The Bodleian Tribute to Islamic Sciences

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These works trace the transmission of science and philosophy from the classical world to Europe along a route which ran eastwards through Byzantium to Baghdad, then, via Sicily and Spain, northwards to the center of Europe at the very moment when hungry minds were eager for the food that centuries of Muslim civilization had to offer.

What is the point of recalling this story of the transmission of ancient knowledge today - when scientific texts are said to be out of date almost before they are printed? It is human beings who acquire and use knowledge. One constant factor in research is the variable, volatile mixture of emotions and purpose which motivates those who pursue it.

Their passion for truth and their boldness in exploration demand a rigorous discipline and an integrity of aim not to be deflected by the jealousies, the insecurities, the ambitions common to man. Intellectual integrity also demands a generosity of spirit, giving credit where credit is due, enhancing the other man's contribution rather than diminishing it.]

In 1981, to mark the opening of the l5th Islamic century, Oxford University's Bodleian Library scanned its collection of Arabic manuscripts - one of the world's largest - and mounted a display of 50 choice works to tell one of the great stories in the histoiy of ideas:

the flowering of philosophy and science in the medieval Muslim world and the transmission of that tradition - the doctrina Arabum, the teachings of the Arabs - to Europe.

With the influence of Islam again spreading and growing, and its intellectual traditions being revived, 1981 - which is 1401 on the Muslim calendar - was an especially appropriate year to open the Bodleian display. As Colin Wakefield, curator of the collection and organizer of the exhibit, said at the opening, "... the exhibition...

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To display its Arabic treasures, Bodleian experts chose Oxford's Divinity School, built 500 years ago for the teaching of theology, then "queen of sciences."

A splendid example of craftsmanship in the final flowering of the Gothic age, the Divinity School and the library above it - built by Duke Humfrey of Gloucester, brother to King Henry V- were a part of the outburst of building that occurred after the after the year's of conflict with France and the civil strife known as the Wars of the Roses; this period produced the perpendicular Gothic unique to England and such structures as the new "College of All Souls of the Faithful Departed," a war memorial to those killed in the Hundred Years War and, not far away, the Bell Tower of Magdalen College.

Today beneath the richly carved, vaulted stone roof of the Divinity School, the surrounding library stores some of its greatest documents and manuscripts: the fist folio edition of Shakespeare, one of the original copies of the Magna Carta and handwritten poems and letters by Shelley Browning and Byron. In 1981, the library also displayed the 50 works which trace the transmission of science and philosophy from the classical world to Europe along a route which ran eastwards through Byzantium to Baghdad, then, via Sicily and Spain, northwards to the center of Europe at the very moment when hungry minds were eager for the food that centuries of Muslim civilization had to offer.

The manuscripts evoked two major periods of intense intellectual activity": Baghdad in the days of the early Abbasid caliphs - the ninth and l0th centuries of the Christian era - and the quickening of thought in l2th- and 13th-century Europe. Both these periods saw the indefatigable work of translators: first those who brought the corpus of classical knowledge to the Arabs and, 300 years later those who passed it on to Western Europe enriched by the labors of Muslim scholars. It is this story that was the focus of the exhibit.

Take Aristotle, for instance.

Only a fraction of his work was known in Europe during the post-classical era, when barbarian invasions caused the loss of so much earlier culture. But most of his books were translated into Arabic, and were studied and commented on over and over again in Baghdad and other centers. European philosophers rediscovered them via these commentaries. Ibn Sina (Avicenna) and Ibn Rushd (Averroes) were famous names in medieval philosophy and their predecessor al-Farabi (Alfarabius) is said to have lectured on Aristotle's Physics 40 times and his Rhetoric 80 times.

At the Bodleian exhibit, the scope of the scientific tradition which reached Europe was shown in the headings of the exhibition: medicine, biology, alchemy and magic; astronomy and

astrology; mathematics and optics. It was especially rich in the fields of medicine, mathematics and the early experiments in alchemy - which were to lead to the development of modern chemistry - for while 13th-century Paris excelled in philosophy, Oxford was ahead in science.

Roger Bacon, for example, who is credited with initiating the first developments in experimental science, was represented in the exhibition by his Opus Tertius; the third part of an encyclopedic work, it cites all the above named philosophers, as well as the astronomer al-Zarqali, and Ibn al-Haitham, whose works on optics had a great influence on early European scientists - and whose own works were also in the exhibition.

It is notable that many of the Latin manuscripts shown date from the 13th and 14th centuries - examples of the textbooks used in teaching and research in the universities of that period. They were housed in college libraries such as that of Merton College - which produced a sequence of brilliant mathematicians in pre-Renaissance times - or in the fist library belonging to the university, a small building adjoining the University Church.

The main center of Latin translations from Arabic was Toledo, reconquered from the Arabs in 1085 and for 200 years a center in which Latin, Greek and Arabic were all in use. Another center was Sicily where the Norman kings gathered a brilliant, multi-lingual court which, at the Bodleian, was represented by a translation of a manuscript made for the Emperor Frederick II, who not only encouraged learning of all sorts but also kept a zoo, wrote on falconry and was passionately interested in animals.

The manuscript contains the zoological chapters of an Arabic encyclopedia, a famous work by Ibn Sina, al-Shifa - other portions of which were also displayed - dealing with physics and with the existence of the soul.

The zoological section of this encyclopedia was translated by Michael Scott, a contemporary of Roger Bacon. Scott whose studies in astrology gave him a sinister reputation as a magician, was probably from Scotland, and traveled south in search of the new learning. As was the custom then, the equivalent of today's doctoral candidate would make his way, on foot, to Spain, and perhaps Sicily as well,

to hear "the wisest philosophers in the world,"and return bringing some fresh work which scientists at home - Bacon and others - would incorporate in their teaching and research. Scott worked as a translator in Toledo for some years, then went to Sicily where he was appointed Court Astrologer to Frederick II. No doubt he took with him the translation he had already made of Aristotle's writings on animals for an interest in the animal world would find favor with the emperor.

Botany and agriculture follow zoology and anthropologists undoubtedly took special note of Ibn Wahshiyya's al-Filalia al-Nabatiyya, a treatise on farming which gives a wealth of facts about popular customs, religion and magic as well as agricultural and botanical information. Another vital work, basic to the study of pharmacology is the De Materia Medica by Dioscorides, a Greek writer of the first century It led to the science in which the Muslims excelled: medicine.

In the history of medicine, a number of books from Arab sources became standard texts reproduced first in manuscript and later in print. Works by the fathers of Greek medicine, Hippocrates and Galen, for example, were known to the Arabs and translated into Arabic during the eighth and ninth centuries. Under the caliph al-Ma'mun, son of Harun al-Rashid, a translation center in Baghdad,

known as Bait al-Hikma, the House of Wisdom, was established, at which the outstanding Hunain ibn Ishaq is said to have translated 100 books by Galen, Hippocrates and other physicians. Later Hunain's own authoritative Introduction to Medicine was translated into Latin - and remained a popular manual of instruction for 600 years. His only rival was Gerard of Cremona, the greatest translator of the Toledo school. When he died, his pupils drew up a list of 71 of his translations - and it was not exhaustive.

One of his greatest contributions, a version of Avicenna's Canon of Medicine (Ibn Sina's al-Qanun fi al-Tibb), was used in both Europe and the Islamic world from the l1th to the 17th centuries and, during the l5th and 16th centuries, was printed at least 35 times in Europe.

Another of Gerard's translations was of a book on surgery by al-Zahrawi, who practiced Medicine in al-Andalus [Spain] in the l1th century. The various Latin printed editions of his work include one published in Oxford in 1778. Diagrams of surgical instruments found in the Arabic manuscript are copied in the translation.

Alongside these major texts was shown a smaller one, a traveler's manual with medical advice by a North African doctor who died about 1004. This manual was popular in the Muslim world, and it became equally so in Europe when one of the first medical translators Constantinus Africanus produced a Latin version - which he claimed as his own work.

One other name that must not be omitted is that of Maimonides, the Jewish scholar, philosopher and physician who left Cordoba for Egypt and practiced medicine in Cairo in the time of Salah al-Din (Saladin). One of his numerous medical works was a regimen of health prepared for the son of Saladin, who succeeded his father as ruler of Egypt. Also shown is Maimonides' Guide to the Perplexed composed, as was customary for Jewish authors at the time, in Arabic but written in the Hebrew alphabet.

Moving on to astronomy and mathematics, the exhibit showed the debt of European astronomers to their Eastern counterparts for the foundations on which all subsequent advances in scientific study were to be built.

Included, for example, was the mathematician al-Khwarizmi, who worked in Baghdad and drew up some of the earliest astronomical tables used by the Arabs. Revised in Cordoba, these tables were translated by Adelard of Bath, whose Latin version was used by many early European astronomers.

In another book, also shown in the exhibition, the same al-Khwarizmi introduces algebra to Europe. But his most important contribution was the introduction - via Baghdad - of the Indian system of numerals, which, in the 13th century began to replace the cumbersome Latin system of numeration.

Renamed "Arabic numerals," they spread from the merchants of the Mediterranean ports into every sphere of life.

Geometry was also represented at the Bodleian exhibition - in one of the great classical works: the Conics of Apollonius of Perga. It consisted of seven books, three of which survive only in Arabic translation. The Oxford astronomer Edmund Halley - famous for his observation of the comet known by his name - used Bodley's Arabic manuscript of the Conics in preparing a complete edition of that work, published in 1710.

Other Oxford astronomers in the 17th century also drew on Muslim sources - such as the star tables worked out in the magnificent observatory in Samarkand, built in the l5th century by Ulugh Beg, a grandson of Tamerlane. These astronomical and chronological tables were an advance on those of previous scientists. They became known in Europe in the 17th century and the Savilian Professor of Astronomy John Greaves, obtained and used the manuscript exhibited here, in preparing the tables for publication with a Latin translation: a continuation five centuries later of the 12th-century practice.

Finally two manuscripts deal with the making of scientific instruments - another field in which much was owed to Islamic sources. One of the earliest astronomers to write in Arabic - also an astrologer at the court of the caliph al-Mansur who firmly established the Abbasid dynasty - was Masha' allah (Messahalla), whose writings are only known in Hebrew and Latin translations.

Masha' allah draws on Indian and Persian sources as well as Arabic and classical, and the Latin translation of his De Compositione Astrolabii showed how to construct that basic tool of observation and reckoning of time: the astrolabe. Later Chaucer drew on Masha' allah for his Treatise on the Astrolabe a charming piece of prose, explaining to a 10-year-old boy the use of

this scientific instrument. Chaucer's writings full of references to Arab sources, whether in the form of tales or of learning, show how far such elements had penetrated the general thinking of his day – l00 years after the translators had completed most of their work.

In such a limited selection of the Bodleian's wealth, of course, there had to be significant omissions. One was a delightful picture of Roger Bacon at work in his study, another the book of maps composed by the Sicilian Arab, al-Idrisi, greatest of all medieval geographers, and a third the first translation of the Koran into Latin, begun in 1142 in Toledo by an English scholar. With all its imperfections, this translation represented the first Christian attempt to take an objective view of the Koranic text. Four centuries later at the height of the hysteria aroused by the Ottoman Invasions of Hungary and Austria, this same translation was courageously printed in Basel by the Swiss theologian Bibliander – and the Bodleian has a fine 13th century manuscript of the original translation, as well as copies of the two first printings in Basel.

To Muslim scholars whose work was shown in the exhibition, the Koran was the summation of human knowledge. The source of all knowledge was God's revelation – as indeed it was for their Christian counterparts.

Faith inspired all these men, whether expressed in the Oxford motto Deus illuminatio mea, the Psalmist's The heavens declare the glory of God or the Koranic God is the light of the heavens and the earth. The Muslim custom of beginning every piece of writing with praise and thanks to God reappears in the Latin translations of Islamic works of scholarship.

For example, The Canon of Medicine of Ibn Sina, translated by Gerard of Cremona in Toledo from Arabic to Latin, begins with, "Let us first give thanks to God ... whose mercies are manifest upon all the Prophets." Muslim philosophers also threw light on the relationship between faith and reason – as live a question today as it was when Bacon studied Avicenna's commentaries on Aristotle.

What is the point of recalling this story of the transmission of ancient knowledge today – when scientific texts are said to be out of date almost before they are printed? Is the history of the development of the astrolabe likely to be relevant in the age of the computer?

The answer to these questions lies in the fundamental precepts of scholarship – and of human nature.

It is human beings who acquire and use knowledge. One constant factor in research is the variable, volatile mixture of emotions and purpose which motivates those who pursue it. Their passion for truth and their boldness in exploration demand a rigorous discipline and an integrity of aim not to be deflected by the jealousies,

the insecurities, the ambitions common to man. Intellectual integrity also demands a

generosity of spirit, giving credit where credit is due, enhancing the other man's contribution rather than diminishing it.

One lesson can be drawn from the story of 12th- and 13th-century Europe and its advances in scholarship. Relationships between intellectuals can play an important part in times of conflict in preparing the way for a better future. For it must not be forgotten that the period of the translators was also the period of the Crusades.

The real points of contact, of course, were not on the battlefields of Palestine, but were in the court of Palermo and the libraries of Toledo, where Christian, Muslim and Jewish scholars - using Latin, Greek, Arabic and Hebrew - achieved a cooperation important to the whole future of Europe.

These vital points of contact have largely been forgotten. Bacon, for example, spoke against military endeavor and took account of Islam's positive contribution to the divine scheme of revelation. He and others had some grasp of the common basis of faith of Muslims and Christians.

Thus a tribute - in gratitude for a long forgotten debt owed by European scholarship to the Muslim world - was neither out of place nor out of date; it was a timely reminder which may smooth the path toward future cooperation, and which illuminates the possibilities of give-and-take between scholars, in a turbulent age.