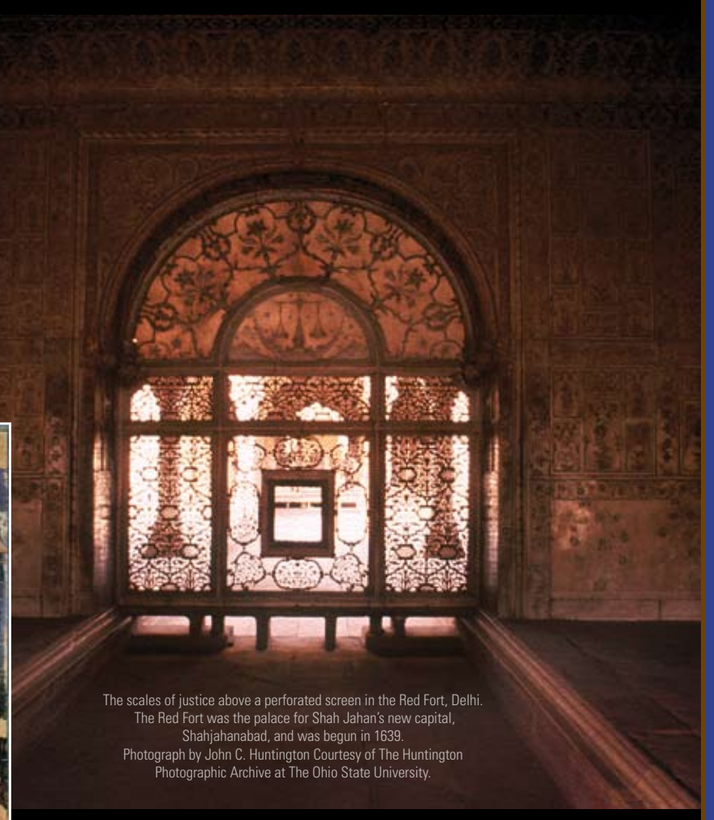
FINDING THE BALANCE

Who does not want to preserve a balance in personal life? Are we likely to be persuaded by an unbalanced approach to argument or debate? What enterprise can afford to take its eye off the balance sheet?

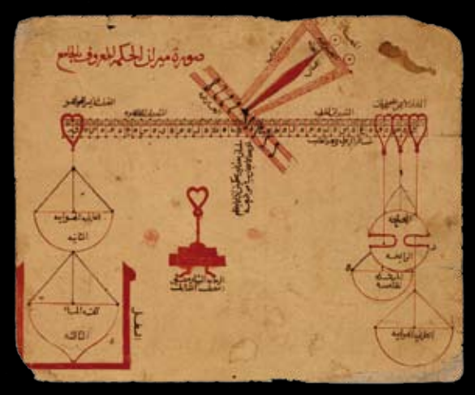
These preoccupations with the balance may seem peculiarly modern. But the balance is an ancient instrument, and it has been both a practical tool and a guiding metaphor in many societies. Ubiquitous in daily life, it was also a universally recognized feature of the heavens: al-Mizan is the zodiac sign Libra. The balance was probably even more culturally pervasive in the medieval Islamic world than now.

Hand balance set, by Nawruz 'Ali,
Persian, 19th century?
MHS inv. 54979

The Emperor Jahangir weighing his son Khurram in gold, silver and fine cloth in 1607. This ritual ceremony took place twice a year at the Mughal court and afterwards the prince's weight in these precious materials was distributed to the poor.
Trustees of the British Museum ME OA 1948.10-9.069



The scales of justice above a perforated screen in the Red Fort, Delhi. The Red Fort was the palace for Shah Jahan's new capital, Shahjahanabad, and was begun in 1639.
Photograph by John C. Huntington Courtesy of The Huntington Photographic Archive at The Ohio State University.



One of the high points of Al-Khazini's great treatise on the science of weights was this very elaborate 'balance of wisdom', which gave its name to the complete work.
Lawrence J Schoenberg Collection, LJS 386

THE GEOGRAPHY OF ISLAM

After the foundation of the Islamic era in 622, the Islamic empire grew with extraordinary speed. Within a century of its foundation, its territory stretched from Central Asia to the Atlantic coast of Spain — larger than the Roman Empire had ever been.

The empire's rulers controlled a huge diversity of peoples and places. Although the empire eventually split into rival dynasties and regions, the widespread use of Arabic helped to maintain a common culture. Arabic was not only the language of the Qur'an but the vehicle for translations and original authorship in all areas of scholarship.

Artefacts also reveal continuities across the Islamic world. Although cities were often renowned for particular manufacturing specialities, the Museum's collection of astrolabes reveals a shared heritage across time and space. While their design details vary, these astronomical instruments demonstrate the combination of mathematical and metalworking skills across a vast geographical area.

An astrolabe by Muhammad Mahdi al-Yazdi, Persian, c. 1660 showing a gazetteer with the position and direction to Mecca of 43 Eastern Islamic towns.
MHS inv. 45581

SCIENCE AND CRAFT

Sophisticated astronomical instruments survive from many parts of the Islamic world. Their technical design depended on the knowledge found in mathematical texts, and they are usually studied as part of the history of ideas. But they are craft objects as well as intellectual creations, and were produced by skilled hand work.

The detail shows an unusually artful 'horse' (wedge), which holds together the pieces of this astrolabe by Khalil Muhammad ibn Hasan `Ali (manufacture) and Abd al-A'imma (decoration), Persian, c.1700
MHS inv. 50987

The manufacture of scientific instruments was organised much like other forms of craft production. Most makers would have had their own small workshop, where the master worked and trained apprentices. As elsewhere in society, trades were often passed on from one family generation to the next, resulting in dynasties of makers. Collaboration was also common, with a range of specialist skills required to create complex artefacts. Just like other fine pieces of metalwork, an astrolabe might be signed by both a maker and decorator.

But astrolabe makers did not belong entirely to the ranks of ordinary artisans. The intellectual expertise required to construct mathematical instruments gave them a status similar to that of calligraphers, whose mastery of the written word also provided a connection to the learned world.

MUSEUM of the HISTORY of SCIENCE

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المـــيزان
AL-MIZAN

SCIENCES AND ARTS IN THE ISLAMIC WORLD

A SPECIAL EXHIBITION
26 OCTOBER 2010 – 20 MARCH 2011

'Al-Mizan' is the Arabic word for balance—both the familiar measuring instrument and the metaphorical pursuit of justice and harmony in all human endeavours.

For hundreds of years after the advent of Islam, Arabic was the language in which mathematics and science were most actively studied. The intellectual achievements of scholars in the Islamic world were matched by the emergence of a highly distinctive visual and artistic culture.

This exhibition explores the connections between the sciences and arts in Muslim societies. It presents highlights from the Museum's collection of Islamic scientific instruments alongside medieval manuscripts, metalwork and ceramics on loan from other major collections. The links between scientific inquiry and artistic beauty are vividly revealed through the decorative and practical work of the craftsman.

Al-Mizan (Libra) from *Kitab al-Bulhan*, a 15th-century Arabic manuscript of astrological, astronomical and divinatory texts compiled by Abd al-Hasan al-Isfahani.
The Bodleian Library, University of Oxford, MS. Or. 133, f.13b

OXFORD Centre for Islamic Studies

The exhibition is staged in collaboration with the Oxford Centre for Islamic Studies, in celebration of its 25th anniversary.

COURTLY CULTURE

Royal courts were the most important sites for knowledge in the first centuries of Islam. From the 8th century onwards the caliphs in the new imperial city of Baghdad orchestrated a systematic programme of translation of ancient Greek and Indian sciences into Arabic.

Later centuries also saw the development of new educational institutions (*madrasas*) and the emergence of urban patrons. But the court remained an important centre for research and authorship, with princes and administrators sponsoring beautifully prepared texts, ranging from religion and literature to astronomy and geography. The most spectacular scientific instruments were an additional element in the courtly culture of conspicuous display.

This celestial globe by Ja'far ibn 'Umar ibn Dawlatshah al-Kirmani, Persian, 1362/3 must have been made for a substantial patron. The constellations are engraved and the stars are indicated by inlaid silver discs whose sizes correspond to the magnitude of the stars.
MHS inv. 44790

THE ART OF METALWORK

This handsome casket from Iran c. 1200 embodies many metalwork techniques. It has been cast, engraved, pierced, ring-matted and inlaid with copper and a black compound, and its complex decoration is figurative, epigraphic, geometrical and floral.
Nasser D. Khalili Collection of Islamic Art, MTW 1106 (Nour Foundation; courtesy of the Khalili Family Trust).

Most surviving scientific instruments are made of metal—a robust material for practical and portable devices. Brass was the preferred material for many utilitarian vessels and utensils, and its suitability for engraving made it ideal for the lines and inscriptions on astrolabes and globes.

From the 12th century onwards the technique of inlay became particularly popular across the Islamic world. Silver, gold or copper was hammered into the surface of brass to create a brilliant decorative surface. Brass was transformed from a workaday material to the status of a prized luxury commodity.

The manufacture of an astrolabe required much the same equipment and skills as other forms of metalwork. This close connection is underlined by similarities in decoration: a prestigious instrument would feature the decorative styles encountered in other forms of metalwork.

One hemisphere of the globe from the Museum's unique spherical astrolabe, by Musa, Eastern Islamic, 1480/81. Silver wire has been inlaid into the brass surface of the globe to create lines and legible text. A small portion of the silver has fallen out of the central inscription to reveal the groove into which the silver was hammered.
MHS inv. 49687

MATERIALS

A Turkish astrolabe-quadrant of 1682/3 by Ahmad al-Ayyubi made of gold-decorated lacquered wood, with its original velvet case decorated with metal wire and lined with silk. MHS inv. 15598

As with many other civilizations, gold and silver were the most precious materials available in the Islamic world. Royal treasuries such as that of the Topkapi Palace in Istanbul preserve ornate creations encrusted with gems. But objects made of those metals were easily melted down in times of need, and they do not survive well. In addition, some Muslims shunned gold and silver vessels, and there was considerable debate on the extent to which these metals could be used as inlay on brass.

Brass is therefore the dominant metal of surviving decorative artefacts, as well as scientific instruments. But just as there were many other media for Islamic art—such as textiles and ceramics—so instruments used a variety of materials. Wood provided a lightweight, easily-inked surface for portable quadrants, and stone was used for outdoor sundials. Occasionally semi-precious stones were added to instruments for decorative effect, and manuscripts used gold and colouring in their illuminated letters and miniature paintings.

CALLIGRAPHY

Portrait of a calligrapher by Riza-yi Abbasi, Isfahan, c. 1600. The addition of 'Abbasi' to the artist's name was an honour conferred by Shah Abbas I, who greatly admired Riza's work. Trustees of the British Museum, 1920,0917,0.271.1

Writing assumed great significance in Islamic culture. The centrality of the Qur'an and the strict prohibition against any artistic representations of God helped to make calligraphy both a religious and an aesthetic discipline.

Key figures in the creation of scripts suitable for the Qur'an and for secular use were widely celebrated. The 10th-century vizier Ibn Muqla, who provided a geometric codification of cursive scripts, was even likened to 'a prophet in the field of handwriting; it was poured upon his hand, even as it was revealed to the bees to make their honey cells hexagonal.'

Treatises on penmanship ennobled the art of writing through the mathematical proportions of fine calligraphy: 'Euclid said: Handwriting is spiritual geometry which appears by means of a bodily instrument'. It is therefore especially appropriate that calligraphy played a vital decorative role in the most prestigious mathematical instruments.

The patron and first owner of this Persian astrolabe of 1647/8 is calligraphically embodied in the *ankabut* (*rete*). The name of Shah Abbas II has been incorporated into the metalwork by the maker Muhammad Muqim al-Yazdi. MHS inv. 45747

The status of calligraphy is underlined by the lavish decoration of pen-boxes. This Syrian example of the early 14th century carries seated figures and geometric patterns and is inlaid with silver and gold. The Arab historian Qalqashandi wrote 'know that it is necessary for the scribe to do his utmost to adorn the pen-box, to make it excellent and to look after it.'
Trustees of the British Museum, 1881,0802.19

ZODIAC SIGNS

The signs of the zodiac are prominently featured in the decorative roundels of this early 13th-century jar from the city of Kashan in Iran. Ashmolean Museum, University of Oxford, EA1956.58

The horoscope of the Persian Timurid ruler Iskandar Sultan, 1411. This is the only surviving individual illuminated horoscope from medieval Islam. Al-Mizan is at 3 o'clock in the circle of zodiac signs. Wellcome Library, Or MS PER 474, fols. 70v-70r (ff. 18b-19a).

Al-Mizan is known in Latin (and in English) as Libra, both a constellation of stars and one of the signs of the zodiac. The twelve signs demonstrate that the science of the stars is closely linked to artistic iconography in Islamic culture.

The signs of the Zodiac appear in many treatises on astronomy and are an essential element of astrolabes and celestial globes. The twelve signs were of great importance for the development of the Islamic visual tradition: the oldest illustrated Arabic text is a manuscript on the constellations preserved in Oxford's Bodleian Library.

The zodiac was especially vital in astrology, each sign having its own character and influence and presented within far more precise and elaborate systems of interpretation and prediction than survive in today's newspaper horoscopes. The astrological significance of the signs helped them to achieve a very wide circulation as visual icons. Such was their symbolic and human significance that they frequently appeared as a central decorative element on many forms of metalwork and ceramics.

The sign al-Mizan from the inlaid silver rim of an astrolabe with geared calendar by Muhammad ibn Abi Bakr, Isfahan, 1221/2. MHS inv. 48213

INSCRIPTIONS

The importance of calligraphy gave inscriptions a far greater role and status in Islamic culture than in contemporary Europe. On a monumental scale, excerpts from the Qur'an were cut in brickwork to become three dimensional elements of buildings, or rendered on tiles as a lustrously colourful surface. In addition to their decorative effect, such inscriptions often give clues about the function and meaning of Islamic architecture and objects.

This elegant dish relies for its decoration entirely on text and is characteristic of the highly distinctive Samanid epigraphic earthenware produced in Khurasan province. It was made in the city of Nishapur, Iran, in the 10th or 11th century and its inscription says "Since wealth is bound to disappear, the best wealth is that which would bequeath praise to its owner. Good fortune".
Nasser D. Khalili Collection of Islamic Art, POT 810 (Nour Foundation; courtesy of the Khalili Family Trust).

Many types of artefact include specifically religious or more generally moral phrases. Blessings for anonymous owners were common on metalware and ceramics, suggesting that they were intended for sale at market rather than specially commissioned by an individual patron.

The surfaces of scientific instruments provided a medium for such pious adages. An instrument intended specifically for a ruler might have a different celebratory and propagandistic purpose, and carry a bombastically lengthy inscription with the patron's many honorific titles.

There is one inscription peculiarly appropriate for astrolabes. One of the best-known passages in the Qur'an is the Throne verse (2: 255). This is used, for example, to surround the highest point of the dome in many Ottoman mosques, and appears in numerous other contexts. The top part of an astrolabe, which connects the suspension ring and the circular rim, is known as the throne. The Qur'anic verse is often engraved there.

The throne of this Persian astrolabe of c.1700 by Khalil Muhammad ibn Hasan 'Ali features the Throne verse from the Qur'an. MHS inv. 42649

AL-ANKABUT AS ART

'*Ankabut*' literally means 'spider', but it is also the Arabic name for what is known in Latin (and now English) as a *rete*: the rotating part of an astrolabe which displays the sun and stars. The *ankabut* embodies the characteristic combination of science and artistry at the heart of this exhibition.

The *ankabut* is cut and filed from a single sheet of metal. The essential elements of the structure are the off-centre zodiac circle for the sun and the pointers representing bright stars in the sky. The design of the remaining framework must ensure that it does not fall apart, but is otherwise unconstrained by the heavens or mathematics.

There is a great variety of styles in *ankabut* design, as well as remarkably persistent traditions. Stars can be represented figuratively, as birds and fish, or the whole surface can be covered in decorative engraving. The earliest instruments are plain with 'dagger' pointers while, eight centuries later, Mughal Indian astrolabes are shaped and engraved with intertwining, proliferating foliage. Displayed on the right is a small selection from the Museum's collection to suggest the art of *al-ankabut*. They have all been reproduced at the same size to emphasize the common elements of their structure as well as their stylistic differences. In reality they all vary in size, the largest being more than double the diameter of the smallest.

This 13th-century astrolabe from the British Museum has the most astonishingly figurative of all astrolabe *ankabuts*. Trustees of the British Museum, 1855,0709.1

The patron and first owner of this Persian astrolabe of 1647/8 is calligraphically embodied in the *ankabut*. The name of Shah Abbas II has been incorporated into the metalwork by the maker Muhammad Muqim al-Yazdi.
MHS inv. 45747

An early survivor: a plain Syro-Egyptian *ankabut* probably of the early 10th century, with dagger pointers and later additions in Armenian. MHS inv. 48470

The surface of this Persian *ankabut* is almost entirely filled by decorative engraving; by Khalil Muhammad and Abd al-A'imma, 1707/8. MHS inv. 46680

The spiky star pointers have pierced bases or knobs in this astrolabe from Al-Andalus (Muslim Spain). It was made by Muhammad ibn Fattuh al-Khamairi in Seville, 1224/5. MHS inv. 50934

Although made five centuries later on a different continent, this North African astrolabe by Muhammad ibn Ahmad al-Battuti is remarkably similar in design to the Seville example on its right. MHS inv. 51459

This Persian *ankabut* incorporates a Qur'anic invocation. It was made in 1682 by Qassim 'Ali Qa'inbi. MHS inv. 45509

This is a 15th-century replacement for the *ankabut* of a 13th-century astrolabe. The new owner's name was calligraphically incorporated into the design, but this has since been broken and only "Sultan" remains. MHS inv. 37148

Foliate forms are characteristic of Indo-Persian *ankabuts*; this example is by Muhammad Salih Tatawi, 1666/7. MHS inv. 33474

The profusion of foliage in this Indo-Persian *ankabut* of c. 1600 risks obscuring the view of the underlying plate when the instrument is assembled. MHS inv. 34611

The upper part of this Persian *ankabut* includes a small quatrefoil; by Shams ad-din Muhammad Saffar, 1505/6. MHS inv. 51182

Turkish astrolabes are typically much less ornate than contemporary Mughal or Persian instruments. This example of 1713/4 by 'Adbi features a strapwork motif. MHS inv. 39955