigae) are omitted from the globe even though al-Sufi included them. Furthermore, in a few constellations the number of stars indicated on the globe is in error. For example, Draco has only 16 instead of the required 12, and Corona Borealis has none at all.

The unreliability of the position of the stars far from the ecliptic as well as the variation in the number of stars is inconsistent with the general accuracy and precision of the rest of the instrument. The question thus arises as to how many astronomers would have been involved in its production. In the absence of the two maker’s inscriptions the globe is said to be the work (sawab) of Muhammad ibn Mahmud, and by using a synonym roughly equivalent to the Latin opus—the maker might have intended to indicate that he actually constructed the sphere or was responsible for the design of the globe in terms of laying out the great circles and gradations. In the longer signature, he claims responsibility for the inscriptions (rasm), by which he apparently intended to indicate that he engraved all the inscriptions. Whether he also placed the stars on the sphere cannot be stated with certainty as it is not, however, clear. The stars are indicated by small silver points laid into pre-drilled holes; this involved a different metalworking technique from engraving, and it is likely that one person in the workshop specialized in placing the stars.

It is also noticeable that the circles and lettering are fairly deeply incised, while the star points are engraved which indicates that either a finer and lighter line—a combination of techniques in keeping with much of the craftsmanship on other early globes. The more delicate engraving might suggest that another specialist craftsman was involved. Thus it is possible that at least three different artisans worked on this one product.

Apart from the positioning of the stars distant from the ecliptic, al-Tabarai’s globe is a precise instrument which gives the impression that it was intended to function as a scientific instrument rather than as a decorative curiosity for a benefactor or patron. Nevertheless, the surface of the globe shows no signs of having been rubbed or scraped by rings. Either the rings were so well made as to produce no abrasion, or the globe was little used, or possibly removed from the rings after its construction. Aggressive cleaning may, alternatively, have removed evidence of abrasion.

A nearly identical globe, with the same date and maker’s name, has been in the collections of the Musée du Louvre in Paris since the end of the last century, but it can now be shown to be a 19th-century copy made by a metalurgical technique characteristic of later Indo-Persian products. 32 This poorly formed Kufic script and spelling errors, as well as the inaccuracy of its graduations and technical features, contrast sharply with the Khallī globe, which surely set a model for the artisans at the Louvre example. A new and comparison of the Louvre and Khallī should be published elsewhere.

It is worth noting that sections of the globe and astrolabes made by Mahmud’s father, Cat., were brought from India for The copy of the globe.
of the general accuracy of the rest of the instructions thus arises as to how it was put together. The instructions would have been inscribed on the globe. The maker's instructions to be 'the work' of the 'master' Muhammad ibn Mahmud, son—roughly equivalent to 'the maker of the globe'—indicated that he created the sphere or was the designer of the globe. The globe was cut out of the great circle.

In the longer signature responsibility for the work, by which is meant to indicate that he made the inscription. Whether he was on the sphere to be engraved or constellation outlines on the stars. The stars are all silver points with holes; this involved a working technique and it is likely that one workshop specialized in this. The globe is a decorative instrument which was intended as a scientific instrument or a decorative artifact or ornamental. The surface of the globe is surrounded by red lines. Either the rings of red lines were to produce no trouble was little used, kept in the rings of red lines. Agricultural, in a sense, have taken the role of abrading. The globe, with the maker's name, has been on the Musée du Louvre since the end of the last century and can be shown to be a copy made by a metal caster of inferior quality. The globe is not a perfect sphere; it is not a perfect circle. The globe was made by Muhammad ibn Mahmud's father. Cat. 123 was allegedly brought from India for sale in London. The copy of the globe, now in the Museum, was bought in Cairo in 1851, but its method of manufacture indicates that it was made in India. The astrolabe dated AD 1170–71 was acquired in Benares (Varanasi) before 1851 by a 'Professor Wilson', so that it is sometimes referred to as 'Professor Wilson's astrolabe'. The maker was engraved, or possibly re-engraved, with a gazetteer of Indian towns and their latitudes, in Kufic script. Wilson is probably the ornithologist Horace Hayman Wilson (1816–1866), who began his career as a surgeon for the East India Company, and became Professor of Sanskrit at Oxford in 1813. The maker of the astrolabe dated AD 1207–08 was engraved with an astrological table, using Hindu-Arabic numerals; this may have been re-engraving, but it should be stressed that the Kufic letters of the names of the stars in the heads of the table are almost identical to those of the Arabic letters used on the globe. The Arabic letters had been replaced by an Indo-Persian (Mughal) text, probably of the 17th century; the plates were missing.

That three instruments made by Muhammad ibn Ali and his father should have reached India may suggest that members of the family travelled there.

1. For the mi'bah, al-Tabarist, see Helgola 1935, Barthold 1984, pp. 13–14. The name al-Tabarist should not be interpreted as referring to the town of Taborath (Tibiritus) in the Lebanon, for the mi'bah of someone from there is in Tabaristan.


3. The other horary quadrant, of similar radius (5 cm diameters), but with a slightly different arrangement of the scales, inscribed for latitude 51°, is signed 'Made by Saldu bin Ali, al-ma'ad ibn (the muristan). It is also undated and now in a private collection in Kuwait; see below, p. 266. See Maddison & Turner 1976, p. 11, no. 71; Birnboim & Maddison, forthcoming, 'Birnboim b. Ali'. For dates proposed in Maddison & Turner 1978 and 18th century AD, but these dates were estimated solely on stylistic grounds and are not immune from revision.

4. An astrolabe with a diameter of approximately 24 cm is in the Bibliothèque nationale, Paris, in the Bibliothèque nationale, Paris, and in the Bibliothèque nationale, Paris. This smaller astrolabe, with a diameter of 12.5 cm is, was sold at the Bibliothèque nationale, Paris, before 1851, and has not been identified. See Birnboim & Maddison, forthcoming, 'Maimonid b. Ali at Tabor 2'. The dedication remains unidentified.

5. Reading ta'wil, meaning the misinterpretation of divinities' points or the production of alternative readings, see Steins 1976, p. 336. Dossi 1881, p. 312. Unfortunately the word d-r-i is written where the hole bored at the south pole of the celestial pole cuts off the end of the final letter. It is tempting to read this as the passive kataba, but like English and other Indo-European languages, in Arabic the passive cannot be used when the doer of the act is mentioned. Consequently, it must be read as the noun kataba or it must be assumed that a personal suffix was attached to the word (reading kataba) when there does not, however, seem to be sufficient space for this rendering. See also Paul Kunitzsch in a book review in Der Islam, 64, 1985, p. 370, who argues that the nearly identical inscriptions on the Louvre globe should be read as kataba.

6. Paris, Musée du Louvre, Section Islamique, inv. no. 6013; see Savage-Smith 1981, pp. 107–109, nos. 16 and 27–49, where some of its questionable features were discussed prior to the discovery of the globe now in the Khalili Collection. The inscriptions given by Savage-Smith for the Louvre globe were based on the text printed in Casanova 1856, p. 379, and in Comte, Sauvage & Wiss 1990, p. 44–45, no. 471. Later examination of the globe indicated that two words had been omitted in the transcription.

10. An alternative, but less probable, identification would be John Wilson (1814–77), missionary and orientalist, who became Dean of the Faculty of Arts in Bombay University in 1857. For both these Wilsons, see Dictionary of National Biography.

Astrolabes and globes
Planispheric astrolabe
inscribed in Judeo-Arabic

Probably Spain, circa 1300

The rete set with silver studs, some now missing:
- Diameter 18.4 cm
- Maximum height 22 cm
- Including the gnomon and the suspension ring.
- Thickness of mater: 2.1 cm

 maker Abraham
accession no. 92837
provenance Dr Tommaso Franco, Vicenza, Italy
published in Christie’s, Amsterdam, 15 December 1988, lot no. 247.
Berlin 1992, p. 1217;

Astrolabes inscribed in the Hebrew script are very rare. Indeed, apart from a number of crude modern forgeries, only four are known, including the example. One of the other specimens, which is in the British Museum, may date from the mid-14th century, and is rather similar to the example shown in the catalogue of the Kogel collection in Paris, from the mid-14th century; and the third, in the Adler Planetarium in Chicago, from the mid-14th century. All three can be presumed to have been made in non-Muslim Europe, as in their quatrefoil Gothic design they resemble contemporary instruments with Latin inscriptions. Cat. 11.4.2.4 is therefore unique, as it was made by a member of an Arabic-speaking Jewish community. The maker’s client seems to have intended to use the astrolabe in Tius, Seville and Cordoba, and perhaps also in Siuimash, Marrakesh, Cairo and Jerusalem, and the rete is set with the silver studs characteristic of astrolabes from Islamic Spain and the Maghreb (compare cat. 152, 153 and 162). It therefore seems reasonable to attribute the piece to Spain or North Africa. At the same time a consideration of the vertical point in the zodiac/calendar scale on the back, of the star positions on the rete, and of the general style of the astrolabe suggests that it was made exactly at the turn of the 15th century. The rete indicates 28 stars, 15 within the ecliptical circle and 13 outside it. Each star is named and is indicated by a simple triangular pointer with one or three silver studs at its base. Four additional studs were arranged symmetrically on the upper part of the rete. The three plates are engraved with albegreem at intervals of five degrees and azimuths at intervals of ten degrees, the Equator, the Tropic of Cancer and the lines of unequal hours; these last are numbered in words. The plates are inscribed in the centre, below the horizon line, with the latitude for which they were made. One was intended "for the latitude of Siuimash, 21° on one side and for the latitude of Marrakesh, 31° on the other, the second 'for the latitude of Cairo, 30° and for the latitude of Jerusalem, 17°', and the third 'for the latitude of Seville, 37°' and 'for the latitude of Cordoba, 35°'. The small projecting lugs that prevented the plates from turning within the mater are now missing (as are the alidade, horse and pin). The Hebrew script on the first and second plate is less taut than that on the rete and the rete, and they may be by a different hand, but the script on the third plate, for Seville and Cordoba, is all but identical; this plate is therefore probably contemporary.

The knot, which has engraved arabic script, is in a form made separately from the mater and was soldered on, perhaps in the course of a repair. The connected alidade has similar decoration. The inside of the mater is engraved as a plate 'for the latitude of Tius, 37°', while the scale of 160° on the limb is numbered east–clockwise at intervals of five degrees. On the back, within four quadrants of degrees the zodiac/calendar scale of the Julian calendar and, approximately, with the lunar months of the Jewish calendar (9 Arist 14 March 1480), a form of perpetual almanac and half a shadow square, around the sides of the rete there is a long inscription in Judeo-Arabic, one of the types of Middle Arabic used by Jewish communities and written in the Hebrew script.

Middle Arabic was a form of literary Arabic based on a vernacular but influenced by the classical standard. It was usually employed by non-Muslim populations of the Arab world, who were free of the pressure to conform rigidly to the classical language, and the result was a universalized model. Middle Arabic varies from example to example, as does the orthography. On this astrolabe, for example, the names of the signs of the zodiac are spelt differently on the rete and on the mater, although they appear to be in the same hand. The inscription on the rim is difficult to interpret, but it appears to have been addressed by the maker to the user, 'May it show you the things which need to be paid attention to, in ... that you are great who have lifted it. But your servant Abraham ... your fate from something ... was not satisfied with the country it shows you, [for] it has shown you the furthest star by means of its text.'

The rarity of astrolabes inscribed in the Hebrew script may reflect the less prominent role the instrument played in Jewish astronomy and in Jewish culture in general, but there are medieval Jewish treatises on the astrolabe, such as that written by Abraham ibn Ezra in 1148–8.

1. The description that follows is based on that in the Christie’s catalogue. 2. Formerly in the Spitzer Collection, Paris; see Gunther 1932, p. 504, no. 53; Goldstein 1956, p. 271, n. 2; 271 passim; Gibbs, Henderson & della Pietra 1975, no. 438. 3. Bandeira Ferreira 1964; Gibbs, Henderson & della Pietra 1975, no. 396; Goldstein 1976. 4. Formerly in the Menzing Collection, Amsterdam, inv. no. 3444; see Engelmann 1924, p. 13, pl. 16, no. 202; Gunther 1932, 11. 3. 504; Gibbs, Henderson & della Pietra 1973, no. 193; Pingree, forthcoming. The date is that proposed by Goldstein, but the quatrefoil Gothic rod would suggest it is earlier. 6. There is an unfinished rete on an astrolabe of slightly earlier date and made by Muhammad ibn Salih in Valencia in 1263 AD (1090–91) in the National Museum of American History, Smithsonian Institution, Washington, DC, inv. no. 316. 6; Gibbs with Saliba 1964, pp. 172–7, and figs 115–17; Gibbs, Henderson & della Pietra 1975, no. 1372. See also Breiten & Maddison, forthcoming, 'Muhammad b. as Salih 7; Goldstein 1976, p. 115, n. 11; Goldstein & Saliba 1983. For an astrolabe on which the celestial and terrestrial names have been duplicated in Hebrew without obliterating the Arabic, see Goldstein & Saliba 1983, p. 59, n. 4. 8. It should be noted that at this date Seville and Córdoba were already under Christian rule. 9. Blau 1988; Hery 1996; Weisler 1996, passim.

The text displays typical Judeo-Arabic features such as the pseudo-correct use of the classical negation lam, asyndetic relative clauses, plurals not designating persons referred to by the plural, and unusual retention of case endings; see Blau 1966–7, 5. 201, 316, 181, 248 respectively. This discussion is a draft of the final manuscript. The details given by M.J. Brown in the Christies’s sale catalogue (see above, note 2), and the rest of the text, have been supplied for the present catalogue by Dr Geoffrey Khan: 'People in need granted [ha]c to you as a gift and celebrated in a great festival. ... But your servant Abraham Hen saw that your power transcended what is seen. He was not satisfied with the earth and gave you as a gift, by which also far-reaching dominion has been given to you.' See also Breiten & Maddison forthcoming, 'Abraham'. 10. Solomon Gandz (1927) published the Hebrew terminology for the astrolabe and its components parts. In general, see Encyclopedia Judaica, 11, cols 784–807; Heinrichsdorff 1964; and Berlin 1993, pp. 469, 570, no. 1218.
The astrolabe in the image is a significant artifact, especially in the context of its provenance and inscription. The text mentions the astrolabe's relationship with slightly earlier instruments and highlights its importance in the history of Islamic science. It references specific studies and figures, such as Muhammad ibn Musa al-fazhari and the Smithsonian's collection, emphasizing the astrolabe's place in the study of astronomical instruments and their historical significance.
The development of astronomy in Muslim India appeared with the reign of emperor Muhammad (r. 1139-1186). Babur, the Timurid of northern India, almost certainly knew King's or the astronomer and astrologer of Mulla Bala Ali his matchless in the sciences of astronomy and astrology, who this is confirmed by Firdawsi that "Hashah paid much for me. He always had his scholars and the learned to discuss on learned in his presence."

Humayun learnt as Ilyas Ardabi, and this is also in Iraq and the from other scholars. The lessons is mathematics, astronomy, and had 'extra' and professed in the lab, globe, and other of the observatory..." Firdawsi described in the horoscopes and time for in the month of Juma in April, among the astrologers, the astrologers, and fixed the fast and so on. The work of the kia sections of the court was astrological in form. He reported from falling in of his library, which he from a three-storey building could be used for or an official had been hearing in an after the course of time. He crop a discussion had some mathematicians, the appearance of the others.

One, at least, of the instrument-makers was Mughal Khan, who devoted the Raisa-i-Humayan (i.e. Humayun) abstraction. He astrolabes, globes, in so that the observers of the wonderstruck.

However, nearly every astrolabes and globe for which he can be traced was made by one of several men in the family. The only signed is a 12th-century by a short period following which appears to be of often attributed to the east. The first month mentioned in the hands of the signature of any the Hulid (or possibly Habib) are always characterized as Hulidi Lahmir ("the" meaning that Allah-dar was patronized by or the..."
Indian (Mughal) astrolabes

The development of astrolabe-making in India appears to be associ-ated with the reign of the Mughal emperor Muhammad Humayun (reg. 1530–40, 1545–56), the son of Babur, the Timurid conqueror of northern India, almost certainly as a result of the King's personal interest in astronomy and astrology. According to Maulla Badawi, Humayun "was matchless in the science of astronomy, astrology and all other strange arts," this is confirmed by Fethiabba, who says that "he had much proficiency in mathematics, was averse to scholastic philosophy and the learned, and constant discussion on learned topics took place in his presence." Humayun learnt astronomy from Ilyas Ashabbi, and during his temporary exile in Iraq and Iran took lessons from other scholars, he himself gave lessons in mathematics and astrology, and had "extraordinary interest and proficiency in the use of the astrol-ab, globe, and other instruments of the observatory." Humayun's sister described how the king himself fixed the auspicious time for a wedding: "in the month of Jamala 1, 1519, at Yator on Monday at noon, His Majesty the King took the astrolab in his hand and fixed the felicitous hour." The work of the king and the functions of the court were organised on an astrological basis. Humayun died, it is reported, from falling down the stairs of his library, which had been converted from a three-storey bastion so that it could be used as an observatory. He had been hurrying down the stairs after the evening call to prayer interrupted a discussion he was having with some mathematicians, while awaiting the appearance of the planet Venus.

One, at least, of Humayun's instrument-makers was Mawlama Maqdu Maqari, who "was one of the teachers of the Resident of the Paradise [i.e. Humayun]... He manufactured astrolabes, globes, in such a manner that the observers of his works were wonderstruck." However, nearly every surviving astrolabe and globe from Muslim India which is known was made in Lahore by one of several members of the same family. Unsigned Islamic instruments which appear to be of Indian origin can often be attributed to their workshops. The earliest member of this family mentioned in the naslid (pedigree) of the signature of any of these astrolabes is a certain astolib shaikh Allah-dad (or possibly Allah dad), who is always characterized as astolib Humayun Lhatib ("the Humayun astrolabist of Lahore"), presumably meaning that Allah-dad was in some way patronized or associated with the royal court. The genealogical table below shows the relationship of the descendants of Allah-dad who continued to work as astrolabs through most of the 17th century. The work of Allah-dad himself is one of elaborately decorated, accurate, and shows a wish to make his astrolabes as useful as possible by including a variety of scales and tables. In many respects, his work resembles that of the earliest and less ornate astrolabes made when astrolabe-making was revived in Iran in Safavid times, and a connection may be proposed. The work of his descendants shows a certain elaboration in style, but never any lavish decoration of the sort characteristic of Safavid Iranian instruments. On the Indo-Iranian Mughal astrolabes, the trajectory of the rate is usually complex, not so much because of the intricacies of the floral pattern, but because of the number of stars represented. The korut is nearly always high and worked a four, in contrast with the usually solid design on a Iranian astrolabe. The Lahore makers not only came to make astrolabes with a very full complement of plates for different latitudes, but added to the plates astrological tables which are drawn below the horizon, and lines for Babylonian and Indian hours as well as the sun's maximum and minimum points. The back is often painted with a pattern of the signs of the zodiac, assume a characteristic sigmoid shape, which appears to be diagnostic of Mughal astrolabes. The few known instruments with unusual rate patterns also come from the Lahore astrolabists. These makers usually sign in or above the shadow-circles, not in a cartouche; dates are often given in the Alexander and Yasgulasa era as well as that of the Hijra. There are a few 17th-century and later astrolabes from Mughal India which are not the work of the Lahore workshops, but none earlier. Al-Biruni says that, while in India, he taught the Hindu pandits the use of the astrolabe. This may be the reason why most of the surviving Hindu astrolabes, engraved in Sausalot, albeit probably no earlier than the 17th or 18th century, resemble closely Islamic instruments of the 12th–13th centuries, and only rarely reveal any later Iranian influence. One may suppose that in the absence of an instrument-making tradition there may have been illustrations in manuscript treatises on the astrolabe.

A family of astrolabemakers from Lahore

The number of signed, dated and numbered globes and astrolabes known to us for each maker is as follows. The list excludes unsigned items that can be assigned to them on stylistic grounds:

<table>
<thead>
<tr>
<th>Allah-dad</th>
<th>only one dated, no globes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qa'im Muhammad</td>
<td>includes a globe</td>
</tr>
</tbody>
</table>

Muhammad Mughim

includes 16 globes

Haimid

17, two of them globes

JAMLAL AL-DIN

4, no globes.

Two astrolabes dated AD 1609–10, and one undated astro- labes, are signed as made jointly by Qa'im Muhammad and Muhammad Mughim, the sons of Tan. They are included in the total for both makers listed above.

The astrolabe production of this family is well represented in the Khalili Collection: Muhammad Mughim was the maker of cat. 116, his son, Haimid, was the maker of the complex instrument cat. 121, as well as the astrolabe cat. 128. Dijal dal-Din made cat. 127 and 130.

1. The AD dates given in the diagram below are the range of the conversion of the earliest and last AD dates on the recorded dated instruments: many items by these makers are not dated. See also Svara, with 1475, pp.14–15. Seven of the items are dated to the day and month, a degree of precision unusual on astronomical instruments.

(Astrolabes and globes 219)
Planispheric astrolabe
India, dated AD 1203 (AD 1394-5)

Brass, sheet and cast, cut and engraved
diameter 19.4 cm; maximum height
27 cm (excluding the shackle and suspension ring)

maximum thickness at the base 1.3 cm
maker Muhammad Muqim b. Uthman Allabadi Asturlabi Humayun Lahori
acquisition no. 10146
published Christie’s, London, 29 September 1988, lot 20, lot 287

The rite indicates 58 named stars in a
foliate tracery of very unusual pattern;
some of this tracery is now missing at
the top. The outer band of the rite,
which carries a turning knob, does not
represent the Tropic of Capricorn, as is
normal, and the plates have a broad
band beyond the circle for the Tropic
of Capricorn to compensate. The
ecliptic circle is divided by the hori-
zontal bar of the rite, the portion
below being divided to each degree on
an inner bevelled edge, and numbered
at intervals of six degrees, with the
names of the zodiacal signs from Ariens
to Virgo cut in silhouette on the outer
equator (compare cat. 122), while the
portion above is similarly divided and
numbered on an outer bevelled edge,
with the names of the signs from Libra
to Pisces engraved in relief on a hatched
background. The tracery incorporates
the very rare astronomical (‘ship’) design,
described in early Arabic texts on the
astrolabe: two intersecting arcs at the
centre are oblique horizontals, which
would have been used with a specially
drawn small ‘plate’ at the centre of one
of the plates, now missing (but compare
cat. 125); when seen together with the
vertical meridian, each arc has
something of the form of a ship. There
are a few construction lines on the
back of the rite.

The limbs of the mater are divided to
each degree and numbered at intervals
of five degrees. In the mater, which
lacks the lug preventing the plates
from rotating, there is an unusually
and decoratively laid out gazetteer of
the longitudes and latitudes of many
places. On the back, within the upper
two quadrants of 90°, an armillary
sphenic – cosmic quadrant to the left, and
a quadrant of the arcs of the signs with
sigmoid graphs of meridian solar alti-
dudes for latitudes 35°, 55°, 75° and 90°
to the right; below, within scales of

cotangents on the limb square and a semi-
circle table of the the lunar mean
corresponding a table of the
tripliiceps, a division of
zodiac according to the
cosmological and supposed natural
cycles. Below the shadow squa-
table showing multiple in degres and minuter-
length of the tropical y
The kaviti is high and d
pierced in characters inc
incorporating a blank
each side. The slid

One plate (from, po-
nal plates) survives, fo
hours 14°, 18°, and 20°.
The azimuths are drawn
drawn, with units
and lines for Babylonian
hours, and with a series
of the geographical
the lower cirucleres.
The astrolabe is sig-
ins the centre of the qua
of the signs, but the ins
been basically rubb

2. Brintw & Maddox
Muhammad Muqim
127  
Matter of a planispheric astrolabe
India, dated AD 1071

Brass, sheet and cast, engraved diameter 11.4 cm height 11.3 cm
(excluding shackle and suspension ring)
maximum thickness of material 0.1 cm
maker: Shala al-Dīn Muhammad ibn Qāīm Muhammad ibn Isā ibn Allahād
accession no. SC11

The matter of the astrolabe, of Arabic style, is of approximately 40 stars. The five places are for latitudes 21° and 21° 35' and 37° 30' and 38°; a multiple plate for 0°, 72° and 90°; a plate of ecliptical coordinates, and a tabular list of horizons. The azimuths are drawn below the horizontal lines, with lines for unequal and Babylonian hours. The material is engraved as a gazetteer for the longitudes and latitudes of 48 places. On the back there are two altitude scales of 90° each, within which areas are divided quadrants, and the area of the signs with graphs of solar meridian altitude for latitudes 20, 27, and 37. Below, within scales of constellations, an astrological table correlates the 28 lunar mansions with the signs of the zodiac, and there is a table of eclipses within a shared space. There is a decoratively shaped alidade without any engraved scales, a pin, a washer, and a boss. The kernel is high, triangular, and decoratively pierced.

Between the square and the semi-circular band of the astrolabe, the table is the date and the signature of the maker.

1. See Brieux and Maddison, forthcoming, 'Hierim b. Muhammad Qāīm Muhammad'. 

128  
Planispheric astrolabe
India, dated AD 1068

Brass, sheet and cast, engraved diameter 15.1 cm height 17 cm
(excluding shackle and suspension ring)
maximum thickness of material 0.1 cm
maker: Ahmed ibn Muhammad Qāīm ibn Isā ibn Allahād
accession no. SC12

The matter of the astrolabe, of Arabic style, is divided into five degrees and the scale is numbered at intervals of five degrees (all the adjacent numerals are given in full so that, for example, 29° 15' 33° 57'). There are five plates, for latitudes 0°, 20°, 35°, 56° and 90°, and a multiple plate for 0°, 72° and 90°; a plate of ecliptical coordinates, and a tabular list of horizons. The azimuths are engraved between the horizontal lines, and there are rows for unequal, Babylonian, and Indian hours. The material is engraved as a gazetteer for the longitudes and latitudes of 69 places, arranged according to three o'clocks (the third, fourth and fifth). On the back, within four quadrants of 90°, are a nine-quadrant (upper left), the area of the signs without any graphs of meridian solar altitude (upper right), a shadow square within which is a table of trichotomies, and an astrological table of the lunar mansions, and the terms, faces, and limits of the planets; between the semicircular bands of the table and the degree scales are concentric quadrants. The alidade is decoratively shaped and engraved with declaration scales and there is a horse and pin. The kernel is deeply engraved, leaving an inscription in nastaʿlīq in relief against a background of foliate scrolls. The inscription begins with the invocation Allāhu akbar ('God is most great') and gives the Hijra date and, on the back, the regnal year 570 of the Mughal Emperor Jahangir (reg. 1605-1627).

In view of several similarities between this astrolabe and cat. 133 it is tempting to suggest that both are the products of the same workshop, perhaps that of one of the members of the well-known family of astronomers and globe-makers from Lahore (see cat. 126, 128 and 133).

1. On Ptolemy's 472nd, see Anaw 1993, passim.
Mater of a planispheric astrolabe
Lahore, circa 1240 (AD 1629–30)

Brass, cast and beaten, engraved diameter 18.3 cm thickness 1.1 cm maker Diva' al-Din Muhammad ibn Qura! Muhammad ibn Mulla Tawon Shaykh Allahabad Asturlabi Humayuni Lahori accession no. 121283

This is the mater of a massive astrolabe, by a member of the well-known Lahore family of astrologists. The presence in the centre of only a single astrological table, the absence of solar altitude curves on the upper right quadrant of the back, indicate that the mater, though finely engraved with the usual scales, was never completed. It has the high, cast triangular bevels, worked a year in a distinctive pattern, the stile and the borders of the Lahore makers.1

1. Cf. the description of cat. 128 and 131, made by Muhammad ibn Qura! s first cousin, Hamid.
2. Bein & Maddison, forthcoming, Muhammad b. Qura!, this astrolabe is Muhammad b. Qura! 39.

Brass, short and cast, cut and engraved diameter 30 cm height 35 cm (excluding shackle and suspension ring) depth 4 cm (when closed, excluding boss)

The handle, horse pie of the astrolabe is missing, and it is not clear where they would have been placed.

The high Kow is not perforated, as is usual on Mughal astrolabes, but the back bears crudely engraved decoration and the front an erased inscription.

On the back of the mater there is a nine–coined quadrant (upper left) and a quadrant of the arc of the signs of the zodiac, with sigmoid graphs of meridians of altitudes of the Sun for latitudes 20°, 25°, 27° and 30° (upper right), both framed by scales of 90°.

In the space at the center of the second quadrant there is an inscription giving the names of the maker, Qura! Khan Mahandi, and the date AH 1546 (AD 1522–3). The lower two quadrants are framed by a scale of constellations and are filled with an astrological table of the 12 lunar mansions and of the triplicities, and the terms, faces and limits of the planets. The maker's name and the date of manufacture appear in a semicircular band that runs along the inside of the scale of equinoxes. Ten instruments by this maker, eight astrolabes and one celestial globe, have been recorded, ranging in date from AH 1538 (AD 1628–9) to AH 1615 (AD 1693), seven of them precisely dated to the day and month of the year, unusual on astronomical instruments.

1. See Bein & Maddison, forthcoming, 'Hamid b. Muhammad Muz qim'.

126 Astrolabes and globes
a horse and pin of the missing, and it is not clear could have been placed.
rest is not performed, as is hal astrolobe, but the deeply engraved decoration an erased inscription.

of the matter there is a quadrant (upper left) and the area of the signs of 6th signoid graph of sides of the Sun for lati-
15° and 33° (upper right), by scale of 9°. In the centre of the second.
there is an inscription giving a owner, Qulirdad
b., and the date AH1186.
The lower two quadrants a scale of cotangents and an astrological table of 
names and of the triple terms, axes and limits 

The maker's name and manufacture appear in a 
band that runs along the 
scale of cotangents. Ten 
by this maker, eight astro-
centric globe, have been 
ging in date from 215 CE to 
AH 1102 (AD 1691), 
precisely dated to the 
23rd of the year, unsual on 

St. Madmonn, Forth-
H. Muhammad
Planispheric astrolabe

India, 17th century

Brass, sheet and cast, cut and engraved; the ketāv is in set with flush silver inlays. Diameter 35.6 cm height 66 cm (excluding shackles and suspension ring) thickness of mater 1.6 cm accession no. 35153

This remarkably fine, large astrolabe illustrates the symbiosis of Hindu and Muslim astrological and astronomical traditions. The inscriptions are in both Arabic and Sanskrit. In general, in its complexity this astrolabe is typical of the Lahore school, but the exuberant foliate structure of the ketāv is in contrast to most Lahore work, which is somewhat severe. The design of the ketāv is that of a branchy stem, each branch bearing several pointed leaves, where the points and other profligacies are star-pointers. The Arabic inscriptions on these pointers are inlaid with silver. The stem culminates in a "flower", consisting of an empty circle, with petals issuing from the circumference, within and at the top of the ecliptic circle. Unusually this ketāv includes a partial meridional band which within the ecliptic circle, crossed by two curved bands representing "oblique" horizons for two latitudes, one for latitude 28°, the other for latitude 31°. The portion of the meridional band above each horizon in association with the horizon resembles the outline of a ship with a single mast, hence the name saurāj given to this type of ketāv. The degree scale on the limb is marked at intervals of three degrees, as befits an instrument of this size.

The ketāv is decorative engraved in relief on both sides: on the front there is a floral design on the back, four birds among flowers. The design shows a hawk pecking at the entrails of a duck; the two other birds, one of which is crested, are pigeons.

There are six plates, the usual complexity of the projections on Mughal instruments made more apparent by the duplication of the Arabic inscriptions in Sanskrit. The plates are for o° and 90° in 15° steps and for a plate with a quadruplicate table of horizons (of the common eastern Islamic pattern), and a table of coordinates of the ecliptic (66°). On the plate for 15°, the length of the longest day is given in hours and minutes but as 48 ghatī (here spells ghātī). On the other side, where the latitude appears to be given as 31°, the length of the day is also given in ghātī (here spells ghātī) as 32 (gh.) o (rup.). A ghatī is an Indian division of the day, corresponding to 1.44 of our minutes. The reverse side of the first plate mentioned above, that for o° and 90°, is particularly complex. It includes, in the centre, a small projection, with the ecliptic circle and some stars marked, for use with the saurāj part of the ketāv. The two arcs of the saurāj must terminate at each end of the circle of Capricorn. Given that the saurāj is small, this requires an appropriately small plate to be engraved in the centre of the large plate.

The mater is engraved as a gazerāt showing the longitudinal, latitude and imbrāf of a great number of places, which are arranged by region, with India at the centre. Some of the plates and the gazerāt use the Greek-derived symbol for zero, 0. On the back of the mater there is a nine-cotter quadrant (upper left), a quadrant of the arcs of the signs of the zodiac (upper right), with three sigmoid graphs for the meridian altitude of the Sun, throughout the year, for the latitudes 27° 29° and 31°. Below, the two lower quadrants are engraved with a shadow square, within which there is an astrological table of trilaterals. These are framed by semi-circular scales of the signs of the zodiac, the 12 lunar mansions, and terms and faces of the planets.

The alidade, horse and pin are missing.

1. This is unfinished and lacks any graphs of solar meridian altitude.


3. Gunther 1972, 1, pp. 218-220 and fig. 212, and pls. 124 and 118 and XLI, 100-101; Turner 1975, pp. 78, 79, fig. 18, on the saurāj, see Sedillot 1843, pp. 182, 183, and pl. 17, fig. 83, for the account by Abu Ali Al-Hassan Ibn Al'Umar al-Marrakushi of unusual astrolabe reads, which depends on al-Biruni's 9th-century treatise on making astrolabes, and on al-Sijzi (circa AD 945-952). See above, p. 192, for a copy of al-Marrakushi's work in the Khalili Collection.

4. On plates for o° and 90°, and the tablet of coordinates of the ecliptic, see Michel 1947, pp. 66, 61.

5. Cf. cat. 144. A ghatī is subdivided into 60 pādā, which in turn each contain 60 tāpā, which comprise 60 pānā. 60 ghatī correspond to our twenty-four hours. The ghatī are counted from sunrise. Another name for them is ghāqāxā, which is also the name for a simple form of cipaksa, consisting of a bowl with a hole in the bottom. The bowl is floated on the water and in it sinks, time is indicated by graduations marked on it. See Firdowsi 1879, 287, 341; Maddison 1957, p. 34, 191, 6. Cf. cat. 144.

Sachau and al-Buruni
\[\text{Imam of Lahore}\]
\[\text{pp.218-20 and} \]
\[\text{1976,} \text{78, 79, 85-91, 93-96, 98-99, on the}\]
\[\text{Zillor 1844,} \text{pp.182, 183,}\]
\[\text{99, for the account by}\]
\[\text{Jan-ibn-'Ali-Umar}\]
\[\text{of unusual astrolabe}\]
\[\text{pendant on al-Buruni's}\]
\[\text{stature on making}\]
\[\text{on al-Sijzi (circa}\]
\[\text{2). See above, p.192, for}\]
\[\text{Eltarashi's work in the}\]
\[\text{ion.}\]
\[\text{90' and 99', and the}\]
\[\text{inutes of the ecliptic,}\]
\[\text{9, pp.60, 61.}\]
\[\text{A ghafla is subdivided}\]
\[\text{into 27.5 degrees, which comprise}\]
\[\text{the 27.5 degrees, which comprise}\]
\[\text{at corresponding to our}\]
\[\text{hours. The ghafla are}\]
\[\text{suicide. Another name}\]
\[\text{aka, which is also the}\]
\[\text{as a form of clepsidra,}\]
\[\text{bowl with a hole in the}\]
\[\text{and is floated on the}\]
\[\text{sinka, time is indicated}\]
\[\text{marked on it. See}\]
\[\text{p.215; Mardikian 1957,}\]
\[\text{pp.29-31.}\]
Brass horizon ring diameter 35.4 cm inner, 37.3 cm outer height of stand 29.8 cm weight 4.95 kg (globe only) maker Muhammad Salih Tawari, with later additions by Nandaraya published Savage-Smith 1985, pp. 33-4, no. 29 and pp. 44-45, fig. 18; Kyoto 1983, p. 28, no. 69 accession no. 01545

This is a fine, precise globe made by a well-known 17th-century instrument maker who worked in north-western India. Beneath the constellation of the Southern Fish (Piscis Australis) a short Arabic inscription states it to be the work of Muhammad Salih Tawari in AH 1074 (AD 1665-6), who is known to have made a similar globe 50 years earlier, and at least three astrolabes. Muhammad Salih Tawari’s celestial globe of AH 1071 (AD 1663-4) was produced for a patron named Shaykh ‘Abdal-Khalil, who is otherwise unidentified. Both in design and in the use of extensive star captions, this globe is close to that in the Khalili Collection, though it lacks the additional astrometric inscriptions. On it, however, the maker wrote his name slightly differently – that is, Tashab-i instead of Tawari as it reads on cat. 134. There has been some question as to where in India the maker might have worked and whether he came from the town of Tatta in the Sind, the delta of the Indus. The town of Tatta should more accurately be transliterated as thanjla, with a different form of ‘i’ than that used on the globe and with the letter ‘k’ after the first ‘t’. The fact that the sphere is seamless, cast by the lost-wax method, suggests that the maker worked in north-west or north-central India, where the four gemstones of the Lahore workshop perfected the technique (see above, p.219). It would be reasonable to assume that a craftsman skilled as al-Tawari would follow the court for patronage and, since Delhi had been the seat of the Mughal court since 1649, al-Tawari may well have had his workshop there.

A distinctive feature of this globe is the cartography of both Arabic and Sanskrit, the latter being in Nagari script. The Nagari captions, giving the names of constellations and lunar stations, and numbering along the ecliptic and equator were added by an engraver, perhaps with the assistance of an astronomer named Nandaraya, at least a century after al-Tawari completed the globe, probably in 1769 though possibly as late as 1823. The deep engraving of the Sanskrit labels, and the somewhat wavy lines, drawn parallel to the ecliptic and equator, that frame the astrometric numbering, contrast with the original engraving by Tawari, and the edges of the engraving in *nandari* do not show as much wear as the engraving in Arabic. These features corroborate the statement that there are later additions to the globe.

Two other celestial globes, both dated AH 1074 (AD 1665-6), have Arabic inscriptions attributing them to Muhammad Salih Tawari. They are, however, clearly part of a group made several of which have false attribution (see Part Two, Appendices I). The present stand and horizon ring of cat. 134 are not contemporary with the globe and were apparently made when the Sanskrit inscriptions were added. As the stands of two of the recent false globes are strikingly similar to that of cat. 134, it was presumably known to the workshop which produced the modern group.

The sphere is engraved with 46 delicately incised constellation outlines and indicates about 208 stars by inlaid silver points of graduated sizes to show magnitude. In addition to the six ecliptic latitude-measuring circles, there are engraved on it the two tropic circles, the ecliptic, and celestial equator. The latter two are carefully graduated by single degrees with every fifth labelled in *ahjad* letter-numerals, every sixth degree has been later labelled in *nandari* numerals. The numbering along the equator runs continuously from the vernal equinox, while that along the ecliptic repeats every 30°. The ecliptic poles, tropic circles, ecliptic latitude-measuring circles, the greatest distance of the ecliptic from the equator, the constellations, zodiacal houses, and the major stars are all labelled in Arabic, with some of the star labels being more detailed than usual.

A large figure-eight plug left from the casting process is visible. There are approximately 17 chapters (tablet-shaped, round or irregular) which appear to be of copper. Later-melting marks are apparent, though these may be due to later abrasion. The sphere has been aggressively cleaned and the surface recently lacquered.

134 Detail of astrometric inscriptions

The meridian ring is an obvious modern replacement. The quadruped stand with spindle-shaped legs is in a base formed of two cross bars. Attached to the underside of the horizon ring is a semicircular bar, with a finial at the bottom, which supports the meridian ring. The graduation on the horizon ring are identical in size to those on the sphere, though on the ring every sixth degree is indicated by a deep line and labelled in *nandari*, while on the sphere it is every fifth degree that was highlighted by a dotted line and labelled in Arabic at the time of construction.  

1. One dated AH 1776 (AD 1666-7) was in the East India Company Museum; see Morton 1916, pp. 17-9; and Gibbs, Henderson & de Solla Price 1973, no. 23. Another astrolabe dated AH 1777 (AD 1666-7) is in the Museum of the History of Science, Oxford University (Gibbs, Henderson & de Solla Price 1973, no. 220) and a third is in a private collection. For further details on these three items, see Birks & Maddison, forthcoming.  
4. For some of the Hindu astrologers active in the 18th century, see Sara, Anarsi & Kulkarni 1993, pp. 22-3; Ohashi 1984, pp. 173-6.  
5. Near the Arabic signatory inscription, beneath the constellation Canopus, there is a deeply incised Sanskrit two-line inscription in *nandari* script that reads: "This globe was embossed by Nandaraya on the fifth day of the bright half of the month and in the year Siddha-nilgai-India. The year referred to is most likely 1769, assuming the Samvat era was intended. If this era was intended, then the year of the Sanskrit engraving would be 1852. The Sanskrit was read and interpreted by Dr Jennifer Katz, formerly of the Indianastromical Library, Oxford University.

8. Savage-Smith 1984, p. 332 states that the horizon ring and stand appear to be contemporary with the globe. Further consideration and comparison with globes that are unknown now suggest that this assumption was incorrect.
In the Museum of the
Place, Oxford University
nasion & de Solla Price
d and a third is in a
m. For further details
ovements, see Brintz &
bcological Museum at
See Savage-
129-30, nos 31; Dhami
and pl.1791 (for an illus-
arma, Ansal & Kulharni
ar 1,983, p. 14; Samanta
en 1993, p. 15.
the Hindu astronomers
this century, see Samanta

y Ohashi 1986;
his signatory inscrip-
strellation
is a deeply incised
cription in
1292. It reads: 'This globe
by Nandayya on the
ight half of the
ear year Siddhar-va-
ferred to in most
ning the Samvat
. If the ājaka era was
the year of the Sanskrit
ld be 1292. The
ad and interpreted
Katz, formerly of the
Libraries, Oxford
Ansal & Kulharni 1993,
'A' |
scribed in Savage-Smith
51, nos 43; and the globe
rawn and illustrated in
1985, p. 232 states that
and stand appear to be
with the globe. Further
parison with
own now suggest that
was incorrect.
Mater of a planispheric astrolabe
India, circa 1800

Marble, engraved and coloured
diameter 20.6 cm height 19.4 cm
thickness 2.6 cm
accession no. SC142

This object is either the mater of an unusual astrolabe of marble, or the template for a mater. The limb is divided to each degree and numbered by sites. Inside the mater there is a gazetteer of various places in India and the Middle East. On the back on the limb are four sexagesimally divided scales of degrees, numbered in large adjusted numerals, and a sine quadrant with badly drawn lines and divisions; a quadrant of the arcs of the signs of the Zodiac (Indian style) with a graph of the Sun's meridian altitude throughout the year for latitude 15°, and for the same latitude, a shadow-square; and a semi-circular astrological table of the signs of the Zodiac and the 28 lunar mansions. The high, triangular hark recalls the astrolabes of Moghul India, but is not worked a jour.

This astrolabe was probably intended for teaching or as a model for the construction of conventional astrolabes, because several of the essential lines and parts are designated by their descriptive terms. For example, the word hark is engraved across the front of the hark, and the phrase bharat 'arav 'Idga (line of the loop of the suspension cord) alongside a meridian line passing through the centre of the hole for the 'Idga.

1. There is another stone astrolabe in the History of Astronomy Collection of the Adler Planetarium, Chicago, inv. no. 537. It is North Indian, a single plate of dark green stone inscribed in devanagari script with the date 1766 (Vārāja Simat = AD 1709) and words which translate as 'Amer Observatory', the precursor of Jaipur Observatory. Just like the astrolabe described here, it might be either a didactic instrument or a template. See Pingree, forthcoming, Appendix 1, entry 46.

Planispheric astrolabe
India, circa 1800

Brass, short and cast, cut and engraved
diameter 18.9 cm height 22 cm
(excluding shackle and suspension ring) thickness of mater 1.1 cm
accession no. SC149

This instrument has a thick rim, with 16 star pointers, of which only some are named. There are no loose plates. The mater is somewhat massive with a wide limb on which the degree divisions are numbered twice, once in abjad (at intervals of five degrees in four quadrants of 90°) and once in numerals (at intervals of ten degrees, in a single clockwise run of 360°). The type of numerals used indicates that this astrolabe is Indian work. The inside of the mater is engraved as a plate, but the latitude is not marked.

Of the quadrants on the back, one is a sine quadrant, although the sexagesimal dividing lines are not parallel and horizontal, with the five-degree radial divisions also drawn (upper left); another is engraved with arcs of the signs that are not at a stereographic projection, so on Iranian instruments, but equally spaced as on an Indian one (upper right); the limb numeration is in abjad and numerals, as on the front. In the lower two quadrants there is a double-scaled shadow square and, around the limbs, a long Persian inscription engraved in naskh which gives instructions identical in text and hand to those on cat. 137.

The front of the hark is decoratively engraved in relief, the back was left blank. The alidade is cruciform, with eight-vanes on a straight bar, and radial pointers at the end of a curved bar; the horse is missing.

This astrolabe may have been used for teaching and was clearly produced by the same maker as cat. 137.
Celestial globe
India, dated 15157 (AD 1412–3)

High zinc base
diameter 13.36 cm
ring diameter 14.44 cm
1.5 cm inner
weight 0.55 kg shere, 0.16 kg ring
maker Muhammad Na`in al-Din Muradabadi
patron Muhammad Ajmud`Ali Shah
accession no. SC.14

An informative inscription, placed in the southern hemisphere, reads:
"This globe was copied from the globe of [made by] Akbar Shah Mulhadin Jahanshahi, which [that is, the copy in the year AD 2260 (AD 1424) was presented as an offering to the honorable, the emperor of the age, the father of such a name is otherwise known through written sources or extant artefacts. Consequently, where and when the earlier globe was constructed is unknown.

The copy made in AD 1517 (AD 1412–3) was presented three years later to Muhammad Ajmud`Ali Shah, who became Nawab of Oudh in AD 1424. Nothing further is known of the maker of the copy, who boasts of having improved upon his exemplar. Since the globe by Muradabadi, made during the reign of the last Mogul emperor, is stated to be a copy, with some improvements, we can assume that the instrument of Akbar Shah Mulhadin Jahanshahi was similar to the celestial poles. The ecliptic and equator are carefully graduated in single degrees with every sixth labelled in abjad letter-numerals; the ecliptic repeating every 30° and the equator numbered continuously from the vernal equinox. The tropics, the polar circles, the south ecliptic pole and the equinoxes are labelled in Arabic. Although the circles and gradations are precisely laid out and the stars carefully numbered, the positioning of the stars themselves is not particularly good.

The sphere is constructed of two hemispheres joined along the equator by an internally soldered strip. The incised lines have two different compounds in them, one black and one red, the latter appearing to be the earlier material. The meridian ring is made of a brass similar in composition to that of the sphere. It is attached to the celestial pole with a pin at the south pole and with a wing-screw at the north pole. The ring is unusually wide (1 centimetre) and is graduated by single degrees with every sixth labelled in abjad letter-numerals, beginning at the points of attachment. The horizon ring is missing.

1. Reading ad instead of all.
2. The grammatical structure of the inscription does not permit the interpretation that the globe was made for Akbar Shah by a maker named Mulhadin Jahanshahi, in addition to which it would be unlikely that either Mogul ruler of that title would have been referred to without numerous honorific epithets. See Savage-Smith 1995, p.27.

139
Sine–cosine quadrant
Probably India, circa 1800

Brass sheet, engraved outside radii 20.5 cm and 20.6 cm
accession no. SC.15

Along one radius, the quadrant is equipped with a sulabah sight, its support rivet to the quadrant plate. On one side, the quadrant is engraved as a sexagesimal sine–cosine quadrant, with lines for the obliquity of the ecliptic and verted sine, and the relative positions of ten named stars. Pivotted at the apex is a rule, engraved with linear sexagesimal (decimal) scales, which moves over the 90° scale at the limb.

On the other side a ‘ao’ scale is marked at the limb. Within it there are two cotangent scales corresponding to the ‘finger’ and ‘feel’ scales of a shadow square. There is a shadow square above these scales, and within it a table of the longitudes and latitudes of places in India, Afghanistan and Iran. A plain rule, moving over the degree-scale, is pivoted at the apex.
The quadrant

Engraved brass, 25.5 cm and 20.6 cm

13a. back:

13b. front:

The quadrant is a tubular sight, intended to be attached to the quadrant plane. The quadrant is engraved with a sine-cosine quadrant, the obliquity of the ecliptic lines, and the positions of ten named stars. The apex is a rule, engraved sagittal (declination) moves over the 90° scale. The sides 90° scale is marked. Within the circle are eight scales corresponding to fixed 'toe' scales of a shadow. One is a shadow square above and within it a table of the latitude of places in Spain and Iran. A plain scale over the degree scale, is the apex.
Two globes by Balbhumal

In the 14th century the instrument-making tradition established in Lahore in the 16th and 17th centuries was perpetuated in the work of the Hindu metalworker Lalith Balbhumal Lahuri. As his name implies, he originated from Lahore, and from inscriptions on his instrument it is evident that his workshop was located there. All the globes produced by him employed the cire perdue or lost-wax technique of casting stainless spheres which is associated with the earlier Lahore products. Balbhumal is known by two signed celestial globes, with the 48 classical constellations, about 1308 inlaid stars, and Arabic inscriptions. Both globes were made in AD 1219 (1342), one for the Sikh patron Nanak Lathlal Sahib Bahadur Ahmadi, who ruled Kapurthala, only a few miles southeast of Lahore, from 1353 to 1392.

Balbhumal also produced several astrolabes, one of them for the same patron after he had been made a Rajah by the British government. Another astrolabe bears a Persian inscription stating that it was designed in 1649 by Sir Henry Estcourt, c.c., Chief Secretary to the Deputy Governor-General in Kapurthala.

The Balbhumal workshop produced excellent and precise products that are easily identifiable by their workmanship and several distinctive features in the iconography, size, positions, design of the stand and rings, and the execution of the graduations. Balbhumal also added to all his globes six meridian circles at right-angles to the equator, along with the ecliptic latitude-measuring circles. Meridian circles are unusual in Islamic globe design, but Balbhumal made them highly idiosyncratic by shifting them six degrees westward so that no meridian represents the equatorial colure.

Among the objects that can be attributed to this workshop are a Samskrit celestial globe with captions entirely in demscript characters, and two globes in the Khalili Collection, cat. 140 and 141. The former was made for, or at least later owned by, a Hindu astronaut or astrologer (isthul) named Dahramshah. It has the 48 classical constellations with captions in Arabic. The second globe is unusual in that all the inscriptions are in English, implying that Balbhumal made this instrument for an English-speaking patron, as he had made the astrolabe for Sir Henry Estcourt. What Balbhumal's source was for his English captions is unknown, but some names are distinctive, such as the use of "Paimar's House" for Pegana. Although the captions are in English, the instrument is completely within the tradition of Islamic celestial globe making and continues a fine example of the metal working and instrument-making practices in north-west India in the 15th century. Although the engraving on cat. 140 contains an error, it is of better quality than that on cat. 141, made for the English-speaking patron. It is possible that cat. 140 was intended for an exceptionally highly-placed client. However, the error of engraving the globe with one end as the north pole and then inadvertently inverting the sphere and beginning anew at the other pole, may so have deviated the piece that it was left unfinished, unsigned and unowned, only to come later into the possession of the Hindu astronomer/astrologer Dahramshah.

1. The present location of one is unknown, while the other is in Kapurthala, National Museum, inv. no. N.M.1375.1043; see Savage-Smith 1985, pp. 233–6, no. 33, pp. 272–6, no.127, and P.51, fig. 7.4.

2. The present location of this astrolabe, made in 1649, is unknown; see Savage-Smith 1985, p. 235, no. 185; and Bronaugh & MacIntosh, forthcoming.


141. Detail showing the constellation of Hercules and Serpentarius

141. Detail showing the constellation of Pegana ("Paimar's House")
Celestial globe
India, first half of the 12th century

Lead-tin high-zinc brass (globe); high-zinc brass (stand) diameter 37 cm diameter of horizon ring 22 cm inner 16.5 cm outer height of stand 16.8 cm weight 3.95 kg with meridian ring; stand and zenith ring 2.7 kg accession no. 1921.87

This unmarked and unsigned globe with a full set of constellation figures has the distinctive features characteristic of products from the workshop of Lalith Ballumal Lahiru, which flourished in the first half of the 12th century. Although possibly unfinished due to a curious feature on it, it is a superbly carefully and precisely engraved instrument.

In addition to the six great circles that are elliptical latitude-measuring circles, there are six great circles at right angles to the equator, but these six meridians are shifted to the characteristic of Ballumal's work, six degrees westward so that no meridian represents the equatorial colure. The globe bears the classic Ptolemaic constellations, rendered in precisely the Magadha design employed in all Ballumal's work with constellation outlines. Approximately 1018 stars are indicated by inlaid silver points, but none are labelled although the constellations are. The constellations are also numbered, as are the stars within them. Polar circles, the tropic circles and lesser circles at 12° and 16° either side of the equator are inscribed.

The ecliptic and equator are carefully graduated by single degrees with each sixth indicated by a longer line. Along the equator, beginning at the meridian circle nearest the vernal equinox, each 6° space is numbered in sequence, 1 through 60, using abjad letter-numerals. The ecliptic has every six degree labelled in abjad letter-numerals, repeating every 30°.

An excellent feature of this globe is the placement of two numerals instead of one at every 6° interval along the ecliptic, one sequence of numbers reading from the north and the other sequence reading from the south. This labelling reflects the fact that work was apparently begun on the sphere with one pole designated as north. For some reason the sphere was then inverted and the other pole taken as north. As a result there are two Small Bears (Ursa Minor) on it, one at the south celestial pole and one at the north. The small polar constellations, and the labels on both the north and south celestial poles have been changed. Moreover, the names of the zodiacal houses were originally all inlaid in silver and orientated so as to be read from the south pole. They were then rolled down and re-engraved so as to be read from the north. Despite these errors and re-engravings, the workmanship on the globe is of high quality and the precision of the instrument is excellent for this period of instrument making.

The sphereless sphere has a large round sprue for engravings, 44 centimetres in diameter, at the tail of Cygnus and a similar one in Argus Nebris on the opposite side of the sphere. One copper rectangular plug, measuring 1.391 centimetres, at the waist of Hercules is visible along with a number of circular chaplets, also of copper, varying in diameter from 0.4 to 0.75 centimetres. The rings and stand are contemporary with the globe and typical of the Ballumal workshop. The meridian ring is graduated on both faces by single degrees with each sixth indicated by a long line. On the top face of the meridian ring the intervals are numbered in both abjad and standard numerals. One half of the ring is recessed slightly from the surface of the sphere, and a sliding sleeve can be moved along the recessed semicircle; the sleeve is the length of 6° with 6° intervals indicated on its sides and a threaded hole at the centre top. The meridian ring is attached by screws to the celestial pole, with cloth pads between to prevent abrasion.

The detachable zenith ring sits in rectangular slots in the horizon ring and is held firm by two wing-screws. At the apex of the zenith ring is a triangular projection reminiscent of the suspender device, or kauré, on an astrolabe. On one face of the zenith ring is the inscription stating that the owner is a Hindu astronomer or astrologer (Latin) named Dababurahmad. Nothing is known about this person, who apparently flourished in the mid-12th century.

The horizon ring is also graduated in a pattern similar to the meridian ring; with both abjad and standard numerals. This ring is graduated in quadrants, starting at the slot for the zenith ring. These 35°-curve legs, with a doubled tulp design at the centre and resting on rounded feet, are attached by wing-screws to the underside of the horizon ring. Also attached by screws to the underside of the horizon ring is a semicircular arc which rests the nadir of the meridian ring.

1. The last part of the name, -eraband, implies a name from West India or Gujarat; see Phillips 1951, p. 17.

High-zinc brass (both globe and stand) diameter 36 cm height of stand 15.8 cm weight 7.4 kg (with meridian ring) accession no. 1921.87 published Savage-Smith 1990, pl. 3;
Christies, South Kensington, 29 September 1978, lot no. 15

This unmarked, and possibly unfinished, celestial globe has all the hallmark of the workshop of Lalith Ballumal Lahiru, although the labels on it are all in English.

The iconography of the 38 classical constellations and the positions of the inlaid silver points representing stars are identical to those on cat. 140 and to all other products of this workshop. The placement of the tauri and the two inner circles, the polar circle, and the meridian, and also the graduation of the ecliptic and equator, all conform to the style of the Ballumal workshop.

What distinguishes this particular product is the English labelling. Both the ecliptic and the equator are numbered in Western numerals to be read from the south rather than north in order to maintain the proper west-to-east sequence around the globe. All of the northern constellations and in the first seven of the zodiacal constellations the stars are assigned European numerals rather than Arabic ones. The celestial poles are labelled in English ("North Pole, South Pole") and the zodiacal houses are labelled in English along the ecliptic, with Arius to Virgo reading from the north and Libra to Pisces reading from the south. However, the zodiacal constellations themselves are not labelled, though most of the other constellations are given English names. Of the 14 out of 30 northern constellations that are labelled, some are given rather unusual names: Painter's Horse for Pegasi, Pegulae for Equus, Celare for Cygnus. Only 10 of the 15 southern constellations bear titles, and some of those are confused: Orion for Certhus, Lepus for Orion, and Hydrus for Eridanus. The constellations are numbered with a small engraved numeral in Arabic script beginning with 1 in Ursa Minor to 47 in Corona Australis. The forty-eighth constellation, Picta Austris, is unnumbered. A few stars, such as those near Aquarius, are numbered with Arabic rather than European numerals.

At the eighth zodiacal constellation, Scorpio, the numbering of the stars with European numerals ceases. The outline of Scorpio seems incomplete as do some of the other constellation outlines. A slight error, a group near Capricornus and Aquarius, may account for it being unfinished. It seems also that more than one artisan may have worked on the engraving of the constellations. Nevertheless, the globe is carefully executed and a good example of the Ballumal workshop.

X-rays confirm that the globe is in a seamless cast sphere. One large sprue or core plug, 4.1 centimetres in diameter, is obvious in Brass, as are a number of clusters, fly-ashes which probably replaced the original chaplets, which were drilled out and replaced with the same alloy as the sphere. The engraving is filled with a white compound. Most of the great circles have been traced lightly and then engraved deeply. The rings and stand are nearly identical to those on cat. 140. The sliding sleeve on the meridian ring is 10° in length rather than 6°, and attached to the slide is a rotatable 90° arc also graduated by single degrees with every sixth labelled in European numerals from the lower end up to the point of attachment to the slide. The number of the meridian ring is inlaid in its sides, while its top face is blank except for a groove down its centre. Both faces of the zenith ring have a floral and leaf design interspersed with patterns of five dots. Scrolling stems are engraved on the top edge. An oval ring is engraved at right angles at the top of the kauré. The zenith ring is currently attached to the horizon ring with modern screws that cannot be easily removed. The horizon ring is labelled in European numerals in a pattern identical to cat. 140, and there are engraved scrolling vines interspersed with the five-dot pattern seen on the zenith ring.

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Universal equinoctial sundial

Probably India, circa 1850

Brass sheet, engraved
Diameter 35.4 cm
Acc. no. 142

Sundials of this type usually consist of a double ring with a movable suspension bracket and a horizontal 'bridge' across the centre (in this case, the bracket is fixed by two pins). The outer ring - the meridian ring - has two scales of 90° marked in its upper two quadrants. Divided to each degree and numbered in sines in abjad notation, these scales permitted the use of the instrument at both northern and southern latitudes.

The inner ring - the equatorial ring - is joined to the meridian ring by pivots at 0° and 180°, and it can therefore open at right angles to the meridian ring. Its lower section is engraved with two scales of equal-hour divisions, rising from 0 to 17. Each hour is numbered in abjad notation and is marked in thirds, that is, at intervals of 20 minutes.

The 'bridge' is pivoted on supports fixed to the meridian ring, and straddles the equatorial ring when the latter is folded flat. It carries a sliding element pierced with a small hole and equipped with a knob to aid its accurate positioning. The slider was adjusted to the solar declination, according to either one of the scales marked on the edges of the bridge (a scale of 0°-14°, divided by sines, on one side; on the other, a scale of zodiacal signs, also divided by sines). Once this had been done for the key of use, the dial was opened until the equatorial ring lay at right angles to the meridian ring, and the suspension bracket was moved along the latitude scale to the appropriate latitude (the slider is now fixed, at zero points the scale, by two pins, probably because an outer circumferential ring on which it could be moved, was lost). The dial was then suspended from the suspension ring and manipulated by turning the whole dial and the bridge until sunlight passing through the hole in the slider fell on the equatorial hour-scale. This spot of light then indicated the time, the dial being self-orienting.

Typologically the universal equinoctial ring-dial belongs in the tradition of the armillary sphere, the armillary ring dial, and the astronomical ring. Its invention is attributed to the English mathematician William Oughtred (1575-1666), who added a description of it to his discussion of the double horizontal dial published in London in 1652; the instrument maker, Henry Wroe, who published a description of this type of dial in 1682, named Oughtred as the inventor on the title page. The universal equinoctial dial was one of the few sundials which, having no compass for orientation and therefore requiring no mounting of gimbals to insulate it from a ship's movement, could be used with facility on board ship, but it was also popular on land. Such dials could be made fairly large while remaining easily portable, and their accuracy increased with size. A number of universal equinoctial dials were made in India during the 19th century, but there was no indigenous tradition of this kind of sundial in Islamic or Hindu astronomy.

2. See Christie's, 27 September 1990, p. 40, lot no. 190, for an Indian equinoctial ring-dial, of silver, not signed or dated, but of the mid-19th century.

Image 142a: Closed

Image 142b: Open
remaining easily
their accuracy increased
a number of universal
were made in India
century, but there was
edition of this kind of
Hindu astronomy. 2
1969, pp. 44–6, esp.
17, passim.
27 September 1995,
for an Indian
mill, of silver, not
out of the mid-19th
Iranian astrolabes fall into two distinct groups. Those made in the 10th to the early 16th century continue in much the same simple style of the earliest eastern Islamic astrolabes, but the occasional zoomorphic decoration of the zette, some elaboration of the vault, and more numerous scales on the back contribute to a less austere appearance. The script is still Kufic, at least up to the work of Muhammad ibn Ja’far al-atdurrah, known as al-Jalal, who flourished at the end of the 12th and in the first half of the 13th century, and of his son Mahmud. Some 30 years later, astrolabes are already engraved in the cursive naskhi script, but remain some of the earlier characteristics.

Thereafter, there appears to have been a brief haul in astrolabe-making in Iran, but from the end of the 15th century we may distinguish a second group of astrolabes which can be associated with the Safavid shahs from the time of Abbas I onwards. The earliest of these is that made in 1536 (AD 1579-80), the year of Abbas’s accession, by Muhammad Amin b. Amirza Khan al-Nakhi, better known as al-Qummi. It is clearly in plain design and resembles in certain respects the astrolabes then beginning to be made in Moghal India. Its success, however, soon assumes the ornate, highly decorated style associated with Safavid Iran. The form of these astrolabes is a pattern of tendrils, waving between the circles of Capricorn and the ecliptic, bearing leaf-shaped star-points. The hub is high, triangular, and either engraved with floral patterns or with religious or dedicatory inscriptions. Likewise, the rim, the back, and even the plates tend to have vacant spaces between the essential scales engraved with patterns or inscriptions in cursive Persian script. The astrolabe, who was sometimes assisted by a ‘decorator’ or ‘engraver’, generally signed in a cartouche below the shadow-squares on the back. Astrolabes from 17th- and 18th-century Iran are quite numerous; the survival of so many precisely and beautifully worked instruments is rather a reflection of the passion for astrology at the Safavid court which Sir John Chardin comments on (see above, p.156), than of a devotion to astronomical investigation, and the universal presence on the backs of the astrolabes of astrological tables is a testimony to this.

1. See Bireux & Maddison, forthcoming, ‘Muhammad ibn Ja’far ibn ‘Umar’; the two astrolabes and two globes known by this maker range in date from AH 796 (AD 1393-4) to AH 814 (AD 1412-3). His father, Ja’far ibn ‘Umar ibn Dawlatshah al-Kirmani, is known as the maker of some eight fine astrolabes and globes; see Bireux & Maddison, forthcoming, ‘Mahmud ibn Jalal’.

The present celestial globe was made by Muhammad Zaman, the son of Muhammad Zaman, assigned no. 12148. This highly accurate and finely engraved celestial globe has 39 prominent stars, labelled in Arabic and indicated by inlaid silver points. Although asigned and undated, the globe’s star positions are consistent with those used on a globe, now in the Victoria & Albert Museum, that was produced in 1450 (AD 1649-51) by Muhammad Zaman, an astrolabe maker known to have worked in Mashhad during the reign of Shah Abbas’s successor, Safi I (reg. 1629-1642). Muhammad Zaman made at least two other celestial globes, although these are not quite as well executed as the one he produced in 1649, and at least seven astrolabes which span the years from 1654 to 1673 or 1674. The globe in the Victoria & Albert Museum is a nearly perfect instrument of approximately the same size as cat. 143 and is also made in hemispheres, but it includes a full set of constellation outlines and stars. Although these are lacking on cat. 143, it is an even more precisely executed instrument, employing more intricate metalurgical production techniques than those of globes known with certainty to have been made by Muhammad Zaman or under his supervision.

The globe, which lacks the original rings and stand, is constructed in two hemispheres joined along the celestial equator. The weight, and the fact that it is biased when rolled, suggest that the hemispheres were cast with quite thick walls. There is a slightly damaged area near the vertical equator and some nibbling of the finish in a few places. The surface has been cleaned and varnished fairly recently and lacquered with a gilt lacquer that probably does not indicate the original surface colouration.

Nevertheless, the sphere was executed with great precision, both metalurgically and astronomically. The sphericity is exceptional for a globe made in hemispheres, while the graduation of the ecliptic and equator is unusually precise and the positioning of the stars is consistently accurate in terms of the star catalogues of the day. Moreover, the inlaying techniques are excellent and the calligraphy of the highest quality.

The band of the equator is divided into single degrees with every fifth degree labelled with an ahfah letter-numeral, numbered continuously beginning from the vernal equinox. The inner edge of the band indicating the celestial equator is inlaid with a copper wire, while the inner edge of the ecliptic is inlaid with a thin silver wire, alongside which are engraved the Arabic names of the 12 zodiacal houses, written antediluvian when viewed from the north pole. The ecliptic is divided into single degrees with every fifth labelled by ahfah letter-numerals, repeating every thirty degrees (i.e., 5°, 10°, 15°, 20°, 25°, 30°, 35°, 40°, etc.).

Six great ecliptic latitude-measuring circles divide the ecliptic into twelve equal parts (the zodiacal houses). The equinoctial colure, the Tropic of Cancer, the Tropic of Capricorn, and the two ‘polar circles’ (circles centred at the celestial poles with the circumference passing through the ecliptic poles) are each indicated by single engraved circles. A rod passes through holes drilled at the celestial poles. The north celestial pole and polar circle, the equinoctial colure, and the greatest distance between the ecliptic and the equator at the solstices are given Arabic labels. The labelling of the stars is given in Appendix III.

1. London, Victoria & Albert Museum, Department of Metalwork, inv. no. 115.82.57-58; see Savage-Smith 1983, pp. 21, 96, no. 16, and p. 41, fig. 21, p. 2. One globe, now in a private collection in Kuwait, was made in 1504 (AD 1684-5); the second globe is undated and is now in Cairo, Museum of Islamic Art, inv. no. 152.664; see Savage-Smith 1983, p. 21, 96, no. 17, and pp. 235, 206.4. For the astrolabes, see Savage-Smith 1983, p. 218, no. 164. Bireux & Maddison, forthcoming, ‘Muhammad Zaman I-110’, and nos 1 and 06 (both fakes), list the globes and astrolabes; Muhammad Zaman I is not signed by Muhammad Zaman, but by Muhammad Zaman 3.
tor is laid with a line in the inner edge of the plate and a thin silver line to the edge of the plate. The zodiacal signs are engraved on the plate, and single degrees are marked by raised letters every thirty minutes.

A circle measuring the ecliptic into twelve zodiacal houses. The equinox, the Tropic of Cancer, and the Tropic of Capricorn are all represented by the circles centred on the equinox, and the sphere is divided by the ecliptic into twelve equal parts. A rod passes through the celestial poles, the polar axis, and the equator, dividing the sphere into two equal parts. The labelling of the spheres is shown in Appendix II.

Sara & Albertlement of Metalwork, 187; see Savage-Smith, 1971, and p. 49, fig. 41. The model shown in a private collection was made in the 1054-7094 second globe is now in Cairo, Museum of Islamic Art 10723.) See also 183, p. 244, no. 97, and E. of the astrolabes, see 205, p. 351, n. 104, son, forthcoming, min. 1-107, and os and lists the globes and ammad Zaman 10 is Mohammed Zaman, but Zaman 3.
of the longitude, latitude and inshelf of

Brass, sheet and cast, cut and engraved diameter 3.5 cm height 2.6 cm (excluding shackle and suspension ring) thickness of mater 0.7 cm maker Muhammad al-Yazdi accession no. NC 1153

This truly beautiful Safavid astrolabe is finely engraved by one of the outstanding makers of the period. His signature appears in a cartouche on the back, below the shadow square, 'Decorated by Muhammad al-Yazdi'. Muhammad al-Yazdi was the son of Muhammad Amiri al-Yazdi, and the nephew of Muhammad Khalil al-Isfahani, both well-known astrologers, the sons of Hasan al-Haj. Muhammad Madhi signed sometimes janaqin (he made it), sometimes, as here, namdara (he decorated it) and sometimes mubi (he engraved it); he decorated at least one astrolabe made by his uncle. The six known dated instruments by him range from 1619 (459/5) to 1628 (468/5). the present instrument being dated 1626 (465/5).

The rear is of an intricate, detailed, foliate floral pattern, typical of Muhammad Madhi's style, and is for 44 stars. The inscriptions are engraved in relief. The first half of a long inscription in verses, along the Capricorn band, reads: Az 'llim 'milam tarabk-i

3. The Koran bears a circular depression, which contained a small compass, probably with a bird-shaped needle, and directions of the qiblah marked on its base, as is found on another astrolabe by Muhammad al-Yazdi from 1627. A little lower edge of the limb is a cartouche with a quotation from the Fudain ("Rose Garden") by the 13th-century Persian poet Sadi of Shiraz: Ghesht-e-i-naghv e k-e ma ba mard, which means "la est mal est encore un mal est". The object of engraving is that it should live after us; I do not see permanence in excellence. This is the first line of the second aqabal of the preface.

4. The alidade and, probably, the pin are original; each end of the alidade is voiced with a leaf-shaped design, similar to that on the Kur.

The English traveller, Sir John Claudius Napier, met Muhammad Madhi's father, Muhammad Amiri, when in Isfahan in the years 1672 to 1675 (see above, p. 159). It is possible that Claudius or members of his entourage were introduced to Muhammad Amiri or other instrument-makers to some Western European astronomers by Muhammad Madhi. Specifically, Muhammad Madhi made close copies of French solar polar stereographic constellation-maps of the northern and southern hemispheres on either side of a plate of an astrolabe (and on plates of at least two others), serving purely as substitutes for the plate of 'epicentric' coordinates. The original map used by Muhammad Madhi was either that printed circa 1615 by the Parisian mapmaker Mercho Tavenier, or a very similar map printed, in 1626, just across the Seine by Antoine de Fer. It is possible that either or both maps were brought to Iran by Mercho Tavenier's brother, the traveller Jean-Baptiste Tavernier, who made several journeys to the Near East, including Iran. There are other examples of Safavid astrolabe-makers' awareness of French astronomical material; for example, the anonymous universal astrolabe, engraved with an orthogonal projection as described in Jean de Rozier's Astronomie, Paris, 1750 (1751), made for Shah Husayn (reg. 1694-1722).

This small astrolabe, much of it well-engraved in relief and the scales finely divided, recalls the much more elaborate astrolabe of Muhammad al-Yazdi, as seen in cat. 144, even to the curved 'heaven' at the ends of the alidade, but it is unlikely to be his work. The delicate foliate tracery of the rose marks of stars. The Kur is engraved in relief with foliate designs in the front and back. There are plates for the latitudes 30° and 32° 13' and 31° 3' 36" and 35° 24' 18", with a tablet of horizon – the azimuths are drawn above the horizon and there are lines for unequal and Babylonian hours. As is usual, the latitude for which the projection on the plate is drawn is engraved below the horizon line, in the centre, but here the number of hours and minutes of daylight during the longest day in that latitude is also given. This is the common layout on eastern astrolabes. The mater is engraved as a gazetteer
astrolabe

and engraved
height 9.7 cm (excluding suspension ring)
width of mater 6.5 cm

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144
144, front of mater, plate and rete
145, back of mater with alidade
Planispheric astrolabe
Iran, 17th century
Brass, sheet and cast, cut and engraved; later ivory suspension ring; the pin and horse replaced by a brass bolt with an ivory nut. Diameter 9.7 cm height 11.6 cm (excluding shackle and suspension rings) thickness of mater 0.9 cm
Accession no. SC1150
The foliate pattern of the rete for 33 stars of this astrolabe is reminiscent of that on cat.145, but the remainder of the instrument is more simply engraved, without decoration. The horse is high and plain. There are four plates, for latitudes 32° and 31°; 30° and 36°; 34° and 37°; and 36°, with a tablet of horizons.
The mater is engraved as a gazetteer of the longitudes, latitude and inhrayf of 28 places. On the back there is a sine quadrant (upper left); the area of the signs of the zodiac, on which are superimposed curves of the azimuths of the qiblah for Medina, Baara, Isfahan and Tis. Below are a shadow square, within which is an astrological table of eclipses. The alidade is original, and is engraved with a declination scale and a horary scale, although there is no horary diagram on the back.

Planispheric astrolabe
Probably Iran, 18th century
Brass, sheet and cast, cut and engraved. Diameter 13.9 cm height 24.6 cm (excluding shackle and suspension ring) thickness of mater 1 cm
Accession no. SC1151
The rete of this instrument is of an elaborately decorative foliate pattern with named star-pointers; the ecliptic circle is divided to each degree and numbered by fives. The limb is divided to each degree and numbered by fives. The five plates are engraved for latitudes 30° and 31°; 32° and 33°; 34° and 35°; 36° and 37°; and 38°, with a tablet of horizons on the reverse. On the back, the scale on the limb is divided to each degree and numbered by fives. It begins in the upper-left quadrant, at the horizontal line, but continues beyond 90° in an anticlasswise direction to form a scale of 360°. Within the scale on the limb there is an eccentically-placed 24-hour scale (but with no associated calendar-scale), and within that scale, a sine quadrant with its own 90° scale on which is superimposed an unequal-hour diagram (upper left), a series of meridian altitude graphs on the arcs of the signs but with no place-names engraved (upper right), a shadow square, and astrological tables, including the 28 lunar mansions. The horse is engraved on both sides with a crude floral pattern against a networked background; the same texturing was effected on the ecliptic-circle and on the Capricorn band on the rete.
At the bottom of the back, between the ecliptic scale and the limb-scale, is the name Abd al-A'immah, followed by the numeral 8, the meaning of which remains unexplained. This signature, if indeed it is a signature, is not the usual form of that of the famous Iranian astrolabes, 'Abd al-'A'immaah, and for that and stylistic reasons, it would be impossible to attribute this astrolabe to him. However, it is much better made than many of the crude 'Abd al-'A'immaah fakes,' and perhaps it belongs to that class of 'fake' postulated by Gingerich and Saliba as attempts to reproduce the prestigious works of makers such as 'Abd al-'A'imma and 'Abd al-'Ali.2
The alidade bears declination scales; the horse is a modern replacement.

1. Brieux & Maddison, forthcoming,
"Abd al-'A'immaah.
2. Gingerich, King & Saliba 1972,
passim; see above, pp. 136-6.
Brass, sheet and cast, cut and engraved diameter 9.3 cm height 12.1 cm (excluding shackle) thickness of matter 0.8 cm Open-fronted plywood case, 20.2 x 14.2 x 1.1 cm, covered with red leather and set with two leather seal impressions, 2.6 x 2.4 cm (upper) and 4.8 x 5.7 cm (lower) accession no. 10521

This beautifully made small astrolabe is one of seven by Haji 'Ali ibn Sadiq Quummi, an Iranian astrolabist of the late 18th century. Though undated, the work closely resembles that of another astrolabist, Haji 'Ali, who produced at least 24 numbered astrolabes, seven of which are dated, the earliest from a.d. 1220 (ad 1778-79), the latest, which carries the number 16, from a.d. 1222 (ad 1779-80). Indeed, the astrolabes of both makers are so similar in size and design that it has been suspected that they are by the same maker, or from the same workshop. However, whereas Haji 'Ali signed himself thus in a cartouche below the shadow square, engraving the date and usually theopus number, 'Ali ibn Sadiq always left the cartouche blank, and placed his signature on the limb, at the very bottom of the back. Only on cat. 149 and on that in the Museum of Islamic Art, Cairo, did he use the title Haji, and only on the astrolabe last known to be in a private collection in Hanover did he use the nisbah Quummi ('the man from Quum').

Both astrolabists use the noun, 'umal ('work') in their signatures. On cat. 149 the signature is placed in a cartouche at the bottom of the back of the astrolabe. It is not dotted, and there is an unepoxiated mark or letter, similar in shape to a madda over the ba' of ibn.

Although it is not certain whether Haji 'Ali ibn Sadiq was the same person as Haji 'Ali, the present astrolabe may be assigned a date of about 1780 on comparative grounds.

The reticule is of the foliate pattern with pointers for 19 stars. The script of the signs of the zodiac on the ecliptic circle, the azimuth and exponents on the limb, and of the place names on the gnomon, was engraved in reserve against a patterned ground. There are four plates of the usual Iranian design. One is engraved for latitude 33°, with a table of horizons on the reverse; the others are engraved for latitudes 30° and 36°, 33° and 34°, and 37° and 38°. There are lines for Italian hours, as well as the usual unequal-hour lines.

The master is engraved with a gnomon of the longitudinal, latitude, and introitus of 34 places. The back is typical of Iranian astrolabes of the 17th and 18th centuries: one quadrant is divided as a time–cosine quadrant (upper left); another bears graphs of meridian altitudes of the sun for seven different latitudes, and of azimuths of the qiblah for Shiraz, Baghdad, Mecca, and 'Ibn (upper right). Below these quadrants are a shadow square, an astrological table of terms and faces of the planets and of the 28 lunar mansions, with scales of cotangents on the limb. The alidade is engraved with declination and houry scales. The bear, front and back, bears an elegant floral design.
This instrument is in the Safavid tradition of highly decorated astrolabes, though it is late and its engraving is somewhat less rich. The fringe of the casting bears the inscription "It was completed to the order, which has the power of destiny, of ... Mahammad Mirza Qazvini" and on the back: "He is God — May He be exalted! It was completed to the order, which has the power of destiny, of the very great Prince, in the town of Nishaprud, which resembles Paradise, by this servant of the Court, Muhammad Akbar Afsar." A second astrolabe by Muhammad Afsar has been recorded; it is dated AH 1254 (AD 1839 – 1840). 1

1. See also Brixe & Maddison, forthcoming, "Muhammad Akbar 1.

northern cities of Tonk (Jahanpanah), Peshawar where Sawai Jai Singh built observatories. At 131 does suggest an eye-catching instrument by the report of her travels in Iran seen in the Shah’s treasury a gold globe, 20 centimeters in diameter and set with rubies. On the corning to her describer and the ecliptic were set large diamonds, while the are marked by emerald stones outlined in rubies, set in the periphery which was pronged.

A large, labelled globe with 39 parts, there are certain unique to this specimen.

A spherical globe to function as a spheroidal elevation or as both the north and south celestial poles could possibly be made for the specified latitudes of 30° and 72°. It is not clear what purpose was served. Inscribed onto a sphere two hemispheric maps representing the hemispheres of the celestial sphere onto a flat plane, however, that if the north and south celestial poles, then it could have served as a celestial map, or open star map, on an astrolabe, to be placed on a celestial pole, then it could have served as a

The upper
The rings, of which there appear to have been three, are now missing, and it is possible that additional features have also been lost. Had these survived, they would have assisted in the interpretation of the instrument.

It is curious that the latitude of 30° North found on the 'astralobe plate' engraved at the north celestial pole does not correspond to any latitude given in the gazetteer on the horizon ring. The gazetteer of 16 cities indicates a very limited area of intended use: from Nakhibiyan in the west to Isfahan in the east, and from Tiflis (Tbilisi) in the north to Lashkari in the south, with a length of daylight from about 15 hours at the northern latitudes to 14 hours and 3 minutes in the south. This discrepancy suggests that the horizon ring was possibly designed for another globe, or that the engraved planispheric maps of the coordinate systems were added later, perhaps for decoration. However, it appears that the stereographically projected coordinates for latitudes 30° and 72° were engraved when the rest of the globe was constructed.

The choice of 32° for the set of coordinates inscribed on the south pole was probably determined by the fact that at 72° north and 32° south, the two circle-the entire Sun would be seen at the summer solstice to be above the horizon for a 24-hour period. This latitude also has the longest night-time period at the winter solstice, for no fraction of the Sun’s disk appears at or below the horizon for the time of the winter solstice. The Arctic circle, or latitude 66° 30′, is commonly regarded as the latitude at which the longest day occurs, but at that latitude the full disk would not appear above the horizon for the entire twenty-four-hour period at the summer solstice. Plates made for planispheric astrolabes do occasionally have plates designed for 24°, through plates for 66° 30′ are more common.

On the sphere, the ecliptic is graduated by single degrees indicated by dots with a unique short line and labelled in abjad letter-numerals, repeating every 30 degrees. The names of the nodal houses are inscribed in a yellow line to the ecliptic.

The equator is similarly graduated but numbered continuously from the vertical equator. The tropic circles and the celestial cohere on a globular sphere. There are also lesser circles parallel to the equator, placed at 15° and 20° either side. Six great circles at right angles to the ecliptic, ecliptic latitude-mesuring circles, demarcate the twelve zodiacal houses. In the houses of Virgo, Libra, Pisces and Aquarius there are arcs of circles parallel to those that extend between the circles at 20° either side of the equator.

The two ovoids, both solstices, the coequatorial circle, the equinoctial circle, and the two celestial poles are all labelled in a large double-outlined script similar to that of the signature inscription. Also in a similar script the greatest ellipticity or distance of the eclipse from the ecliptic (max or min) is labelled and said to be 23° 30′.7

Centred at the north celestial pole, with the tropic of Cancer as the circumference, there is inscribed a version of an astralobe plate designed for a latitude of 30°. In fact, the design is labelled as if it were an astralobe plate: "Latitude 30°. Hours of the smallest day 13 [16 minutes]."

Almacantar (circles of equal altitude) are inscribed every six degrees. Also on this portion of the globe are arcs and circles representing the tropic of Cancer and the equator as drawn using stereographic projection on an astralobe plate. The east-west points along the equinoctial cohere are labelled. Arcs of unequal hours arc labelled one through four hours, one through four hours. At the south celestial pole, with the tropic of Capricorn as the circumference, another form of astralobe plate is inscribed. This too is labelled as the latitude of 72° with a longest day of 24 hours. The almacytars appear to be indicated for every three degrees. There are arcs of unequal length drawn, 90 lines of equal azimuth or an obvious equator.

X-rays show that the sphere was cast in one piece. Beneath the signature is a rectangular plug (2.8 × 1.7 centimetres) made of the same alloy as the rest of the sphere and held with solder. Several round chapters of a different alloy are visible, ranging in size from 0.4 to 0.2 centimetres in diameter. The sphere rumbles when shaken due to loose bits from the casting process, and it is very biased so that the large hole is always at the top when the sphere is allowed to move freely on a horizontal surface. The large hole intended for a gnomon is 0.4 centimetres in diameter, while the north ecliptic and equatorial poles have holes of 0.3 centimetres diame-
ter. A rod runs through the globes at roughly right angles to the equator.

The horizon ring and stand appear to be contemporary with the sphere. The top ring has four round holes, each labelled with one of the cardinal points; the intermediate quadrants are labelled northwest, southwest, southeast, and northeast. The holes at the north—south points would have held a semicircular ring serving as the meridian ring, and the east–west holes a similar ring acting as the zetith ring; both are now missing. To the underside of the two points marked north and south there is attached a semicircular arc supporting the horizon ring; it is graduated by single degrees with every fifth labelled from the points of attachment. Holes are drilled in this arc at different points labelled north, south, east, west, and north–south. These two supports are attached to a stand formed of two crossed semicircular bars resting on an undecorated ring base.

The top of the horizon ring is gradu-
ated by single degrees, with every fifth labelled in abjad letter-numerals in non-consecutive segments of 30° beginning at the north–south points. At 47°–49° antimicroweek from the north–south points there are two notches cut for another ring, now missing, which might have supported an openwork cap or rea. On the underside of the horizon ring there are engraved the names of cities, each with its longitude, its latitude, its azimuth of the qibla (all rounded to the nearest degree), inddication of the azimuth of the qibla with respect to the four cardinal points, and the length of its daylight on the longest day.

The eight cities are Qazvin, Golpayegan, Sumamar, Isfahan, Kashan, Qom, Tehran and Mazanarizh. The names were inscribed: Tiflis (Tbilisi), Bakouyeh, Arasabil, Nakhibiyan, Maragheh, Tabriz, Ganzhi and Vezanoo.

The 39 stars, whose radii indicate silver points, are labelled (see Appendix III).

1. Pingree 1978b, p. 317. The translation was completed in 1772 and the earliest dated copy was completed in 1614, see Pingree 1978b, p. 315.

2. See the examples made by Hans Volmar in Nuremberg and Johann Willebrandt in Augsburg, now in the Whipple Museum of the History of Science, inv nos 665 and 1660; see Bryden 1984, nos 210 and 311. For a 17th-century German example see the unsigned globedial in Oxford, Museum of the History of Science, Lewis Evans Collection, inv.no. 0-556-9. See Steyn 1972, p. 207.


4. For the spherical astrolabe see Madelung 1980.

5. For examples of astrolabes with plates designed for 72° see Gunther 1938, p. 317, 318, 323, 343, 371, and 261; and Gibbs & Saliba 1974, p. 118.

6. A similar stated value, with a precision for greater than the material of the globe would allow, is given on a celeb- 

tical globe completed 03.23 Jumada 1 1221 (9 August 1613) by Muhammad Ali al-Husayni and now in Cairo, Museum of Islamic Art, inv.no. 12574; see Savage-Smith 1986, pp. 214–5, 207, 73. 7. There are no lines of equal azimuth, however, possibly because they would have interfered with the nearby ecliptic latitude-measuring circles.

8. For an illustration of an astralobe plate displaying similar stereographically projected coordinates for the latitudes of 30°, made about 1740 by the prolific astrolabe-maker named Hajji Ali, see Gibbs with Saliba 1984, p. 78.

9. For Hajji Ali, see above, cat. 149. In this case, only those in a south- west direction are given.
...nother ring, now might have supported a p or rete. On the horizon ring there are also eight cities, each at its true latitude, its 8th angle (all rounded to 30 degrees). This direction of the p or rete with respect to the points of the compass, and the latitudes of the cities, are shown on the reverse side of the globe.

The tradition of astrolabes with this feature is widespread, as seen in Gunther (121, 123, 124, 125), and Saliba 1974 p. 148. For a specific example, see Gunther 123. The example shown here is from the same period as this astrolabe, but it is smaller and has a different design. The globe is made of brass and has a diameter of about 15 cm. The dials are engraved with the names of cities and their latitudes, and the dials have a blue glass cover.

The astrolabe was used for determining the position of celestial objects, and was an important tool for astronomers and navigators. It was also used for navigation, and was an important tool for the early explorers. The astrolabe was used to determine the position of the sun and the stars, and was an important tool for the early explorers. The astrolabe was used to determine the position of the sun and the stars, and was an important tool for the early explorers. The astrolabe was used to determine the position of the sun and the stars, and was an important tool for the early explorers.
Andalusí and Maghribí astrologers

The earliest astrologers from eastern Islam are followed closely in time by those from al-Andalus (Muslim Spain) where, during the reign of al-Hakam II (d. 961) cultural influences from eastern Islam began to penetrate the Umayyad kingdom. Al-Hakam II (reg. 961–976), especially patronized the sciences, but there followed a period under his successor al-Hakam III (reg. 976–985) during which the sciences were considered heretical and books were burnt. The situation did not improve until the beginning of the 10th century. The author of an early Andalusí treatise on the astrologer Ibn al-Saffar, left Córdoba with his son shortly after the beginning of the civil war (915/15) which saw the end of the Umayyad kingdom some 50 years before. Ibn al-Saffar was the maker of the earliest known Andalusí astrologer, that of 917 (917–918), now in the Royal Scottish Museum, Edinburgh. 'Sadi' al-Andalusí claims that he was celebrated for his skill in the construction of astrologers in Andalusí which he had known better than he how to construct this instrument.2 Probably because of the master-apprentice system, astrologers tended to be conservative in the style of their products. In each distinct period and region of Islam, as isolated from intellectual and cultural influence throughout the period during which that particular cultural area flourished. This absence of eclecticism results in most astrologers being immediately recognizable as to their period and geographical origin. In Muslim Spain, the astrologers described above, the very earliest known to us already have a distinctive style which persists even on astrologers made in North Africa in the 16th century and later, the extinction of the Islamic workshops in Spain, in the wake of the Reconquista, the fall of Granada in 1492, and the expulsion of the Moorish astrologers, is low and usually unrepresented, but it sometimes retains the two holes.3 The star-pointers are less severe, and soon are worked a four, sparingly from bases studded with silver or brass knobs (presumably to assist identification in the dark) eventually the may be bored, revealing a finely pierced point.5 The rete tracery

often includes a ‘Moonrise’ arch, or other motif distinctive of its origin. Apart from the presence of lines indicating the times of prayer on the plates, a noticeable difference in the design of the plates is that the table of horizons assumes a characteristic form; it is not quadrangular as in eastern astrologers. On the back is a zodiac—calendar scale that correlates the Sun’s position in the zodiac with the Hindu calendar; and the scales of degrees are sometimes notched at intervals to enable them to be read in the dark. The alidade is ‘straight’, that is to say, the fiducial (diagonal) edge is along one side of a curved frame, not ‘squared’, as was common in the East, with the fiducial edge along opposite sides of ‘half’—rules symmetrically disposed on either side of the difference. Perhaps most characteristic of all is the decorative western Kufic script, which in its early and less mannered form produces a more ornate effect than the simple Kufic used on the contemporary eastern Islamic instruments. In his ‘Book of the Categorics of Nastar (Khitab tabqat al-nasr), written in the course of the year 940 AH (AD 1049), Al-Farabi concludes his history of mathematics in Muslim Spain with the following words: ‘These are the best-known scholars who worked in the science of mathematicians in al-Andalus. There were others that I have not mentioned either because of the following decade; and the names of the following are well known in al-Andalus. During the course of the present time, there are many young scholars who have distinguished themselves in the study of philosophy [as the sciences derived from the Greeks, as opposed to the traditional Islamic Sciences] and demonstrated great energy and ability to acquire knowledge of most of its branches. Those of them who live in Toledo or around it include Abū Bakr ibn al-Hasan al-Suyuti (the pharmacist), Abū Ishaq ibn ‘Ali Yahya al-Naqshī, known by the name Wālid Aṣwārql, Abū Mu‘āwia Abū ‘Allah ibn Khalaf al-‘Isnādī, Abū ʿAlī al-Ashraf Abū ‘Umar ibn al-Hasan al-Turākī, Abū ʿUmar Abū ‘Alī al-Ma‘ādhī, Abū ‘Umar Abū ‘Alī al-Ma‘ādhī, Abū ʿUmar al-Hasan al-Sahlī, the constructor of astrologers.’ Sadi then selects for notice two scholars from Zaragoza and three from Valencia. The Toledo list quoted above is a distinguished one. The first two names are those of the most famous astronomers of Muslim Spain, Alī ibn Khalaf, and Sādī ibn al-Zarqalluh, the Azhnd of medieval Christian Europe, the compiler of the Toledoan astronomical table, the inventor of instruments and water-clocks. It is to some extent a testimony to the importance attached in Muslim culture to the makers of astronomical instruments, especially astrologers, that among the short list of six names there should be that of an astrologer, Ibrahim ibn Sādī ibn Ashbagh al-Ansaria al-Sahlī al-Sawāzī (or al-Marjūazi). His first workabed meant that an ancestor was one of the Helpers of the Prophet, the second means ‘from the Valencia plait’, the third ‘the scales or balances man’. He worked both in Toledo and Valencia, and some five or six instruments by him are known, dating from AD 1078 (AD 978) to at least AD 1086 (AD 1081), all astrologers, except for a celestial globe made together with his son.5 From the very year (AD 1061) (AD 961) in which Sadi al-Andalusí placed Ibrahim ibn Sādī’s name among those of the outstanding contemporary mathematical scholars in Toledo, there survives an astrologer made by Ibrahim in that city, with the maker’s signature written in western Kufic script on the back. On the back of this astrologer may also be the characteristic western Islamic zodiac—calendar scale (7° Arisz = 14 March), and shadow-square. The later, in the classic Andalusí-Maghribí style, is for 24 stars. There are ten plates, with the names of places as well as the latitudes in which they could be used, and the interior of the mater is also engraved as a plate, whereas on some western astrologers the mater bears a perpetual calendar.6 The Judeo-Arabic astrologer, cal.124, is in the same stylistic tradition. As mentioned above, there were scarcely any astrologer makers in North Africa before the expulsion of the ‘Moors’ from Spain. A maker who worked in North Africa before 1245 is Abu Bâr ibn ‘Uyûsâd al-Marrakshî, known as the maker of particularly fine astrologers, dating from AD 1206–7 to AD 1225 (AD 1206–12, 1218–19), though of these five two may be the same instrument.7 One of the last known astrologer makers in Spain before the expulsion of the ‘Moors’ was the famous astronomer, Abu ‘Alî al-Ashraf Abû ‘Umar al-Hasan al-Basî, who died in AD 779 (AD 779–80), and who had been the monk of the Great Mosque of Granada, when the kingdom of Granada flourished under Nasrid rule his work is reputed to have surpassed that of the astrolabe makers of the past.8 Over a hundred years later, and nearer the time of the expulsion, there was still an astrologer working in Granada, Muhammad ibn Faraj, who was active in about AD 1427. The revival of Western Islamic astrologer-making in North Africa, after the expulsion, includes the sole known work of ‘Ali ibn Muhammad ibn ‘Abdallāh ibn Faraj, dated AD 1574–5, and who was possibly related to Muhammad ibn Faraj, and the brothers, Abu ‘l-Hasan ‘Ali and Abu ‘abdallāh Muhammad, sons of Muhammad az-‘Azîd (AD 1540–41). In the 17th century, there is ‘Abdallâh ibn Sâhâr, of Sahl, who made an astrologer in 1680–87 and al-Faraj ibn Ahmad al-Battûr, whose younger brother, Muhammad ibn Ahmad al-Battûr, was a prolific maker at Mekeke, apparently dominating astrologer-production in early 18th-century Morocco.9


160 Andalusí and Maghribí astrologers
The revival of astrolabe-making in the expulsion, some work of 'Ali in 'Abdallah ibn al-Ziyad, p. 69, and who was Muhammad ibn there, Abu'l-Hassan Allah Muhammad, al-Azdi in 17th century there 61, of Sufi, who in 1687-8 and the al-Bustani, whose Muhammad ibn, was a prolific maker andy dominating ion in early 16th-

Addison, forthcoming.

15.

Andalusi, p. 69. 

Faison, forthcoming.

The celestial globe was made by ibn, Muhammad, and 'its design of' Sufi 4/78 he earlier Islamic

Faison, 1974. al-Shawwal 469.

Faison, forthcoming.

Fig. forthcoming, 


(illustrated).

As mentioned, see .


Ahmad al-Battani in.

See of it Illustrating 

pp. 203-4.
Planisphere astrolabe
Morocco, probably Meknès, dated AD 1188 (AD 1767–7) 12
Brass, sheet and cast, cut and engraved; the rete is set with silver studs, some new missing.
diameter 20 cm
maximum height 3.5 cm (excluding stake and suspension ring)
maximum thickness of mater 0.7 cm
maker Muhammad ibn Ahmad al-Battani
acquisition no. ST450, provenance Edward Joanis Collection, Los Angeles

The rete indicates 26 named stars; the bases of the curved star-pointers are embellished with silver studs, eight of which are missing while one was never inserted. Two similar studs, placed as turning aids on the horizontal crossbar, are also missing. The scale on the ecliptic circle is based on units of three degrees and numbered at intervals of six degrees. The limb of the mater bears a scale of 360°, which is numbered clockwise at intervals of five degrees, in the sequence "θ = 5°, 10°, 15°, 20° to 360°/θ = 11.5° to 180°/θ = 18°/θ = 30°/θ = 45°/θ = 60°/θ = 90°. There are three plates. The first is engraved on both sides with arcminutes at intervals of three degrees and azimuths at intervals of five degrees, in addition to the equator, the tropics and, in the lower half of the plate, lines for unequal hours. The data given on one side is in the latitude of Mecca (May God be satisfied with him), 31° 30' and, on the other side, "for all the cities at a latitude of 35° 30'". The second plate is similarly inscribed for cities at latitudes of 30° and 35°, and the third for cities at a latitude of 35° 0' on one side and on the other a table of horizons with no numeration except for the abjad numeral "α" = 6, indicating that its lines were drawn at six degree intervals. The frets are blank. The alidade is of typical plain, straight Maghrībi type; the pin and rosette-shaped washers may be original.
The inside of the mater is blank. On the back, the upper two quadrants of the limb are divided to each degree and numbered at intervals of five degrees from the east–west line to the top. There is a zodiac–calendar scale (20° Aries = 9 March), with an unequal-hour diagram and a shadow square within. Part of the horary diagram was erased. As an inscription on the mater laid it was obliterated. On a semicircular band across the horary diagram (the diameter of the band corresponding to the intersection of the shadow square with the horizontal line) there is the signature of the maker, Muhammad ibn Ahmad al-Battani and the date, expressed in abjad numerals as "αθλυ 11/λ/θ = AH 1188 (AD 1767–7).

The abjad system employed here is that current in the western Islamic world, which varies from the standard system for some numbers above 30.

Muhammad ibn Ahmad al-Battani is the best known of Maghrībi astrologers, 19 astronomers and an astrological quadrant by him having been recorded. Cat. 152 is the earliest, while the latest was made in AD 1216 (AD 1778–9). On an astrolobe he made in AD 1163 (AD 1724–5), he signed himself as Muhammad ibn Ahmad ibn al-Hasan al-Battani. His brother was al-Hassan ibn Ahmad al-Battani, an astrologist known from three instruments dated AD 1197 (AD 1759–61), 1205 (AD 1767–8) and 1226 (AD 1789–92). On another astrolabe, made in AD 1148 (AD 1715–6) and now in a private collection in Paris, Muhammad ibn Ahmad al-Battani described himself as working in Meknès 'of the olive tree', and cat. 152 may have been produced in the same city.


This finely made astrolobe dates from the late 18th–early 19th century, when most surviving astrolabes from Morocco were made by al-Hassan ibn Ahmad ibn al-Battani, who worked in Meknès, by his brother, Muhammad ibn Ahmad ibn al-Hassan ibn al-Battani, the maker of cat. 152, or by Muhammad ibn Ahmad ibn Ibrahim, who worked in Fes.

This example is similar to cat. 152 although it differs in such details as the pattern of tracery on the rete, the hatching of the intervals between the divisions of the shadow square and in the style of maghrībi script, but Muhammad ibn Ahmad al-Battani's work is never entirely consistent. Only seven of the 20 astrolabes known to be by him are engraved with a scale of lunar mansions correlating with the zodiac–calendar scale; only five have hatching between the shadow square divisions; and at least nine have a characteristic line across the digraph line-alf. All but two of the 27 star-pointers on the rete are set with silver studs at the base. There are three plates, engraved with almanacs at intervals of three degrees, with azimuths at intervals of ten degrees, with the equator and tropics, and lines for unequal hours. The inscriptions below the horizon line indicate that these plates were made for the latitudes 30° and 32°, 35° and 35°, and 34° and 36°. The cities mentioned include Cairo, Sijilmasa, Marrakesh, Tripoli, Meknès and Tiflis. The limb of the mater is inscribed with a scale of 360°, numbered clockwise in the Maghrībi form of abjad notation at intervals of five degrees (in the sequence 5–120°, 3–95°, 200°, 3–59°, 300°, 3–65°). The inside of the mater is blank. The upper quadrants on the back bear two scales of 90°, with 0° on the horizontal east–west line. Within these there is a zodiac/Julian calendar scale (20° Aries = 9 March). This has an inner register showing the 18 lunar mansions, which are named; the correlation is unusual on a Maghrībi astrolabe. The central zone is occupied by a diagram of unequal hours and a shadow square. The fret is plain and of medium height, and the stitckle and suspension ring appear to be original, as do the straight alidade, the pin and the horse.
The center of the instrument has a diagram of a shadow square, and medium tickle and suspension original, as do the horse pin and the horse.
Planispheric astrolabe

The Maghribī, probably Morocco, perhaps 12th century

Brass, sheet and cast, cut and engraved; the rete is set with silver studs, some now missing.

Diameter 11.3 cm
Maximum height 13.5 cm (excluding
shackle and suspension ring)
Maximum thickness of mater 0.6 cm
Accession no. 95227

The rete indicates 23 stars. The base of most of the star-pointers are embellished with single silver studs, and one star pointer (the east pointer) has three such studs; there are two similar but larger studs on the horizontal crossbar of the tracery, to serve as "turning-levers" (madāʾib). Each sign of the ecliptic circle is divided only to six degrees. The limb is divided to each degree and the scale is numbered clockwise at intervals of five degrees, using the Maghribī form of abjad notation (as the sequence 5-100, 1-9, 200, 1-99, 1-99). The four plates are engraved on both sides with almanacs at intervals of six degrees and azimuths at intervals of 15 degrees, in addition to the equator, tropics and hour-limes. However, the hour-lines did not originally include the barbed prayer-time lines usually found on Maghribī astrolabe plates (compare cat. 152 and 153). These have been added in a rather coarse manner on the plate made "for the latitude of the city of Faz (34° 40') and "for the latitude of the city of Meknès (34° 27'). The other plates were made for use in Jerusalem (35°) or Tetouan (35° 5'); in Tunis (35°) or any city at latitude 35°, and in Marrakesh (31° 32') or Cairo (30° 50'). The inside of the mater is blank.

On the back, within two quadrant scales of 90°, are a zodiac—calendar scale (5 'Aries = 9.3 March), an unequal-hour diagram, and a shadow square. The brass and suspension apparatus are fairly characteristic of Maghribī astrolabes, as is the "straight" alidade with typical Maghribī notched decoration along part of its bevelled edge; there is a subtly-designed horse, a simple rectangle with a small parallel projection which locks it in place. The absence of prayer-time lines, the absence of Meknès and the presence of Jerusalem might suggest that this astrolabe was made for a non-Muslim in Morocco, perhaps a Jew; and later adapted for Muslim use in Faz or Meknès.

Sine—cosine quadrant

Morocco, dated AD 1344

Brass sheet, engraved outer radius 13.5 and 15
Accession no. 95241

This instrument is engraved sexagesimal sine—cosine with arcs of sine and versed sine with sides of sine and versed sine, and a scalloped e.

Year 1344. In the time of Ahmad ibn Abi Baka a-

The amir referred to is the son of the Zenata berber.
Sine–cosine quadrant
Morocco, dated AH 1344 (AD 1922–3)

Brass sheet, engraved
case reads 15.5 and 35.6 cm
collection no. SC414

This instrument is engraved as a hexagonal sine–cosine quadrant, with arcs of sine and versed sine. The reverse is blank except for an applied disc with a scalloped edge engraved, "Year 1344. In the time of the amir Ahmad ibn Abu Bakr al-Zanati, Fez".

The amir referred to is presumably one of the Zanata Berbers.
The name 'quadrant' is given to several types of instrument which consist essentially of a flat plate, of wood or metal, in the shape of a quarter of a circle. The simplest form of quadrant has a scale of 90° along the curved edge, and a plumb-line and bob suspended from the apex of the right-angle. Equipped with a pair of sights, it can be used for measuring the angular elevation of a heavenly body, e.g. in surveying. Simple quadrants were used in Hellenistic times, and this primitive form of device was developed in early Islam on the basis of trigonometrical knowledge, partly derived from Indian sources. The radii were divided sexagesimally, and cross parallels were drawn from the division to the scale of 90°, so creating a monograph of sines and cosines of the angles marked on the arc, horizontal lines for the sines, vertical lines for the cosines. The quadrants usually also had certain additional lines, such as 'arc of the obliquity of the eclipse' and arcs of sines and 'versed sines'. This type of quadrant is called a sinetical, or sine, or sine-co sine quadrant (rab al-μajūṣiyāt) or quadrant of the canon (rab al-dā'irāt). It was developed in Baghdad in the 9th century, and was used in the upper-left quadrant on the backs of astrolabes. It has been described as a 'kind of quadrant of a dodecants-civitale rule'. With such a device, bearings markings resembling modern graph paper, one can solve numerically the more complicated problems of medieval trigonometry, such as the 'qibla problem', and time-telling. On an astrolabe of this type, a separate quadrant would be in a separate quadrant, there was a plumb-line, of cotton string, or with brass or lead weights, and with a sliding edge, as described below. Another type of quadrant (oratory quadrant) was engraved with a diagram of unequal hours for a particular latitude and a zodiac scale (that is, of solar declination) above a scale of degree, and was used with a plumb-line with sliding edge.

Two very small quadrants (with a radius of approximately 6 millimeters) of this latter type are known. They were engraved in Kufic script and are difficult to date, and date from the 10th to the 12th centuries of our era can be suggested; one is signed by Muhammad ibn Mahmūd, the other by Ṣaḥib ibn ʿAlī al-Mutaddibīn (i.e. the Sūrakī), both from eastern Islam. The former is now in the Metropolitan Museum of Art, New York; the latter was stolen from a private collection in Kuwait. Both are engraved on one side only. Along the arc, there is a scale of degrees. Equidistant concentric arcs of the signs of the zodiac are engraved above. Over the arcs are plotted lines for unequal hours. In use, a plumb-line (with a sliding bead on the string) and bob were suspended from the apex. The plumb-line was held taut along whichever zodiac scale, along one of the radii (there are six of the signs named along each radius), included in the symbolic sign in which the Sun was known to be on the day of use. The bead was then moved along the plumb-line until it lay in a position, in the sign, roughly corresponding to the Sun's declination (e.g. if the Sun were known to be at 2° Leo, then the bead would be moved until it was a third of the way along from the beginning of Leo, towards the beginning of the next sign). Then the plumb-line was allowed to hang freely, and the quadrant directed towards the Sun, so that light falling through the plumb-hole in the front of the quadrant would fall on the back-sight (both sights are on one of the radii). The position of the bead in relation to the zodiac sign at that time. This type of horary quadrant could be used in any latitude by engraving the zodiac scale on a sliding cursor, but no Islamic examples of this universal type are known.

Yet another type of quadrant derives from the use of Roman tabulae and tabellae many of the functions of that instrument. Though its use is more complicated than that of the astrolabe, it is more simple to make and cheaper. The astrolabe quadrant, as it is generally called, was described by the Judeo-Provençal mathematician, astronomer, and zoologist, Ya'qub ben Mahir ibn Tibbon of Marseilles and Montpellier, known in Latin as Peurbachus Iodamas and in Romance as Proctor Tibbon (circa AD 1180-1240). He called his quadrant robu Zorab and it was also known as quadrantis morus to distinguish it from earlier quadrants. It is an ingenious reduction to a quarter of a circle of the essential lines of the stereographic projection on the rete and plate of a conventional astrolabe (hence its Arabic name rab al-μajūṣiyāt), achieved by 'folding' twice, each time on to the other half, the astrolabe projection. As Michael summarized it, '... Prophetaus' instrument no longer resolves problems of spherical astronomy by a purely geometric procedure (as on a conventional astrolabe), but by a combination of geometry with trigonometry. In that respect there is a notable evolution of its mathematical method. The [astrolabe] quadrant is at the same time both an observational instrument and a true "slide-rule".'

The typical Islamic quadrant is engraved or drawn on one side in a sine-co sine quadrant and on the other side as a Prophetaus astrolabe quadrant. Such quadrants were made and used in Islamic countries until at least the first decade of this century; there are examples from the Maghrib in the 19th century and from the Ottoman Balkans in the early 20th century. The mode of transmission of the Prophetaus astrolabe quadrant from medieval Europe to Islam is not known, but astrolabe quadrants of AD 1277 (AD 1316-17) and subsequent years, made by Muhammad ibn al-Mizi, who died early in AD 1370 (AD 1399), and the book he wrote on the subject, ʿAṣna bi-ʿrāb al-maṣūmatayn (The Blossoming Garden on the use of the astrolabe quadrant), shows that this must have occurred not long after Prophetaus wrote his own treatise. There are no earlier unclassified Islamic sources.

Astrolabe quadrants, now in the British Museum, London, and the Museum of Islamic Art, Cairo, were made in AD 1277 (AD 1316-17) by al-Mizi, almost certainly in Damascus, perhaps less than 67 years after Prophetaus wrote his treatise. They are of brass, finely engraved in Kufic script, and were made for latitude 35° (Damascus); 21 stars are marked on that chart in the British Museum. There other quadrants (but no astrolabe) made by al-Mizi are known. His quadrants sold for two dinars and more, his astrolabes for ten dinars during his lifetime, and for double that after his death. Also in the British Museum is an astrolabe quadrant, made in AD 1277 (AD 1316-17) for the chief museum of the Umayyad Mosque in Damascus, by 'Ali ibn al-Shihab, and engraved by Muhammad ibn al-Muzaini. The manuscript is Kufic script, with a long inscription damascened in silver, it is quite large, having a radius of 200 millimeters. Twelve stars are marked, and made for latitude 30° 17' (Damascus). Another early astrolabe quadrant that was made, unusually, of ivory by Abu-Tahir, now in the Benaki Museum, Athens. 

From the late 12th century, a characteristic form of astrolabe quadrant became to judge by the number which survive, very popular in the Principality of Byzantine Turkey. They are drawn in ink on painted wood, often with gold and coloured lacquer decoration. Above the astrolabe quadrant proper, there is usually a small hour diagram (a horary quadrant as described above) consisting of a sundial for unequal hours; the other side is the usual quadrant. One radius of the instrument has two raised sections, to serve as foresight and back-sight, and sometimes long inscriptions on the edges (which are thin, because the quadrants are of wood). Each quadrant serves a specific purpose. For example, there are instruments for providing the mean sun or mean sun of a mosque with a means of determining prayer times. The portable astronomical instruments which have been discussed here, unless there be as yet undiscovered common source.

The astrolabe quadrants, now in the British Museum, London, and the Museum of Islamic Art, Cairo, were made in AD 1277 (AD 1316-17) by al-Mizi, almost certainly in Damascus, perhaps less than 67 years after Prophetaus wrote his treatise. They are of brass, finely engraved in Kufic script, and were made for latitude 35° (Damascus); 21 stars are marked on that chart in the British Museum. There other quadrants (but no astrolabe) made by al-Mizi are known. His quadrants sold for two dinars and more, his astrolabes for ten dinars during his lifetime, and for double that after his death. Also in the British Museum is an astrolabe quadrant, almost entirely disapp
almost entirely disappeared, because they were fragile, or because they did not continue to be prized.

1. The basis of this text was originally written by Francis Maddison for an encyclopedia of Islamic science (Rashed 1996), but omitted through a misunderstanding: it should appear in the French and Arabic versions of the encyclopedia. On quadrants in general, including astrolabe quadrants, see Turner 1982, pp. 202-18, and on Islamic quadrants, Schmalzl 1959 and King 1967, nos. 1, pp. 6-10.


3. On these quadrants, see Brieux & Maddison, forthcoming, p. 75, and Maddison & Turner 1976, p. 151, nos. 70 and 71.

4. Probably the maker of the globe discussed above, cat. 112, the son of Mahmud ibn Shihab al-Tahiti; the globe may be dated circa AD 1215.

5. Inv. no. 167-7-14

6. Translated from Michel 1947, p. 228; see also Saunders 1984, pp. 40-52, for the technical description.


respectively in the David Collection, Copenhagen (inv. 750), Musée M.V. Lozenberg, St Petersburg (inv. 734), and the British Museum, London (inv. 724). Inv. no. 39-11-16-11, see also the biographical note on this maker.

10. Inv. no. 39-11-16-11, see Brieux & Maddison, forthcoming, "Abu al-Shahibh", Maddison & Turner 1976, pp. 113, 114, no. 71, from the collection of William Hook Morley (1815-86), where the remarkable illustrations in Morley's book on this astrolabe quadrant, and in Morley 1876 are discussed.

11. Inv. no. 39-11-16-11. See Brieux & Maddison, forthcoming, "Abu al-Tahir"; Maddison & Turner 1976, pp. 2-15, no. 71; Mayer (1990) gives the date 16 AH 749, but though the quadrant is engraved in Kufic script, the date is written not on the quadrant in Hindu-Arabic numerals, and is not clear: it might be AH 740, 741 or 749.
Astrolabe quadrant

Istanbul, dated AD 1256 (AD 1845–46)

Wood, with lines and scales and seats in vocalized script in black and red, lacquered outer radii 12.8 cm and 16.8 cm depth 3 cm maker al-Hafi As-Salih al-Uyfi (Hafis Hasan al-Hilmi), known as Gebci (J.) accession no. 85.240 published Geneva 1995, no. 67

On one side of this instrument is a Proparhros astrolabe quadrant for latitude 41°, with an unequal-hour diagram above (A). On the other side there is a sine–coine quadrant with arcs of sine and versed sine (B). The longer radius is indented so as to provide two sight vanes. Both sides and one edge are inscribed with tables and instructions.

The quadrant is signed and dated at the end of the degree scale on the limb of the astrolabe quadrant and at the apex of the sine–coine quadrant. The names used by this maker vary slightly, but he appears to have been a Turk from the town of Oly in Pontus (al-Üyfi) called Hafis Hasan Hilmi, and his family name may be read as Gebci ("son of the useful"). This reading is supported by the fact that Oly was part of the Greek empire of Trebizond until 1455, after which its population gradually converted to Islam, a process that was not complete by the Turkish War of Independence and the exchange of populations.

Quadrant

Turkey, dated 6 Ramadān 1213 (29 May 1858)

This board is glazed with a wooden core, inscribed in red and black, lacquered; edges painted with red leaf; brass bushing for plumb lines outer radii 11.8 cm and 11.6 depth 2.2 cm radius of inscribed quadrant 12.3 cm maker al-Hajj Sayyid Sulayman Rustu (J.) accession no. 85.240 published Geneva 1995, no. 68

On one side is a sine–coine quadrant, with the scale of degrees along the limb set out decoratively. To the left of the quadrant there are instructions for use in Turkish, with a table including the Turkish names of the solar months. On the other side are astronomical tables, a scale of 90° along the limb, and a cartouche containing the signature of the maker, al-Hajj Sayyid Sulayman Rustu (J.) of Sığin. His home town may be identified with a small settlement in north-western Anatolia, to the north-west of Eskihir. The quadrant is also signed 'Sığin' on the fore-sight.

Astrolabe quadrant

Turkey, circa 1800

Wood, lines in black ink and inscriptions in ras' script, gilt dots on scales, lacquered; brass bushing for plumb lines outer radii 9.9 cm and 10 cm depth 1.3 cm maker 'Uthman Buṣnawī accession no. 85.241 published Geneva 1995, no. 69

This instrument is unusual in that it does not carry the full range of diagrams typical of such astrolabe quadrants; it lacks a senageral sine–coine quadrant on one side, and there is only a basic array of lines, with many common details, such as almucantar (circles of altitude), omitted. The main divisions of the scales are highlighted by gilt dots, and the spare numeration occurs only on the hour scales, which are numbered in Hindi–Arabic numerals. On one side (A), in addition to the stereographic projection of the ecliptic, there are scales including hour scales, which have two different centres to permit the use of two plumb lines simultaneously. The brass gnomons for the plumb lines pass through to the other side (B). The instrument carries instructions for calculating the almucantar, and the sine of the rising star. As it is customary, one radius is cut so as to provide a raised part at each end to serve as sight vanes. Below the 'vanes' there is the spot on side (A) in the maker's signature, 'Uthman Buṣnawī, i.e. Osman of Bonia, where astrolabe quadrants continued to be made until after the end of the first decade of the 21st century. This is perhaps the same maker as the one who signed, 'Drawn by Osman', on an astrolabe quadrant dated AD 1211 (AD 1766–67), in a private collection in Sarajevo.1

1. Bierne & Maddison, forthcoming, 'Uthman'. An astrolabe quadrant dated AD 1654 (AD 1834–35) and signed Sayyid 'Uthman is now in the Egyptian National Library, Cairo.
1279 (AD 1462–3)
scales and occasional red ink, gold, lacquered
and 12.3 cm
reim!: 9
1993, no 65

This astrological quadrant side (a) with an
or projection and an
gram for latitude 41°
on the other with a
set (b). The plumb
read and both, now
reduced from the
the apex of the
gram, above the
'Drawn by Ibrahim
appear in the trian-
the 'back sight', at
ture scale on the arc.
latitude inscription
projection is
the word h-`anabbi
in black, is followed
and "i' in red, with a
them to indicate that
read as abjad
follows a zero
issues, derived from
recipes manuscripts (see
Astrolabe quadrant
Ottoman empire, 19 January 1597
(20 May 1866)

Brass sheet, engraved
radius 14 cm height 0.7 cm
maker 'Abd al-Mukhtar ibn al-Marhum
Sulayh ibn al-Murad
accession no. SC152

One side is engraved with an astrolabe quadrant for latitude 33° 30', and on
one radius there are two pin-hole sight vanes. The maker's signature occupies
the space between the center scale of the
astrolabe quadrant and the edge of the
quadrant plane. The back is engraved as
a nine-course quadrant. The plumb-
line and bob are missing.

Graphometer
Turkey, circa 1900

Brass, engraved, with pivots, alidade
and shaft of steel; two brass washers,
one flat and one with a recessed top
and milled sides; alidade has brass tips
diameter of circle 14.7 cm
diameter of pivot 1.1 cm
height of pivot 0.6 cm
length of alidade 22.3 cm
height of shaft 1.1 cm
maker Imperial Cannon Foundry,
Istanbul
accession no. SC1530

The graphomètre was invented by
the 16th-century French printier,
type-designer and instrument-maker
Philippe Dufrèze (d. 1666), who was
appointed Graveur général des
monnaies de France in 1582. It is the
reduction to a semi-circle of an older
European surveying instrument, the
circumferentor, which was based on a
full circle. Both instruments were used
for measuring horizontal angles in the
field, supported on a pole stuck in the
ground or on a tripod. It bears the legend, Topographia númera
207 ('Cannon Foundry, no. 207'),
engraved on the diametral bar and
was probably made by the Imperial
Cannon Foundry in Istanbul for the
Ottoman army. The number 312 and the
letter s appear on the underside
of the bar.

The circumferential scales are
divided to each degree and numbered
in both directions. An alidade, pivoted
at the center, is equipped with two
folding sights.

1. Dufrèze 1577 on Dufrèze, see Carter
& Verriët 1566, Turner 1568, esp.
pp. 29–30, and 36, fig. 1.
2. On the circumferentor, see Kiezy
1947; Maddison 1977, pp. 28–30, nos
212, 213, pl. xxxv.
Finding the direction of Mecca

The setting of the qiblah, the direction the worshipper must face during prayer, was one of the most important stages in the emergence of Islam as an independent monotheistic religion. When Muhammad instituted the salat, the obligatory prayers said at five set times during the day, he appointed Jerusalem as the direction of prayer, in accordance with the practice of Jews and Christians. But the failure of other monotheists, particularly the Jews of Yathrib (Medina), to recognize his mission led to a new emphasis on the Arab character of Islam. As a result the Ka'bah in Mecca was made the direction of prayer, in accordance with the Mandate in the mouth of Isra' and Mi'raj (11, verse 144): “We see the turning of thy face (for guidance) to the heavens: now shall thy house be called Qiblah (that shall please thee). Turn then thy face in the direction of the sacred Mosque: wherever ye are, turn your faces in that direction.”

This change created a new sacred geography with Mecca at its centre and presented every Muslim with the need to establish the bearing of the Ka'bah from his location at the hour of prayer. Upon moving from one place to another the bearing had to be ascertained anew, as when the great polymath al-Biruni (973–1048) was taken from Gurgan to Ghaznah by Sultan Mahmud in 1072. My principal purpose is, however, to determine these data, longitude, latitude, distance, and directions as accurately and as clearly as possible. In this connection there are three questions we may ask: first, how shall we determine the line of the rising and setting of the sun, and the altitude of the sun when it is directly overhead? Second, how shall we determine the direction of the qiblah? What is its real orientation? Third, where shall we find the meridian? These questions may be answered by the methods of spherical trigonometry, through projections of the sphere, or methods of approximation. The determination of latitude did not present problems to Muslim astronomers, as parsable results could be obtained by means of an astrolabe, or by using one of the other large observatory instruments. On the other hand, the only reliable method of establishing longitude was by the observation of lunar eclipses, that is, by accurately recording the time of the eclipse in one place, and then comparing it with the time when the eclipse was observed at another place.

As al-Biruni remarked, “If we know beforehand of the formation of a lunar eclipse and we wish to determine the longitudinal difference between the two towns, we make arrangements beforehand for someone in each town who can measure the times accurately and report to us accurately as possible the times of the beginning of the eclipse and its end, and those of the beginning of clearance and its end.”

The literature on the determination of the qiblah is extensive; it appears that the compass in the astronomical compendium, Jamahir al-yarashi (‘The Chest of rubies’) made in 976 (AD 1075–6) by Ibn al-Shatir is the first known example with a pivoted needle, and of a qiblah compass. Al-Biruni had described four trigonometrical methods, giving proofs, but declined to proceed beyond Ibn al-Shatir’s work. My purpose is, however, to present the methods which, when correctly orientated by means of the pivoted needle, would show the azimuth of the qiblah from a number of places marked on the compass plate. There is an account, written in the 13th century by the Egyptian Baytik al-Qibqib, of the use of a magnetic needle during a voyage from the Lebanon to Alexandria, but this was a pivoted needle floated on a piece of wax. A few astrolabes have small compasses set in the back of the disk, and such compasses on some of the astrolabes made by the Iranian maker Muhammad Madihi in the mid-17th century have qiblah directions engraved around them, as on cat. 134 above.

The gazetteers engraved in the manner of astrolabes often give the longitude and the latitude of a number of places, as well as the inibfat (al-qiblah) for each place, that is, the azimuth of the qiblah expressed in degrees of an arc measured from the meridian as an angle of magnitude less than 90°. This information is accompanied by the jihab, the direction of the qiblah (for example, south-west or south-east), so that the quarter to which the inibfat refers is known, and occasionally by the masafah, or distance from Mecca.

It is very common for portable sundials to include qiblah information, and, to some extent, a precise distinction between portable sundials and combined qiblah compasses and sundials cannot be made. In Ottoman Turkey a number of elaborate qiblah sundials and compasses were produced, including the relatively rare edret el-ma’adid, of which there are two examples in the Khalil Collection, cat. 169 and 169a. By the 18th century a characteristic form of small qiblah compass, ornately engraved with the azimuth from several towns, and often with simple meridian gnomons for showing noon, had become popular in Iran (cat. 164–6). Similar sundials were made by the I. M. Lath during his stay in Egypt in the 1730s.

The astrolabe and the quadrant are almost the only astronomical instruments used in Egypt. Telescopes are rarely seen here; and the magnetic needle is seldom employed, except to discover the direction of Mecca; for which purpose, convenient little compasses (called ‘kibbelzubeis’), showing the direction of the kibbel at various large towns in different countries, are constructed, mostly at Daman: many of these have a dial, which shows the time of noon, and also that of the time, at different places and seasons. Qiblah compasses are still produced today in large numbers. As an American device combines a simple compass with an electronic calculator, and an accompanying book gives geographical coordinates of numerous places, so that the (astronomically defined) Muslim prayer times may be ascertained.

1. This article is based on an unpublished essay by T. H. L. H. L. Goodspeed, "The history of the Qiblah," in Maddison & Turner 1976, folios 268–74.
2. See also vossos 142, 143, 144, and especially 149 and 150 from this sutrah.
3. Al-Biruni—Al, p. 53. For this author’s account of the change in the Muslim qiblah, see al-Biruni—Al, p. 176.
4. The zenith of the place is the point on the celestial sphere directly above the observer. The meridian is the great circle on the celestial sphere that links the zenith of the place, the nadir of the place (the point on the opposite side of the sky from the zenith) and the two celestial poles.
5. Poole note 2, to his extract from al-Maqrizi in Lane 1944, p. 664), given data on the variable directions indicated by the mibrab in early Egyptian mosques.
10. King (1973) refers to al-Khallâb’s table as ‘the most sophisticated trigonometrical table known to me from the entire medieval period’ (p. 182).
14. Lane 1914, p. 212.
the meridian gnomon of, had become vast (c. 184–46). Similar examples may be found in E. W. Lane's account of the quadrants in Egypt in the 18th, and the quadrant are described as astronomical instruments. Telescopes are and the magnetic employed, except to the astronomers of Mecca: for convenience little compass bearings), showing the kiibah at various different countries, are only at Dimyat in many al, which shows the and also that of the Al and seasons.318 astes are still produced, for example. An ast combines a simple electronic calculator, giving booklets giving ordinates of numerous (astronomically prayer times may be a mon is based on astes: 'The Astronomical Almanac' of Addison & Turner 1879–79; 1891, 1894, 1897, 1901, and 1910, from this surah. p. 32. For this astes of the change in the see al-Biruni: 'Al. A place is the point on the directly above it, the great circle on the that links the zenith of the place (the directly beneath the celestial poles. to his extracts from al-1914, p. 601A gives data directions indicated by Egyptian mosques. 1, p. 350. 1961, 1966a, 1978b; & Hawkins 1982. al-Biruni 1976, folios 1, 4, pp. 245–58: the 1960 pp. 253–56. refers to al-Khaldi's the sophisticated table known to me medieval period' (p. 82). 1929), pp. 202–3. 1924, pp. 203–7. 1992, pp. 596–200, map of circa 1970. 223.
Combined qiblah compass and sundial
Iran, 19th century

The rectangular plate is divided into two equal sections. The upper (northern) half was set with a small compass for orienting the plate, but only the case survives. Above the compass there is a quadrant scale, with a pivoted pointer to show the direction of the qiblah from the location of the user, and to one side there was a pin gnomon and lines for Babylonian hours (that is, equal hours counted from sunrise). The gnomon is now missing and has been replaced by a folding 'bird'-shaped gnomon, inspired by the noon gnomons on small round qiblah compasses such as cat.164, and also by the 'bird' gnomons on 17th- and 18th-century French pocket sundials, such as those made in Paris by Michael Butterfield (c.1724). The right side of the quadrant scale, which is engraved with a series of equally spaced concentric arcs, numbered from 0 to 40, perhaps for use as a solar declination scale.

The underside of the plate bears two tables of geographical coordinates for various places and the maker's signature (lower centre). 'The most humble 'Abd al-A'immah made it'. Another qiblah indicator of this type signed by 'Abd al-A'immah, and also undated, is in a private collection in Paris; its quality of workmanship is so near that expected of the famous astrolabist, which may indicate that cat.165 is a copy. A third example, which is neither signed nor dated, but is finely engraved, is in the Museum of the History of Science, Oxford University.

1. Bireix & Maddison, forthcoming, "'Abd al-A'immah 26".
2. Inv. 100.25.

Three qiblah compasses
Iran, late 19th or early 20th century

Brass sheet, engraved, with hinged lid and hap; magnetic iron needle under a glass held in place by a pierced brass plate, to which a rotatable pointer and folding, simple gnomon are attached. Diameter 8.1 cm; height 1.5 cm, when closed. Acc. no. 80.117

Brass sheet, engraved, with hinged lid and hap; magnetic iron needle under a glass held in place by a pierced brass plate, with a rotatable pointer attached. Diameter 6.1 cm; height 1.3 cm, when closed. Acc. no. 80.118

Brass sheet, engraved, with a hinged lid and hap; magnetic iron needle under a glass held in place by a pierced brass plate, which was formerly furnished with a rotatable pointer; a brass suspension is attached to the hinge. Diameter 5.7 cm; height 1.2 cm, when closed. Acc. no. 80.119

Each of these three instruments is typical examples of the small qiblah compasses produced in Iran in the latter part of the 19th century and at the beginning of the 20th century. On cat.164 and 166 the lid, sides and base are covered inside and out with inscriptions giving the azimuth of the qiblah at many places, together with an indication of the jihab, the quadrants of the compass in which this angle occurs. On cat.165 this information is restricted to the exterior: the inside of the lid is blank, and the base of the compass box is engraved with lines showing the qiblah from the principal places of pilgrimage for Twelver Shi'is, namely, Mecca, Medina, Karbal'a, Najaf, Kazimiyah, Askariyeh, Qum, Mashhad and Imam 'Abd al-A'zim near Tehran. The side of the lid of cat.164 and the side of the base of cat.165 also bear a quatrain giving instructions on the use of the compass.

On cat.164 and 165 the plate over the needle is engraved with a scale of degrees numbered by fives in both notation in four quadrants, while on cat.166 the scale is shown without this notation, due to the smaller size of the piece. In each case the plate had a rotating pointer pivoted at the centre, which served to set the direction of Mecca, and on cat.164 there is also a simple gnomon that shows noon when its shadow falls on itself, after the compass has been correctly oriented.
Inscriptions giving the qiblah at many places of pilgrimage, namely, Mecca, Najaf, al-Kazimiyah, Qum, Mashhad and Qom near Tehran. The plate over the lid is blank, but the compass box is showing the qiblah, the other two plates carry similarly inscribed stanzas, with an indication of the frame of the compass box. On cat. 165 the frame is red, and the plate over the lid is blank, this compass box is showing the qiblah, the other two plates carry similarly inscribed stanzas, with an indication of the frame of the compass box.
Qiblah compass

Istanbul, Ar. 1215 (AD 1835–9)

Turned brass lidded case. The fly is of inscribed and painted card, with a magnetized iron cross beneath and a brass ferrule in the centre; it rests on a brass pivot and is protected by glass, which is held in place by a sprung brass retaining ring. Diameter 26.5 cm; height 5.7 cm.

Maker: Ahmad, time-keeper of the Osman loaded mosque; accession no. 922174.

Published: Geneva 1995, no. 63.

A depiction of the Ka'bah lies near the circumference of the circular card, or fly, and is surrounded by a gold disc containing eight crescents. Within these the four cardinal points are marked in black, and four intermediate points, which were given the names of the relevant winds, are in red, as recommended by Piet Rees in his Book of Seamen'ship (see c1377 below) 1.

From the Ka'bah disc arises a fan-shaped table inscribed with the names of places ranging from the Ottoman cities of Urfa, Diyarbekir, Eremitus, and Morel in the east to Fez, Rabat, the Canary Islands and 'the Spanish New World' in the west. The whole disc is edged with a gold band and a scroll of petals, with the signature of the maker on the gold band, opposite the Ka'bah disc. He was an astronomer named Ali who was time-keeper of the Osman loaded, that is, the Nurunomaniye, mosque in Istanbul 2.

Some of the names on the instrument described here—inside the fan and the two arcs beyond the zigzag line—are illegible. Those within the blades of the fan are a combination of coastal and inland cities of varying importance, but none have any latitudes written above them, or anywhere else.

The fly rotates freely on the brass pivot, and the magnetized iron cross under it is so placed that when the fly stops turning it is aligned on the magnetic meridian. The radial band of the 'fan' containing a given place name indicates the direction of Mecca from that place.

The fly, and the place-names written on it, which include a number of ports, might suggest that the instrument was intended for use at sea. A comparable qiblah compass, with a card including the names of places 'to which sailors direct themselves' and their latitudes is in the National Museum, Damascus. 3


167. underside of fly
The di\textsuperscript{ir}at al-mu\textsuperscript{s}addil

In the mid-13th century an Egyptian astronomer called 'Abd al-\'Aziz ibn Muhammad al-Wa\textsuperscript{a}l al-Miqati, who was timekeeper (mutasqiq) at the mosque of al-Mu\textsuperscript{a}yyad in Cairo, invented an instrument that combined a gilbash compass with a sundial, which he called the di\textsuperscript{ir}at al-mu\textsuperscript{s}addil ("equatorial circle"). It was described by him and by later astronomers, including the Turkish admiral Seyyid Ali Re\textsuperscript{s}i. Perhaps as a result of the work of Seyyid Ali, the instrument became popular in Ottoman Turkey, but it was not represented in Western collections and was not a consequence not mentioned in the literature on Islamic science. Interest was aroused because of a happy coincidence in 1976, when the editors of Seyyid Ali's text were shown photographs of two Ottoman examples in Damascus, and since then others have been recorded in Kuwait, and two have been sold by auction in London. The Khalili Collection is therefore fortunate in possessing two of these interesting and somewhat rare instruments, cat. 168 and 169 below.

The function of gilbash compass was performed by the circular base plate. This had a magnetic compass inserted in it, while the circumference of the plate was inscribed with the names of cities arranged at intervals according to the system employed in traditional Islamic geography. When the compass was aligned with magnetic north, the azimuth of the gilbash at a particular location could be established by following an imaginary line from the centre of the instrument through the mark on the circumference associated with that location (if shown); in other words, the marks on the circumference showed the direction of Makkah once the compass was aligned correctly. The other functions of the equatorial circle required the use of the sundial, which is in the form of a graduated semicircle of almost the same diameter as the base, to which it was attached by hinges. The dial could be adjusted to the place of the celestial equator for any latitude by tilting it through an arc of 91\textdegree, a manoeuvre which was regulated by the graduated vertical quadrant set at right angles to the dial, which was then oriented on the meridian by means of the compass in the base plate. Once the equatorial circle was placed correctly, it was used to ascertain the hour angle of the sun: the vertically slotted sighting device, or alidade, which was pivoted to the centre of the semicircle at one end and moved freely along the outer scale at the other, was turned until the sun, passing through the forward slot or part of the slot (the fore-sight), fell exactly on the rear slot or part of the slot (back-sight). The angle of the sun, and therefore the time, was read from the scale over which the alidade moved. According to the treatises, the alidade could also be used to observe star positions, but this seems hardly practical. The equatorial circle could also be used to establish (imperfectly) the times of Muslim prayer, and some examples, such as cat. 169, have additional sundials.

1. See Suter 1900, pp. 177-78, no. 437; Matveevskaya \\& Rosenfeld 1985, 11, pp. 102-3, no. 457; Tekeli 1962, Janin \\& King 1977, p. 217; King 1979, unpaginated. A terracotta stone qeem for this development is provided by the date of al-Wa\textsuperscript{a}l's death, in either 744 H/1344 (926/7-927/8) or 728 H/1328 (930-31). 2. Tekeli 1960; Dizer 1977; Janin \\& King 1977, pp. 213-14, 211, 217; Brice, Imber \\& Lowes 1976, pp. 4-7. The first example (Damascus, National Museum, acc. no. 1177) incorporates, as the equatorial circle is dated 815 H/1412-13, and the base, which is signed K-. M. is dated 817 H/1415 (929/30); see Brice, Imber \\& Lowes 1976, pp. 6-8, with drawing; Nair 1978, p. 44, pl. 206, with incorrect caption. The second (Damascus, National Museum, acc. no. 446) was supposedly signed by 'Abd al-Hasan ibn al-Radi fusti 'Abd al-Mu\textsuperscript{a}zin ibn Salih al-Muradi and dated 830 H/1428-9 (932-3), see al-Ush, Jami\textsuperscript{u}d and Zoubil 1976, p. 137, no. 845; Brice, Imber \\& Lowes 1978, pp. 9-14, with drawing; Madison \\& Turner 1976, pp. 164-5, no. 16. 4. Dizer 1977; King 1978, p. 51, fig. 1; Qaddumi et al. 1984, no. 7; Christie's, London, 24 September 1991, lot no. 8c (601-97) or 8d97, London, 29 April 1993, lot no. 139. 5. Unfortunately the alidade is missing from both examples in the Khalili Collection.

Figure 11: Diagram showing parts of a di\textsuperscript{ir}at al-mu\textsuperscript{s}addil. After Brice, Imber \\& Lowes 1976, fig. 2.
Da'irat al-mu'addil
168
Istanbul, dated 1218 (AD 1763/4)

Bees, beaten, cast and engraved, attached to a wooden base
height 17.3 cm diameter 24.2 cm
maker Ali al-Mansurqin
acquisition no. 522/170
published Christie's, London,
28 September 1991, lot no. 84;3
Geneva 1995, no. 65

This is a complex version of a da'irat
al-mu'addil. The compass is mounted
at the centre of the circular brass plate
and can be rotated to compensate for
magnetic declination, the earliest
mention of which in an Islamic source
is in the treatise on the da'irat
al-mu'addil by its mid-11th-century
inventor, al-Wafa'. Around the compass
is a windrose, with the four
quarters of the compass alternating
with prevailing associated winds, as on
cat. 167; intermediary winds (qatirat)
and rhumb lines (zahrat) are also engraved.
Around the base are place-names,
arranged according to traditional
Islamic geography, giving the direction
of Mecca from them when the instru-
ment is aligned on the meridian. There
are four levelled screws in the base.
The equinoctial (semi-)circle is
adjusted for latitude by moving it
along the vertical (semi-circular) scale,
which is hinged so that it may be
folded flat. The sighting device, origi-
nally centrally pivoted on the equino-
tial semi-circle, is missing, as is the
plummet which hung in the folding
frame at the north end.

There is also a universal equinoctial
dial for European equal hours, where
the hour scale is in the form of a cres-
cent, the hinged gnomon of which was
probably inspired by French models;
and a horizontal pin-gnomon dial for
equal hours before and after midday,
on the back of which is roughly
engraved a note and diagram giving the
length of the gnomon should it be lost.
On the central compass, at the south-
east point, along the line from north-
west to south-east, is a diagrammatic
rendering of Mecca-i Kostantiniye.

The instrument is signed by its
maker, Ali, who was a time-keeper
(mansurqin) at the Fatih Mosque in
Istanbul. The signature and date are
written on the broad diastematic band
of the equinoctial (semi-)circle. A
curiosity of the signature is that the
name 'Ali is superimposed on the word
and by an abbreviation and re-
directional

169
Da'irat al-mu'addil
Turkey, late 18th century

A wooden disc: 16.5 cm in diameter,
painted in colours and gold and
varnished, set with a small compass
and a graduated vertical arc of 90°,
made of brass and hinged so that it
can lie flat; there are also a graduated
semicircle and a pin gnomon, both
detachable and both made of brass;
the alidade is missing; height when
disassembled 2.5 cm, in which state
the instrument could be stored in
its brown leather case, 17.8 cm in
diameter, lined with marbled paper,
the base covered with red velvet
acquisition no. 522/170
published Geneva 1995, no. 64

This is an example of the combined
qiblah compass and sundial known as
the da'irat al-mu'addil. The religious
associations of the instrument are
made clear by the decoration of the
centre and lower part of the dial, which
bears a depiction of the Ka'bah and
some of the other monuments of the
Haram at Mecca, in addition to the
data required for its operation. Above
the Ka'bah are the hour-lines of a hori-
zontal pin-gnomon sundial, and the
edge of the dial is inscribed with the
principal seas, cities and countries of
the known world of the classical Arab
geographers, so that the piece was in
some respects dated out of place.
Above the hour lines the dial is set with
a compass, which is surrounded by an
eight-lobed rossette, the four quarters
altering with Turkish wind names.
A craftsman's inscription written
below the compass is now largely illeg-
able, but what remains, pİYAMAHU
al-fajr ... im Khān ('Drawn by the
noisy ... im Khan'), suggests that the
maker was associated with the reigning
sultan or an imperial mosque, and the
title 'khān' was only used by the
sovereign.

Qiblah compasses and sundials are
recorded in Ottoman Turkey from the
late 18th century.7

1. An ivory compass in the British
Museum (inv. no. 90.1.144), though not
a da'irat al-mu'addil, is signed by
Bayram b. Ilyas and dated 1219
(AD 1804–5); see Vienna 1985, no.37/4.

1. The description in Christie's catalogue,
with a useful bibliography, is on the basis
of the description given here.
2. Britton & Maddison, forthcoming,
'Abu'l-Fath 'Ali al-'a.'

165, detail of compass
'sanal ("work"). Another instrument of
this type, similarly signed by 'Ali, is
dated 1218 (AD 1752–3) and is now
in the Museum of Kandilli
Observatory, Istanbul.2

165, view of dial
and with the reigning
ial mosque, for the
ly used by the
es and sundials are
ian Barkey from the
as in the British
n. 3 (154), though not
id, is signed by
 dated 1390
enna 1983, no. 27/4.
The text in the image is written in English and contains a table and a diagram. Here is the plain text representation:

**Three ruknas:**

Small, decorative almanacs, usually on parchment, were used for the Islamic calendar in the 17th century. They are associated with Durrand of Anadolu, and the town of Durrand, Anadolu. They are common, and those of the 16th and 17th centuries were written in black inks, with gold, silver, and red ink ornamentation, have a wooden roll with a hand-written page and also exist in scrolls. The almanacs have tables of the times of prayers for each month and year, and other times of importance; the length of the night, and the time of the moon when the sun is in Mecca, data usable in the construction of calendar calculations, and the lunar calendar within a week, and with the Kufic script which was the Syriac script of the Syriac calendar.

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1. This note, and the following notes, are from historical references.

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1. This note, and the following notes, are from historical references.
Three ru'znames

Small, decorative almanacs or calendar scrolls, usually on parchment and of a size suitable for the pocket, were produced in Ottoman Turkey from at least the 17th century. The almanac is usually associated with a certain Durandelli Melhem Mondy, who created an almanac for Istanbul. It is known that he, or his family, came from the town of Dardanel in central Anatolia. Such almanacs are not very common, and those known are of the 17th and 18th centuries. They are usually written in black and colored inks, with gold, silver and colored ornamentation, have a leather flap and a wooden roll with bone finials. There also exists a scroll almanac of this type printed on paper. The known almanacs vary in length, but usually give dates of the tables of Muslim prayers for each month of the solar year, and other times of religious importance, the length of day and night, and the time of sunsets; the time when the sun is in the direction of Mecca (data usable also for the orientation of mosques), and information for calendar calculation correlating the lunar calendar with the days of the week, and with the Rumi calendar, which was the Syro-Árabi version of the Julian calendar.

1. This note, and the descriptions that follow for cat. 170–173, are reprinted, with additions, from the text written by J.M. Rogers and Francis Madiro in Geneva 1995, cat. 70–73 and cat. 75–77. For the 11th-century ru'zname by Shakhb Zafar, of a different type, see King 1985, p. 287. 3. King 1985, pp. 288–290. 4. Such as that in the Museum of the History of Science, Oxford University, no. 1949–94; dated circa 1795, this has a peasant's calendar in Turkish on the back. Other examples are an almanac signed by Sidawayan, known as al-Hilmi, and dated 1174 AH (1759), formerly in the Doughton Collection, Paris (Maddison & Turner 1976, pp. 174–175, no. 98) and now in the Institut du Monde arabe, Paris (Moulène 1965, pp. 118–119); that in the Chester Beatty Library, Dublin (Minorsky 1958, pp. 127–128, no. 43); that in the Musée du Temps, Besançon (Turner 1970); that in the Time Museum, Rockford, Ill. (unpublished); and two others in a private collection, Paris.

171 Calendar scroll

Ottoman Turkey, dated 1220 (AD 1805–6)

Parchment scroll in vertical format, 115 x 62 cm; in ru'zname script in black and carmine inks with panels of carmine inscribed in gold; initial dark brown leather flap with a lobed lozenge filled with arabesque decoration, painted in gold; tied with a silk string; contained in a paper-mâché cylindrical case trimmed with leather and covered with marbled paper signed al-Sayyid Muhammad al-Ma'ruf bi-Nu'man Yanji; accession no. 1963.17; published Sotheby's, 11 April 1985, lot no. 312; Geneva 1995, cat. no. 71.

The scroll has an illuminated heading with an inscription that announces ‘This is the calendar by Durandel’ (Hadīthu ru¿znâmeh-i Dardandul). The manuscript was written in Arabic, while a Turkish text in the right-hand margin may be an almanac. The illumination is so characteristic of the early 18th century, however, that it is tempting to believe that the date given relates to the date of the calendar copied, a not unusual occurrence – a scroll in Oxford, dated to the period circa 1735, is almost identical. This is an indication that workshops in later Ottoman Turkey continued to produce these scrolls as standard works of information.


172 Calendar scroll

Ottoman Turkey, dated 1270 (AD 1853–4)

Cream paper scroll in vertical format, 78 x 9.4 cm; written in black and carmine ink in panels framed in gold and black, and in gold on black panels signed al-Sayyid Muhammad al-Ma'ruf bi-Hilmi; accession no. 1965.17; published Christie's, 16 June 1987, lot no. 56; Geneva 1995, cat. no. 72.

Like cat. 170, the data contained in the document are valid for the latitude of Istanbul. The scribe evidently specialized in the production of such scrolls.

The heading now appears rather dull, though it was originally illuminated and had a title in gold. The paper appears pink within certain columns, including some of those with black script; this may be deliberate highlighting rather than the result of the carmine ink having run. Several errors have been corrected in black on gold.

1. Sotheby's, London, 16 April 1986, lot no. 231 and Sotheby's, London, 20 November 1986, lot no. 212, both bear his signature.

172, detail
SCIENCE, TOOLS & MAGIC