AL-SHAJARAH

ISTAC Journal of Islamic Thought and Civilization

Published by IIUM Press
2023 Volume 28 Number 1

AL-SHAJARAH

Al-Shajarah is a refereed international journal that publishes original scholarly articles in the area of Islamic thought, Islamic civilization, Islamic science, and Malay world issues. The journal is especially interested in studies that elaborate scientific and epistemological problems encountered by Muslims in the present age, scholarly works that provide fresh and insightful Islamic responses to the intellectual and cultural challenges of the modern world. *Al-Shajarah* will also consider articles written on various religions, schools of thought, ideologies and subjects that can contribute towards the formulation of an Islamic philosophy of science. Critical studies of translation of major works of major writers of the past and present. Original works on the subjects of Islamic architecture and art are welcomed. Book reviews and notes are also accepted.

The journal is published twice a year, June-July and November-December. Manuscripts and all correspondence should be sent to the Editor-in-Chief, *Al-Shajarah*, F4 Building, Research and Publication Unit, International Institute of Islamic Thought and Civilisation (ISTAC), International Islamic University Malaysia (IIUM), No. 24, Persiaran Tuanku Syed Sirajuddin, Taman Duta, 50480 Kuala Lumpur, Malaysia. All enquiries on publications may also be e-mailed to alshajarah@iium.edu.my. For subscriptions, please address all queries to the postal or email address above.

Contributions: Submissions must be at least 5,500 words long. All submissions must be in English or Malay and be original work which has not been published elsewhere in any form (abridged or otherwise). In matters of style, *Al-Shajarah* uses the *University of Chicago Manual of Style* and follows the transliteration system shown on the inside back cover of the journal. The Editor-in-Chief reserves the right to return accepted manuscripts to the author for stylistic changes. Manuscripts must be submitted to the Editor-in-Chief in Microsoft Word. The font must be Times New Roman and its size 12. IIUM retains copyright to all published materials, but contributors may republish their articles elsewhere with due acknowledgement to *Al-Shajarah*.

ISSN 1394-6870

THE GENESIS OF ISLAMIC SCIENCE: THE CONTRIBUTION OF CLASSICAL INDIAN SCIENCE REVISITED[1]

Osman Bakar[2]

Introduction

The eighth, ninth, and tenth centuries CE, taken together, may be identified with the formative period of Islamic civilisation. The meaning of the "formative period" in the civilisational sense is now briefly explained. The foundation of this civilisation, which implies a societal order, was laid down by the Prophet Muhammad (ﷺ) in Medina (formerly Yathrib)[3] in the first half of the seventh century CE over ten years (622–632 CE). An astonishment to historians, the foundation was already breathtaking in its societal scope and comprehensiveness, not to mention its unsurpassed quality of moral and ethical life. The Qur'an affirms the completeness of this civilisational foundation in the following terms: "Today I have perfected for you your religion (*dīn*), completed my favours unto you, and chosen Islam for you as your religion."[4]

---

[1] This article was mainly based on a lecture delivered on 10 July 2021 in conjunction with the Indian Independence Day at the invitation of the Indian High Commission Office in Kuala Lumpur. The video recording of the lecture titled "Islam and Indian Civilisation: Historical Highlights" was posted online by the organiser on 11 July 2023.

[2] Al-Ghazali Chair of Epistemology and Civilisational Studies and Renewal, ISTAC, International Islamic University Malaysia (IIUM) and Emeritus Professor, Philosophy of Science, University of Malaya, Kuala Lumpur. Email: osmanbakar@iium.edu.my and obbakar@yahoo.com.

[3] The Prophet himself changed the old name Yathrib to *al-Madinah* apparently for the simple but profound reason that he wanted to convey the message to the world that Islam as the last religion and Islam as the newest divinely inspired civilisation would be established in the newly named city during his lifetime.

[4] The Qur'an, *Surah al-Ma'idah* 5:3. The Arabic word *dīn*, as found in this verse, is usually translated as religion. But its semantic field as explained in detail by Professor Syed Muhammad Naquib al-Attas in his *Islam and Secularism* (Kuala

The Muslim civilisation-building that followed in the first several centuries was not an attempt at improving the quality of spiritual and intellectual life exemplified by the Prophet and his first community. Later Muslim generations were too aware of the prophetic saying "the best of my community is my generation" to entertain the thought that quality-wise, they could improve on his earthly achievements. Rather, the ongoing civilisation-building was an attempt to see that the tree of Islamic civilisation planted by the Prophet would grow to bloom a thousand flowers. It was a collective enterprise to give new concrete civilisational expressions of Islam as conditioned by the Qur'an and the Prophetic Traditions on the one hand and by the presence of other civilisations on the other.

Beginning in the eighth century CE, thanks to its territorial expansion both eastward and westward, Islam encountered the rich treasures of the world's major civilisations. The greatest and the richest of these civilisations were Indian, Chinese, and Persian civilisations in the East and Greek and Roman civilisations in the West. The treasures encountered were mainly in the arts and sciences, literature, technology, and social institutions. Islam as a religion is known for its positive attitude towards other religious scriptures and the intellectual heritage of past human civilisations. The Prophet Muhammad (ﷺ), mindful of his position as the last of the divine messengers to humanity, told his followers to view knowledge (*'ilm*) as "the lost property of the Muslim" and wisdom (*ḥikmah*) as "the lost property of the believer (*al-mu'min*)."[5] They should own them, he said, wherever they find them. The Muslims of this period well heeded this prophetic advice, as clearly shown, for example, by the construction of *Bait al-Ḥikmah* (House of Wisdom) in Baghdad around 815 CE by the 'Abbasid caliph al-Ma'mun (reign: 813–833 CE). This new centre of learning, where intensive translations into Arabic mainly from Greek, Syriac, Pahlavi Persian, and Sanskrit and textual studies in various sciences were carried out under state funding, about which we have more to say later, came to symbolise the *ummatic* agenda of civilisational synthesis. We are

Lumpur: ABIM, 1978), chapter III, suggests that it may also be rendered as a civilisation, namely a way of life in its broadest and deepest sense.

[5] Narrated by Abu Hurairah, *Jami' al-Tirmidhi*, Volume 5, Book 39, Hadith 2687.

referring to this grand civilisational synthesis into which diverse elements of various civilisations were integrated and its contributory processes of knowledge transfer from those civilisations when we speak of the formative period of Islamic civilisation. This synthesis was enabled by Islam's most precious integrating principle, namely the doctrine of tawhid or unity, which is essentially epistemological in nature. A significant source of ideas for this synthesis was the Indian civilisation.

The Synthesis of Islamic Science: The Contributory Role of Classical Indian Science

The main purpose of this article is to highlight the historical fact that classical Indian civilisation played a significant role in the early civilisational growth of Islam during the three centuries under study, particularly in the field of philosophical-scientific knowledge. The Indian role is now acknowledged to be far more extensive than what many people thought and realised. Quite clearly, the Indian contribution helped pave the way for Islam's grand knowledge synthesis or its golden age in the tenth and eleventh centuries.

Unfortunately, in the Western-centric narrative of the history of science, the role of classical Indian science in the early development of Islamic civilisation was downplayed, with disproportionate prominence given to the role of Greek science. As a result, many Easterners today – Hindus and Muslims included – are unaware of the real extent of the classical Indian role in question.[6] A significant facet of this early civilisational growth of Islam was knowledge transfer from the advanced cultures of the time, of which India was a good example. Rather interestingly, this knowledge transfer appeared to be widely known to the Muslims of the time. According to Joseph Mazur, "by the tenth century, there were numerous Arabic texts on the Indian numerals."[7]Another notable

[6] A rare exception is the informative article "Islamic Science's Indian Connection" authored by Alok Kumar and Scott T. Montgomery published in the September/October 2017 issue of the *AramcoWorld*. See aramcoworld.com/Compilations/2017/September-October-2017/Islamic-Science-s-India-Connection.

[7] Joseph Mazur, *Enlightening Symbols: A Short History of Mathematical Notation and Its Hidden Powers* (Princeton University Press, 2014). The texts included those

facet is knowledge organisation, which Muslims consciously pursued in the light of the distinct worldview of the new religion and civilisation. I will now explain what I mean exactly by the term knowledge transfer and the term knowledge organisation that I am using in this article. I will also explain the classical Indian connection to the knowledge activities that were going on in the young Islamic civilisation.

Knowledge transfer to early Islamic societies from diverse civilisations took several forms and involved different kinds of activities. First, in the form of writings that were found scattered over the territories that Islam had acquired during its expansion and their preservation in libraries that its followers had built. Second, which is even more important than the activity of collection and preservation, was in the form of translation into Arabic of selected writings from the inherited collections to which I have referred, as well as of writings that the Caliph of the day had received as foreign literary gifts. A good example of such instances was when the Caliph al-Mansur (reign: 754–775 CE) ordered the translation into Arabic of a seventh-century CE astronomical work in Sanskrit that he had received from an Indian scientific delegation visiting his newly built Abbasid capital city Baghdad in the year 771 CE.[8] The astronomical work in question was known as *Siddhanta* of Brahmagupta (598–668 CE). Brahmagupta, a noted Indian astronomer-mathematician of his time,[9] was a younger contemporary of the Prophet Muhammad (ﷺ). Speaking of the new city of Baghdad itself, it is worth noting that several Indian astronomers were known to have been consulted in its foundation (756 CE).

In the context of the time – we are talking here about eighth-century India and Iraq – the work may be viewed by its then readers as quite a "recent publication" which, therefore, possessed its

authored by al-Kindi (c. 801–873 CE) and Abul Wafa al-Buzjani (940–998 CE).

[8] Seyyed Hossein Nasr, *Science and Civilisation in Islam* (Cambridge: Harvard University Press, 1968), second edition (Cambridge: The Islamic Text Society, 1987), 169.

[9] He is the author of four books on mathematics which includes astronomy. The most famous of these treatises was *Brahma-sphuta-siddhanta* ("Brahma's Correct Astronomical System").

own scientific significance. Brahmagupta and al-Mansur were separated in time by a mere century. The translation was done by Muhammad al-Fazari (d. 777 CE), the official astronomer at al-Mansur's Court, and Ya'qub ibn Tariq (flourished: eighth/ninth centuries CE) under the supervision of an Indian astronomer. Ibn Tariq was well-versed with Indian astronomy, and he knew Sanskrit since he had studied under an Indian master. The Indian supervision of the translation was to ensure its accuracy and quality, as insisted by the Caliph himself. Al-Fazari and Ibn Tariq were notable figures in the connection between classical Indian science and Islamic science. In the words of Nasr, "mainly through the efforts of these two men….Indian astronomy and mathematics entered the stream of Islamic science."[10]

Another *Siddhanta* was presented to the Caliph al-Mansur the following year (772 CE) by an Indian scientist by the name of Kanka. Kanka, who hailed from Ujjain, a city in the state of Madhya Pradesh, was invited by the Caliph to be his guest scientist. Ujjain is of interest to us since it was the city where Brahmagupta used to head its astronomical observatory as the Director. The Ujjain observatory was one of the observatories built by the Hindu prince Jai Singh in several Indian cities.[11] During the reign of al-Mansur Ujjain was apparently still an important centre of Indian mathematical astronomy. Al-Mansur's invitation to Kanka to be his guest scientist raised the question of the possibility of a more active relationship between Baghdad and Ujjain than what we currently know. Kanka's expertise was in computation or *hisab* in Arabic. The work he presented to the Caliph was titled *Siddhanta* of Aryabhata, which, according to the noted contemporary Indian historian of mathematics Radha Charan Gupta, dealt with the motions of the planets. From the scientific point of view, the work was indeed a highly significant one. Kanka appears in the Arabic bibliographical tradition as Kankah al-Hindi.[12] According to al-Biruni (973–1048 CE), the noted

[10] S. H. Nasr, *Science and Civilisation in Islam*, 169.

[11] S. H. Nasr, *Science and Civilisation in Islam*, 88.

[12] For a detailed discussion of Kankah al-Hindi in Arabic sources, see David Pingree, "Kanaka" in *Complete Dictionary of Scientific Biography*, ed., Charles Coulston Gillispie. Available at: https://www.encyclopedia.com/science/dictionaries-

scientist and historian of science, Kankah was an astrologer at the court of Harun al-Rashid (reign: 786–809 CE).[13]

On the issue of translation itself, I would argue that translation is the first real act of knowledge transfer. This is so because translation involves understanding and interpreting texts to be translated, which usually help transform the mind of the translator(s). The transformation is none other than the transfer of knowledge from a foreign culture to the mind of the translator and to many other minds who could read the translation. This message of the numerous benefits to society that could accrue from the translation movement was not lost to the Caliph al-Mansur. The mental and intellectual transformation in question would be even more significant when the translation is supervised by an authority on the subject as was the case with the translation of *Siddhanta* of Brahmagupta.

And the third, which is a more intensive act of knowledge transfer than the translation of texts, is the interpretative study of the translated versions and commentaries on them. This level of knowledge activity led to the creation of study circles centred around translated texts. For example, the period stretching from the reign of al-Mansur to that of al-Ma'mun (reign: 813–833 CE) witnessed the popular use of the Arabic version of *Siddhanta* of Brahmagupta as a text for study circles among scholars and scientists in Baghdad.

Historians of Islamic civilisation generally regard the eighth and the ninth centuries CE as the grand epoch of its translation movement when many great works were translated into Arabic from several languages, including Sanskrit, the sacred language of Hinduism as well as the literary language of classical Indian civilisation. The translation movement in Islam was officially inaugurated by al-Mansur himself when he established the "School of Translation" or "Circle of Translators" at his Court which he patronised. To be sure, translation activities by individuals had been going on in Islamic societies for quite some time prior to their state patronisation initiated by al-Mansur. But these activities were isolated and disorganised. The organised kind and scope of

---

thesauruses-pictures-and-press-releases/kanaka

[13] Al-Biruni, *Chronology of Ancient Nations*, trans., C. Edward Sachau (London, 1879), 129.

translation activities that we saw during al-Mansur's reign could have happened only with state encouragement and support of the State Treasury. Moreover, the high-profile level of participation of Indian scholar-scientists in the translation activities provided clear proof of an organised state patronisation. Apparently, this state patronisation generated a new momentum in the translation movement that impacted the thinking of al-Mansur's successors, especially Harun al-Rashid (786–809 CE) and al-Ma'mun.

Al-Ma'mun, a lover of Greek wisdom, founded a public educational and research institute which was named *Bait al-Ḥikmah*, an Arabic term meaning "The House of Wisdom." In modern terms, we may describe it as a higher educational institution or a research university with a concentration on philosophy and the natural and mathematical sciences. It was a gathering place for many scholars and scientists from many places, including India. Particularly, it brought together competent translators. Although under al-Ma'mun's patronisation, the focus of translation moved away from Sanskrit to Greek philosophical and scientific works, knowledge transfer from Indian civilisation did not stop with the end of translations of Sanskrit works. Indian scholars and scientists were also needed in the post-translation phase of knowledge transfer when scientific circles emerged to critically study the Arabic versions of the original Sanskrit texts. This phase may be described as the serious attempt by Muslim scholars to read and understand the Indian scientific minds. The actual physical presence of Indian scholar-scientists in some of those scientific study circles, who were in fact, state guests, spoke well about the authenticity of the Muslim understanding of classical Indian minds and works. This observation may help explain why even after the job of translation of important Sanskrit texts had been done, the House of Wisdom still entertained the presence of Indian scholar-scientists as its guests.

Having discussed knowledge transfer as an important facet of eighth and ninth-century Islamic civilisation, let me now talk about the activity of knowledge organisation. What I mean by knowledge organisation refers to the intellectual attempt to categorise and classify knowledge and the sciences as well as to formulate concepts, principles, and theories in each branch of knowledge and systematise

them into an organised body of knowledge. The general aim of knowledge organisation is to provide the necessary epistemological infrastructure for the next creative phase, which is the phase of research that would lead to the creation of new knowledge. In the early civilisational development of Islam, particularly the development of its knowledge culture, it was the House of Wisdom that pioneered the institutional role of knowledge organisation in the sense I have just mentioned. What I would like to assert here is that, as the term itself suggests, *Siddhanta* conveys the idea of a body of doctrines and principles, particularly as applied to scientific knowledge. In the initial phase of knowledge organisation in ninth-century Islam, the *Siddhantas* served as the model of knowledge organisation, at least in such branches of knowledge as astronomy, mathematical and the physical sciences.

Subsequently, however, when Greek philosophical and scientific works were made available in their Arabic translations for the first time by the House of Wisdom itself, Muslim philosopher-scientists apparently encountered a new knowledge or epistemological problem. In front of them were now Indian and Greek works in their Arabic versions. Adopting different philosophical and scientific concepts and methodological approaches, these Indian and Greek works, without doubt, posed epistemological problems to the Muslim mind. Reconciliation and harmonisation of ideas from the two traditions that stood on opposite sides of the globe were called for. Muslim minds of the period managed to a great extent to accomplish that goal. The theoretical problems that were then encountered eventually led to the synthesis of ideas, which to my mind, crowned the creative phases of knowledge transfer. As I see it, true knowledge transfer from different cultures would have to end up in some form of knowledge synthesis, which is usually viewed as creative in nature. But it is also to be noted that true knowledge transfer also carried within itself clear traces of the original sources of the ideas under transfer. In other words, it would not fail to acknowledge its original sources. To me, this acknowledgement of original sources is fundamental to knowledge ethics.

Let me illustrate my point with an example. Al-Khwarizmi (d.

863 CE), the first outstanding Muslim mathematician, introduced Indian numerals into the Muslim world. He was attached for some time to the House of Wisdom. According to some Muslim historians, he travelled to India to master the Indian sciences. The source of al-Khwarizmi's Indian numerals was the *Siddhanta* of Brahmagupta. The Indian numerals refer to the nine numerals, and a zero as a placeholder. It was Brahmagupta who first discovered zero as a number and pointed out some of its properties. He defined zero as "the number you get when you subtract a number from itself." Another property of zero he mentioned was that "zero divided by any other number is zero." Later mathematicians affirmed the definition of zero and its particular property that he had given.

In his book on arithmetic, al-Khwarizmi referred to the numerals as Indian numerals and not as Arabic or Persian numerals. Following him, for hundreds of years, Muslims used the term Indian numerals, which was the right thing to do since Indians were the original creators of those numbers. Much later, however, when al-Khwarizmi's work on arithmetic came to be known to the West, it called them "Arabic." In modern times, after the West came to know of the Indian origin of the numerals, it referred to them as Hindu-Arabic. Al-Khwarizmi is celebrated as the father of algebra, which had its roots in Indian mathematics but which he synthesised with Greek methods. In his writings, the Greek and Indian traditions of mathematics became united. Al-Khwarizmi may be regarded as the performer of a minor synthesis in Islamic science within the field of mathematics. Nasr argues that the synthesis achieved by al-Khwarizmi involves the unification of the Greek perspective based on the idea of the finite order of the cosmos, and hence of numbers and geometrical figures, and the Indian perspective based on the idea of the Infinite, whose horizontal image corresponds to the "indefinity" of mathematics.[14]

If we read Muslim scientific works in various branches of knowledge in classical Islam, we will not fail to see their acknowledgement of the Indian origin of many of the scientific ideas that they had inherited. These references to Indian scientific ideas

[14] S. H. Nasr, *Science and Civilisation in Islam*, 148.

could be seen in Muslim works in medicine, astronomy, mathematics, cosmology, and physics. Usually, and certainly so in the works of the creative Muslim philosopher-scientists, they first acknowledged the contributions of their predecessors from other civilisations before presenting their own original ideas in the field of study in question. What this kind of scholarly practice has meant to our common intellectual history is that the traditional treasury of Islamic thought has preserved the Indian philosophical and scientific heritage in its bosom for posterity to see. And through Islamic intellectual synthesis that lasted for centuries and that later became known to the West, the Indian dimension of the synthesis also became known to the West and indeed to the whole human civilisation. Such had been the ways in which inter-civilisational and cross-civilisational encounters happened in history.

Conclusion

Without classical Indian civilisation, there would not have been Islamic civilisation as we know it, that in turn, helped give rise to the European Renaissance and, subsequently, the modern world. The world needs to understand the classical Indian mind that had produced the philosophy, mathematics, especially the numeral system and algebra, astronomy and medicine that were the best in their times. There are permanent lessons that could be learnt from that classical mind. The main civilisational role of Islam was not just to preserve Indian science and then pass it to the West without adding anything new to it. Inheriting Indian and Greek philosophical and scientific thoughts around the same time, Islamic civilisation came up with a new synthesis that it shared back with both the East and the West.

Let me now conclude this article with the following remarks: From the perspective of the world history of ideas, the interactions between scientific minds in Islam and in Indian civilisation of the eighth and ninth centuries had proved to be one of the most fateful. The civilisational impact of the interactions was especially visible in the fields of astronomy, mathematics, and medicine. Through its incorporation into Islamic civilisation, the classical Indian scientific heritage found a new cultural home only to be further advanced and a

sympathetic foreign acknowledgement that helped preserve the originality of the Indian scientific mind. What the world needs today is a more inclusive narrative of the world history of ideas. A faithful account of the historic encounter of Islamic and Indian sciences could significantly contribute to such a narrative of the history of ideas.

TRANSLITERATION TABLE

CONSONANTS

Ar=Arabic, Pr=Persian, OT=Ottoman Turkish, Ur=Urdu

	Ar	Pr	OT	UR		Ar	Pr	OT	UR		Ar	Pr	OT	UR
ء	ʾ	ʾ	ʾ	ʾ	ز	z	z	z	z	گ	–	g	g	g
ب	b	b	b	b	ڑ	–	–	–	ṛ	ل	l	l	l	l
پ	–	p	p	p	ژ	–	zh	j	zh	م	m	m	m	m
ت	t	t	t	t	س	s	s	s	s	ن	n	n	n	n
ٹ	–	–	–	ṭ	ش	sh	sh	ş	sh	ه	h	h	h[1]	h[1]
ث	th	th	th	th	ص	ṣ	ṣ	ṣ	ṣ	و	w	v/u	v	v/u
ج	j	j	c	j	ض	ḍ	ẓ	ż	ż	ی	y	y	y	y
چ	–	ch	çh	ch	ط	ṭ	ṭ	ṭ	ṭ	ة	-ah			-a[2]
ح	ḥ	ḥ	ḥ	ḥ	ظ	ẓ	ẓ	ẓ	ẓ	ال	al[3]			
خ	kh	kh	kh	kh	ع	ʿ	ʿ	ʿ	ʿ					
د	d	d	d	d	غ	gh	gh	ğ	gh					
ڈ	–	–	–	d	ف	f	f	f	f					
ذ	dh	dh	dh	dh	ق	q	q	k	q					
ر	r	r	r	r	ك	k	k/g	k/ñ	k					

[1] – when not final
[2] – at in construct state
[3] – (article) al - or 1-

VOWELS

		Arabic and Persian	Urdu	Ottoman Turkish
Long	ا	ā	ā	ā
	آ	Ā	Ā	–
	و	ū	ū	ū
	ي	ī	ī	ī
Doubled	ي	iyy (final form ī)	iy (final form ī)	iyy (final form ī)
	و	uww (final form ū) uvv (for Persian)	uv	uvv
Diphthongs	و	au or aw	au	ev
	ى	ai or ay	ay	ey
Short	ـَ	a	a	a or e
	ـُ	u	u	u or ü o or ö
	ـِ	i	i	i

URDU ASPIRATED SOUNDS

For aspirated sounds not used in Arabic, Persian, and Turkish add h after the letter and underline both the letters e.g. جھ jh گھ gh

For Ottoman Turkish, modern Turkish orthography may be used.

AL-SHAJARAH
Vol. 28, No. 1, 2023

Contents

ARTICLES

MANUSCRIPT STUDIES

REVIEW ESSAY

WoS-Indexed under *Arts & Humanities Citation Index, Current Contents/Arts and Humanities* and **Scopus**

ISSN 1394-6870