Science and scripture: How did faith influence cartographic methods used to determine the *qibla*, the sacred direction of Islam?

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This paper explores the metaphysical principles that shaped the geographical and astronomical methods used to determine the *qibla* in Makkah, the Islamic orientation point crucial for the five daily prayers, focusing on how the revered scriptures of Qur'ān and prophetic *ḥadīth* influenced Islamic sacred geography. Part one of this paper explores the spiritual value of Makkah as a sacred space and direction, addressing the concepts of sanctity and centredness in the Islamic tradition, and drawing upon the relevant theories proposed by western philosophers and scholars. Part two of this paper then investigates how the mystical need to define the orientation towards Makkah in an expanding Islamic empire had propelled and contributed to Islamic cartography. This is done by assessing Makkah-centred cartography in two-dimensional maps that reflect a flat-earth perception, and comparing it to globular projections that rely on complex spherical geography.

Introduction

David A. King wrote that with the expansion of the Islamic empire, Muslim scholars applied astronomy, mathematics and spherical trigonometry in their attempts to calculate the *qibla;* the orientation point crucial for the five daily prayers.[1] Despite his numerous contributions to the subject, King pointed out that his 'positivist' approach and focus on the technicalities of *qibla* calculation, led to the criticism of the Islamic scholar Muzzafar Iqbal, who as cited by King, believed that the latter's work was devoid of the 'metaphysical

[1] David A. King, Astronomy for Landlubbers and Navigators: The Case of the Islamic Middle Ages, Vol. 164UC (Coimbra: Biblioteca Geral 1, 1984), [hereafter King, Astronomy for Landlubbers]: pp. 211-212

doctrines' that propelled Islamic scientific tradition.[2] This 'positivist' approach is similarly noticed in the works of modern Muslim geographers and topographers.[3] The aim of this paper therefore is to explore the historical and philosophical contexts that shaped the cartographic methods used to determine the *qibla*, focusing on the revered scriptures of Qur'ān and prophetic *ḥadīth*. After briefly looking at the lexicography and geography of Makkah and the *qibla*, this paper explores their metaphysical significance as a sacred space and direction, investigating the concepts of sanctity and centredness in Islamic theology. This paper then considers the resultant medieval and modern cartographical depictions of Makkah as the centre of the world, comparing two geographical approaches in determining the *qibla*; one that perceives the earth as flat in opposition to complex spherical geography. The works studied are placed into the context of relevant western theoretical literature on sacredness and lines, allowing the discussion to fluidly unfold with the logical sequence of the topics addressed.

Background Issues in the Literature Review

In addition to exploring the mystical value of Makkah and *qibla* in Qur'ān and *ḥadīth*, this paper will focus on the works of Qur'ān commentators, lexicographers, historians and geographers, comparing and analysing their different approaches and opinions in relation to the meaning of *qibla* and its determination. The aforementioned shall be studied within the theoretical frameworks of Emile Durkheim (1858-1917), Mircea Eliade (1907-1986) and Tim

[2] David A. King, 'Reflections on some New Studies on Applied Science in Islamic Societies (8th - 19th Centuries)', Islam & Science, 1 (Summer 2004), [hereafter King, Reflections on some New Studies]: p.45

[3] Hussaīn Kamāl al-Dīn, 'Makkah-Based Earth Projection and the Determination of the Qibla', Islamic Research Journal, 2 (Shawāl 1395 – Rabī' al-Awwal 1396 hijrī), [hereafter Kamāl al-Dīn]: 289-338; Ahmad S. Massasati, 'Developing a Prayer Circles (PC) and Prayer Direction Circles (PDC) Map', Journal of Humanities and Social Sciences 20, no.1 (April 2004), [hereafter Massasati, 'Developing a Prayer Circles']: 3-22; Ahmad S. Massasati, 'Mapping the Direction to Makkah: A Cartographic Perspective', American Journal of Islamic Social Sciences, 19 (2002), [hereafter Massasati, 'Mapping the Direction to Makkah']: 87-94; S. Kamal Abdali, 'The Correct Qibla', (1997), http://nurlu.narod.ru/qibla.pdf; [accessed 14 December 2014],[hereafter Abdali]: 1-36

Ingold.[4] While Eliade dealt extensively with the concept of the 'axis mundi' relevant to the *qibla* as an orientation point for daily rituals, Durkheim studied how these rituals provide a sense of unity to the members of society; the main purpose of religion in his opinion.[5] Furthermore, Ingold's study of the concept of lines will be useful in analysing the *qibla* as a 'terminus' of many 'invisible' lines that connect the Muslim to his or her sacred point.[6] This paper will also explore how Makkah's theological centredness is reflected in both medieval cartography and modern 'positivist' *qibla* studies.

Part I: Exploring the Metaphysical and Theological Significance of Makkah

The Sacred Space: Lexicography and Geography

The sacred city of Islam has been mentioned in the Qur'ān by the two names Makkah and Bakkah.[7] Historian Mahmūd Shukrī al-Alūsī (1856-1924) wrote that Makkah refers to the whole city and Bakkah refers to the 'house', specifically the cubic shrine at the centre of the Mosque.[8] This house, Geographer Yaqūt al-Hamawī (1179–1229 CE) elaborated, is also known as the Ka'ba which literally translates to 'square house' or 'cube'; perceived by Eliade as a representation of the 'imago mundi.'[9] The direction of prayer towards the Ka'ba, lexicographer ibn Manẓūr (1233-1312 CE) noted, is called *qibla;* a word

[4] Mircea Eliade, The Sacred and the Profane (London: Harcourt Brace Jovanovich London, 1959), [hereafter Eliade]; Emile Durkheim, The Elementary Forms of the Religious Life, trans. by Joseph Ward Swain (London: George Allen & Unwin Ltd., 1915), [hereafter Durkheim]; Tim Ingold, Lines: A Brief History (New York: Routledge, 2007), [hereafter Ingold].

[5] Eliade, pp.36-42; Durkheim, p.375

[6] Ingold, pp.49-50; pp.75-77; p.96

[7] The Qur'ān, 48:24; 3:96

[8] Mahmūd Shukrī al-Alūsī, The Fulfillment of Desire on Knowledge of the Affairs of Pagan Arabs, ed. by Muhammad Bahgat al-Atharī, Vol. 1 (Beirut: Dār al-Kutub al-'Ilmīya, 1992), p.228.

[9] Shihāb al-Dīn abū 'Abdulla Yaqūt bin 'Abdulla al-Rūmī al-Ḥamawī, Mu'jam Al-Buldān Or Dictionary of Counrties, vol.4 (Beirut: Dār Sāder, 1995), [hereafter al-Ḥamawī]: p.463; Eliade, pp.44-45.

derived from the verb *qabila* which indicates that which is coming, approaching and facing.[10] According to al-Ḥamawī, Makkah was mentioned in Claudius Ptolemy's (c.90-168 CE) *Geography* with the coordinates of 78 degrees west and 23 or 21 degrees 'below the point of Cancer,' apparently referring to what is presently known as the 'Tropic of Cancer.'[11] Stephen M. Fabian stated that this tropic defines a geographical circle of latitude that falls on approximately 23.5 degrees north of the equator, which is the degree that marks the farthest northern limit from which the sun appears directly overhead at its culmination on the June summer solstice.[12] The coordinates referred to by al-Ḥamawī hence seem to be 23 or 21 degrees above the equator, and two or half a degree below the Tropic of Cancer. Although no city with the name Makkah or the aforesaid coordinates is found in Ptolemy's *Geography*, a city called Macoraba is mentioned with the coordinates of 73 degree longitude and 22 degree latitude in his list of Arabian Felix cities (fig. 1).[13] Relying on the *The Times Atlas of the World,* Ahmad S. Massasati pointed out that the modern coordinates of Makkah are 21N25 and 39E47.[14]

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[10] Abū al-Fadl Jamāl al-Dīn Muhammad ibn Mukarram ibn Manẓūr, Lisān Al-'Arab, vol.11 (Beirut: Dār Sāder, 1994), [hereafter ibn Manẓūr]: p.537

[11] al-Hamawī, vol.5, p.181

[12] Stephen M. Fabian, Patterns in the Sky: An Introduction to Ethnoastronomy (Long Grove: Waveland Press): pp.13-14; p.113

[13] Claudius Ptolemy, The Geography, trans. by Edward Luther Stevenson (New York: Dover, 1991), 6:7

[14] Massasati, 'Developing a Prayer Circles', p.18; The Times Atlas of the World (New York: Times Books, 1999)

Figure 1: A reproduction of Claudius Ptolemy's Sixth Map of Asia: Which Includes Arabia Felix, Carmania, and the Persian Gulf *with the city of 'Macoraba' positioned at 73 degree longitude and 22 degree latitude. Geradus Mercator, 1578 CE. Map, 31 x 46 cm. From https://www.wdl.org/en/item/2916/ (accessed 17 August 2016). Image courtesy of the Qatar National Library*

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The Revelation: The 'Cosmicization' of the Qibla

According to the two *Sahīhs* also known as the *Sahīh* of al-Bukhārī (810-870 CE) and Muslim (821-875 CE), the most trusted compilations of prophetic sayings, early Muslims prayed towards Jerusalem for seventeen months after *hijra,* the latter referring to the key date of the migration of the Prophet Muḥammad in 622 CE from Makkah to al-Madīnah after years of persecution

by his tribe Quraīsh.[15] Around that time, Qur'ān commentator al-Tabarī (839-923 CE) wrote, the Prophet consistently looked up after each prayer towards the heavens as if anticipating an order from God.[16] Indeed, the order did come through divine revelation in the Qur'ānic verse:

> We have certainly seen the turning of your face, [O Muhammad], toward the heaven, and We will surely turn you to a qiblah with which you will be pleased. So turn your face toward al-Masjid al-Haram (the Sacred Mosque). And wherever you [believers] are, turn your faces toward it [in prayer].[17]

This revelation was the 'theophany' that defined the new point of orientation, the 'absolute fixed point' and the 'axis mundi' that Eliade associated with sacred places.[18] Makkah and the Ka'ba were instantly 'cosmicized' into a sacred direction and transformed into what Eliade described as an open portal to heavenly communication, putting an end to the Prophet's disorientation.[19] Yet when no sign manifests, Eliade observed, it is deliberately provoked to define the requisite point of orientation that breaks the relativity of profane space.[20] Likewise, the revelation of the new *qibla* was not spontaneous, al-Tabarī opined, but deliberately sought and provoked by the Prophet who desired Makkah to be his orientation point.[21] As stated by theologian and philosopher al-Rāzī (1149-1209 CE), Arabs were naturally inclined to revere Makkah more than Jerusalem, since the 'state of the Arabs' emerged and

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[15] Muslim ibn al-Ḥajjāj Abū al-Ḥasan al-Qushaīrī al-Naīsābūrī, Sahīh Muslim, trans. Abdul Hamid Siddiqui, book 4 of Prayers (Lahore: Ashraf, 1981), [hereafter Sahīh Muslim]: hadīth no. 1071; Abū 'Abd Allāh Muḥammad ibn Ismā'īl al-Bukhārī, Sahīh Al-Bukhārī, trans. by Muhammad Muhsin Khan, vol.1, book 8 of Prayer (Virginia: al-Saadawi Publications, 1996),[hereafter Sahīh Al-Bukhārī]: hadīth no. 392

[16] Abū Ja'far al-Tabarī, Al-Tabarī Qur'ān Commentary: The Complete Elucidation about the Interpretation of the Verses of the Qur'ān, vol.2, (Cairo: Dār Hajr l' al-Tibā'a wa'l-Nahsr wa'l-Tawzī', 2001), [hereafter al-Tabarī]: p.657

[17] The Qur'ān, trans. Saheeh International (Birmingham: Maktabah Booksellers and Publishers, 2010), [hereafter The Qur'ān]: 2:144

[18] Eliade, p.21; p.36

[19] Eliade, pp.26-30

[20] Eliade, p.27

[21] al-Tabarī, vol.2, pp.656-657

flourished after the erection of the Ka'ba.[22] Therefore, as al-Rāzī suggested, the Prophet desired and prayed for this change of *qibla* to appeal to pagan Arabs who were resisting the new religion.[23] Al-Rāzī also opined that veneration for the city of birth and origin of Prophet subsequently entails respect and reverence for the Prophet himself.[24] Furthermore, both al-Tabarī and al-Rāzī wrote that early Muslims were initially directed to face Jerusalem in order to be distinguished from the pagans, and after their migration to al-Madīnah, the *qibla* was changed to Makkah to set them apart from the Jews of al-Madīnah who prayed towards Jerusalem.[25] Hence it is apparent in this case that society organizes the space which it occupies in order to avoid potential 'collision' between incompatible social groups as Durkheim proposed.[26]

However, ninth century historian and commentator al-Azruqī suggested that the 'cosmicization' of Makkah began with Creation.[27] In his book *Aḵbār Makkah* or *History of Makkah;* based extensively on prophetic *ḥadīth*; al-Azruqī wrote that God created the 'sacred house' for the first man and prophet Ādam, who felt forsaken after his fall from the Garden of Eden.[28] This 'house' was meant to bring Ādam solace, al-Azruqī continued, serving as a mirror image of what Ādam was accustomed to in the world above.[29] God then said, 'Ādam, I am sending with you My House to be circumambulated as My Throne is circumambulated, and to be prayed towards like My Throne,' al-Azruqī narrated.[30] This paradigmatic model which the Ka'ba replicates, al-Azruqī elaborated, is known as *al-Bayt al-Ma'mūr,* or the 'Much-frequented House,' located in the seventh firmament.[31] The foundations of the Ka'ba on the other

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[22] Fakhr al-Dīn al-Rāzī, Al-Tafsīr Al-Kabīr or The Great Commentary, vol.4 (Beirut: Dār Ihiā' al-Turāth al-'Arabī, 1999), [hereafter al-Rāzī]: p.83

[23] al-Rāzī, vol.4, pp.94-95

[24] al-Rāzī, vol.4, p.83

[25] al-Tabarī, vol.2, pp.657-658; al-Rāzī, vol.4, p.83

[26] Durkheim, p.443

[27] Muḥammad bin 'Abdulla al-Azruqī, Akhbār Makkah W Ma Jā' Fīha Min Al-Āthār Or the History of Makkah (Beirut: Dār al-Andalus, 1983), [hereafter al-Azruqī]: pp.66-82

[28] al-Azruqī, p.77

[29] al-Azruqī, p.77

[30] al-Azruqī, p.112

[31] al-Azruqī, p.71

hand, al-Azruqī added, stretch down to the seventh earth.[32] Hence, divine intervention saved Ādam from the 'foreign' and 'unknown' profane world, providing him with what Eliade perceived as 'cosmicized' space; a microcosmic replica of the macrocosmic universal model and celestial order.[33] With the 'descent' of the Ka'ba, Ādam was able to access Eliade's 'axis mundi'; an open portal to divine communication that connects the three realms of heaven, earth and the underworld.[34]

The 'house' was then 'lifted' at the time of the Genesis flood of Noah, al-Azruqī wrote, and its location was revealed centuries later to prophet Ibrahīm or Abraham through Archangel Gabriel.[35] After his son prophet Isma'īl grew into adulthood, al-Azruqī continued, Ibrahīm was ordered to return to the 'sacred land' to build the 'House of God' on the already existing foundations; thence becoming a symbol of Abrahamic monotheism.[36] The incident was perpetuated in the Qur'ānic verse; 'And [mention] when Abraham was raising the foundations of the House and [with him] Ishmael, [saying], "Our Lord, accept [this] from us. Indeed You are the Hearing, the Knowing".'[37] The exact location of the primordial foundations of the Ka'ba, al-Azruqī added, was shown to Ibrahīm through a 'floating cloud'; the mysterious sign mentioned by Eliade, for 'men are not free to choose the sacred site.'[38]

The *qibla* hence serves to commemorate what Durkheim described as the 'mythical history' of an ancestor; in this case prophets Ādam, Ibrahīm and Muḥammad.[39] According to al-Rāzī, 'believers faced the Ka'ba because it is the *qibla* of *Khalīl Allah* (God's close companion) and the birth place of *Habīb Allah* (God's beloved)'; referring to prophets Ibrahīm and Muḥammad respectively.[40] Thus, as Durkheim proposed, the five daily prayers perpetuate a system of beliefs that maintain the unity of Muslims around the globe,

[32] al-Azruqī, p.68
[33] Eliade, p.29; p.30-32
[34] Eliade, pp.36-37
[35] al-Azruqī, p.97
[36] al-Azruqī, pp.104-105
[37] Al-Azruqī, p.108; The Qur'ān, 2:127
[38] al-Azruqī, pp.104-110; Eliade, p.28
[39] Durkheim, pp.371-372
[40] al-Rāzī, vol.4, pp.82-83

reviving their connection every day to the founder of their religion, Prophet Muḥammad, for as al-Rāzī wrote, Muslims face 'the ascension place of the Master of Light, Muḥammad peace be upon him, for from his light all light was created.'[41]

Al-Harām: The Sacred and its Threshold

As stated by Durkheim, the categories of understanding consist of essential spatial and temporal contexts that enable the mind to understand experience.[42] These categories are constructed by the 'collective consciousness,' Durkheim added, which is transcendental social intelligence.[43] Both spatial and temporal differentiations are crucial components in the Islamic concept of *ḥarām*. Makkah is referred to in many verses of the Qur'ān as *al-Masjid al-Ḥarām*.[44] According to ibn Manẓūr, *al-Masjid al-Ḥarām* is also known as *Ḥaram of Makkah* and *Ḥaram of Allah*.[45] The words *ḥaram, ḥarām and ḥarem*, and all of their derivatives, indicate that which is forbidden and taboo, ibn Manẓūr explained.[46] For instance, the word *maḥram*, he continued, signifies close blood relatives to which marriage is banned, such as the father, uncle, son and nephew.[47] Clearly therefore, the *ḥaram* refers to the sacred which Durkheim described as 'that which the profane should not touch, and cannot touch with impunity.'[48] It is also the 'taboo' realm that mandates the 'avoidance of certain places, objects or people,' as Fiona Bowie clarified.[49] Thus, the verb *aḥrama,* ibn Manẓūr added, denotes the act of entering into a state of sanctity that mandates the observation

[41] Durkheim, p.375, al-Razī, vol.4, p.82
[42] Durkheim, p.9
[43] Durkheim, pp.442-443
[44] The Qur'ān, 2:144; 2:149; 2:150; 2:191; 2:217; 5:2; 8:34; 9:7; 9:19; 9:28; 17:1; 22:25; 48:25; 48:27
[45] ibn Manẓūr, vol.12, p.120
[46] ibn Manẓūr, vol.12, p.129
[47] ibn Manẓūr, vol.12, p.123
[48] Durkheim, p.40
[49] Fiona Bowie, The Anthropology of Religion: An Introduction (Oxford: Wiley-Blackwell, 2000), p.123

of restrictions which include a severe ban on hunting, killing game and cutting trees.[50] In *Sahīh al-Bukhārī*, the Prophet is narrated to have said:

So, it [Makkah] is a sanctuary by Allah's Decree till the Day of Resurrection. Its thorny bushes should not be cut, and its game should not be chased, its fallen property should not be picked up except by one who will announce it publicly; and its grass should not be uprooted.[51]

The 'irruption' of any sacred space, Eliade proposed, entails the formation of a 'threshold' that surrounds and separates it from the profane.[52] The *ḥaram*, ibn Manẓūr stated, is a large territory that extends beyond the Sacred Mosque with distinguished boundaries since Pagan Arabia.[53] These borders are defined by physical markers called *manār*, ibn Manẓūr added, which are believed to have been placed by prophet Ibrahīm.[54] While the *manār* are visible, the 'taut strings' of boundaries between them are 'imaginary' yet consequential, as Ingold suggested, segregating and partitioning space.[55] These 'ghostly' lines are so seriously delineated that in *Sahīh Muslim* one reads that the Prophet said, 'Allah cursed him who changed the *manār*.'[56] Such invisible lines in general, were perceived by Ingold as demarcating and differentiating time as well.[57]

Truly, the 'threshold' of sacredness and sanctity is not confined to the limits of space and geography in Islam, but encompasses time as well, for as revealed in the Qur'an; 'Allah has made the Ka'ba, the Sacred House, standing for the people and [has sanctified] the sacred months.'[58] The sacred months according to *Sahīh al-Bukhārī* are *Dhul-Qa' da*, *Dhul-Ḥijja*, *Muḥarram*, and *Rajab*.[59] Ibn Manẓūr pointed out that these months were called the *ḥurum* or sacred months since Pagan Arabia.[60] Hence, the word *muḥrim*, ibn Manẓūr concluded,

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[50] ibn Manẓūr, vol.12, p.122
[51] Sahīh al-Bukhārī, Book 58 of Jizyah and Mawaada'ah, hadīth no. 30
[52] Eliade, p.25
[53] ibn Manẓūr, vol.12, p.122
[54] ibn Manẓūr, vol.5, p.241
[55] Ingold, pp.49-50
[56] Sahīh Muslim, Book 35 of Sacrifices, hadīth no. 61
[57] Ingold, p.50
[58] The Qur'ān, 5:97
[59] Sahīh al-Bukhārī, Book 59 of Beginning of Creation, hadīth no. 8
[60] ibn Manẓūr, vol.12, p.121

also refers to a person entering the sanctity of a sacred month, which mandates a ban on raiding, hunting and bloodshed.[61] This ban was further emphasized in the Qur'ān; 'forbidden to you is game from the land as long as you are in the state of ihram.'[62] Serious consequences follow the desecration of the sanctity of these months, for 'whoever returns [to violation], then Allah will take retribution from him.'[63]

Hence, in Islam exists a perpetual spatial *iḥrām* within the precincts of *al-Masjid al-Ḥarām,* and a temporal *iḥrām* independent of space. According to *ḥadīth* compiler Abu Dawūd (817-889 CE), the Prophet said that the devout Muslim enters into a state of temporal *iḥrām* five times a day through *takbīrat al-iḥrām*; the inaugural part of the prayer that involves the recitation of the phrase 'Allāhu Akbar' or 'God is Great' after which the worshipper refrains from external activities.[64] Clearly, *takbīrat al-iḥrām* serves as Durkheim's 'initiation rite,' transporting worshippers into the realm of *ḥarām*, and signalling their withdrawal from the profane to the sacred.[65] The 'threshold' of *ihrām* could be accessed from any place, for as mentioned in the Qur'ān, 'to Allah belongs the east and the west. So wherever you [might] turn, there is the Face of Allah.'[66] Although all directions are equal since all have been created by God, al-Rāzī elucidated, some are holier than others, the *qibla* being the holiest of all.[67]

Ingold opined that any line of transport carries the traveller 'across' to the desired 'terminus'; the point that marks the moment of completion.[68] Likewise, at the moment of *takbīrat al-iḥrām,* the worshipper travels 'across' an invisible line beyond space and time to the *qibla*, the 'terminus' of the *ḥarām;* the point and destination to which all worshippers globally face. This imperceptible straight line that connects every Muslim to the *qibla* facilitates the process of

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[61] ibn Manẓūr, vol,12, p.122

[62] The Qur'ān, 5:96

[63] The Qur'ān, 5:95

[64] Abu Dawūd Sulaīmān ibn al-Ash'ath al-Sijistānī, Sunan abī Dawūd, vol.1 , book 1 of Purification (Beirut: al-Maktabah al-'Asrīyah, n.d.), hadīth no. 61

[65] Durkheim, pp.38-40

[66] The Qur'ān, 2:115

[67] al-Rāzī, vol.4, p.83

[68] Ingold, pp.75-77

guided sanctity, for 'To Allah belongs the east and the west. He guides whom He wills to a straight path.'[69] Unlike the terms 'crooked' and 'twisted,' which according to Ingold became linguistically synonymous to mental and ethical perversion, the straightness of the line here clearly represents what Ingold perceived as a symbolisation of morality and virtue.[70]

Thus, the metaphysical value of Makkah as a divinely consecrated space and direction defined the 'axis mundi' towards which every Muslim is initiated daily into a sacred realm which is both temporal and spatial. Makkah's spiritual, and subsequently liturgical, centrality clearly serves a crucial psycho-sociological role. In addition to commemorating the history of key paradigmatic figures in Islamic theology, the *qibla*, or the terminus that connects worshipping Muslims around the globe, sustains a sense of unity among believers, revitalising their societal identity and differentiating them from others. With the expansion of the Islamic empire, the vital mystical and ritualistic need to define the Makkan point of orientation fundamentally shaped the Islamic geographical perception of the world propelling a rich tradition of Makkah-centred cartography.

Part II: Locating the qibla in the Expanding Islamic Empire

Islamic Sacred Geography: Examining Makkah-Centred Cartography

Eliade proposed that sacred space is perceived as the centre and the 'navel' from which the universe is born and spreads out to the four cardinal points which are represented by the square, or in this case the Ka'ba.[71] This view is evident in the work of al-Ḥamawī who suggested that Makkah was described in the Qur'ān as *Umm al-Qurā* or the 'Mother of Cities' because it is the origin, centre and 'navel of the earth.'[72] Al-Azruqī similarly wrote that Makkah is the primordial point that preceded the Genesis and from which all lands stretched

[69] The Qur'ān, 2:142
[70] Ingold, pp.152-153
[71] Eliade, pp.44-45
[72] The Qur'ān, 42:7; al-Ḥamawī, vol.1, pp.254-255

out.[73] Moreover, al-Rāzī opined that the word *shaṭra* in the verse, 'turn your face (*shaṭra*) toward al-Masjid al-Ḥarām,' denotes the 'centre,' and since the Ka'ba is located at the centre of the Mosque, he continued, it therefore becomes the *qibla*.[74] It is also reported that the Prophet said, al-Rāzī added, that 'The Ka'ba is the *qibla* of the people of the Mosque, and the Mosque is the *qibla* of the people of the *ḥaram*, and the *ḥaram* is the *qibla* of the people of the east and west.'[75] In the Qur'ān, the concepts of *qibla* and *waṣaṭ*, or centre, are linked:

And thus we have made you a just (wasaṭan) community that you will be witnesses over the people and the Messenger will be a witness over you. And We did not make the qiblah which you used to face except that We might make evident who would follow the Messenger from who would turn back on his heels.[76]

Since the Ka'ba is the centre and 'navel' of the earth, al-Rāzī concluded, God naturally ordered all his creation to face this centre in prayer, for God is just and loves 'centredness' and moderation in everything.[77] Hence, the concept of Makkah's centredness reflects the Islamic concept of *waṣaṭīah*; moderation coupled with righteousness. This led to the development of what King termed as the 'sacred geography' of Islam, in which the whole world is divided into sectors around the Ka'ba.[78] While the geographer al-Idrīsī (1099-1161 CE) depicted Makkah as the centre of a circular world surrounded by sea (fig. 2), fourteenth century historian ibn al-Wardī (fig. 3) and sixteenth century cartographer al-Sifāqsī (fig. 4) divided the world into segments around the edifice of the Ka'ba as a locational aid for the worshiper anywhere on the

[73] al-Azruqī, p.67
[74] al-Rāzī, vol.4, p.97; The Qur'ān, 2:144
[75] al-Rāzī, vol.4, pp.98-99
[76] The Qur'ān, 2:143
[77] al-Rāzī, vol.4, pp.82-84
[78] King, Reflections on some New Studies, p.48; David A. King and Richard P. Lorch, 'Qibla Charts, Qibla Maps, and Related Instruments', in History of Cartography: Cartography in the Traditional Islamic and South Asian Societies, vol.2 (Chicago: University of Chicago Press, 1995), [hereafter King, ''Qibla Charts, Qibla Maps, and Related Instruments']: chap.9, p.190

globe.[79] Comparable to Ingold's segments resulting from connecting yet segregating lines, the linear sectors of these Makkah-centred maps merge together into a complete and holistic pattern of 'a higher order'.[80]

[79] abū Abdullah Muḥammad al-Idrīsī, 'Nuzhat Al-Mushtāq fī Ikhtirāq Al-Āfāq'or 'The Pleasure of Him Who Longs to Cross the Horizons,' Manuscript (Sicily: 1154), Arabe 2221, Bibliothèque nationale de France, fols.3v-4r; Zayn al-Dīn 'Umar ibn al-Muẓaffar ibn al-Wardī, 'Kharīdat al-'ajā'ib wa-farīdat al-gharā'ib' or 'The Pearl of wonders and the Uniqueness of strange things', Manuscript (17th century) Garrett no. 267B, fol.43b, Islamic Manuscripts Collection, Manuscripts Division, Department of Rare Books and Special Collections, Princeton University Library; 'Alī ibn Aḥmad ibn Muḥammad al-Sharafī al-Sifāqsī, 'Sea Atlas Made by 'Ali ibn Muhammad al-Sharafi al-Sifaqsi', Manuscript (1551 CE), Arabe 2278, Bibliothèque nationale de France, fol.2v.

[80] Ingold, p.74

Figure 2 Makkah-centred map depicting the classical world with the north placed at the bottom by eleventh century geographer al-Idrīsī. Manuscript, 1154 CE. From Bibliothèque nationale de France, Arabe 2221, fols.3v-4r. Reproduced with permission

Figure 3 The world arranged around the Ka'ba in an eleven sector scheme of sacred geography by ibn al-Wardī. Manuscript, 1800s. From Islamic Manuscripts Collection, Manuscripts Division, Department of Rare Books and Special Collections, Princeton University Library, Garret no. 267B, fol.43b. Reproduced with permission.

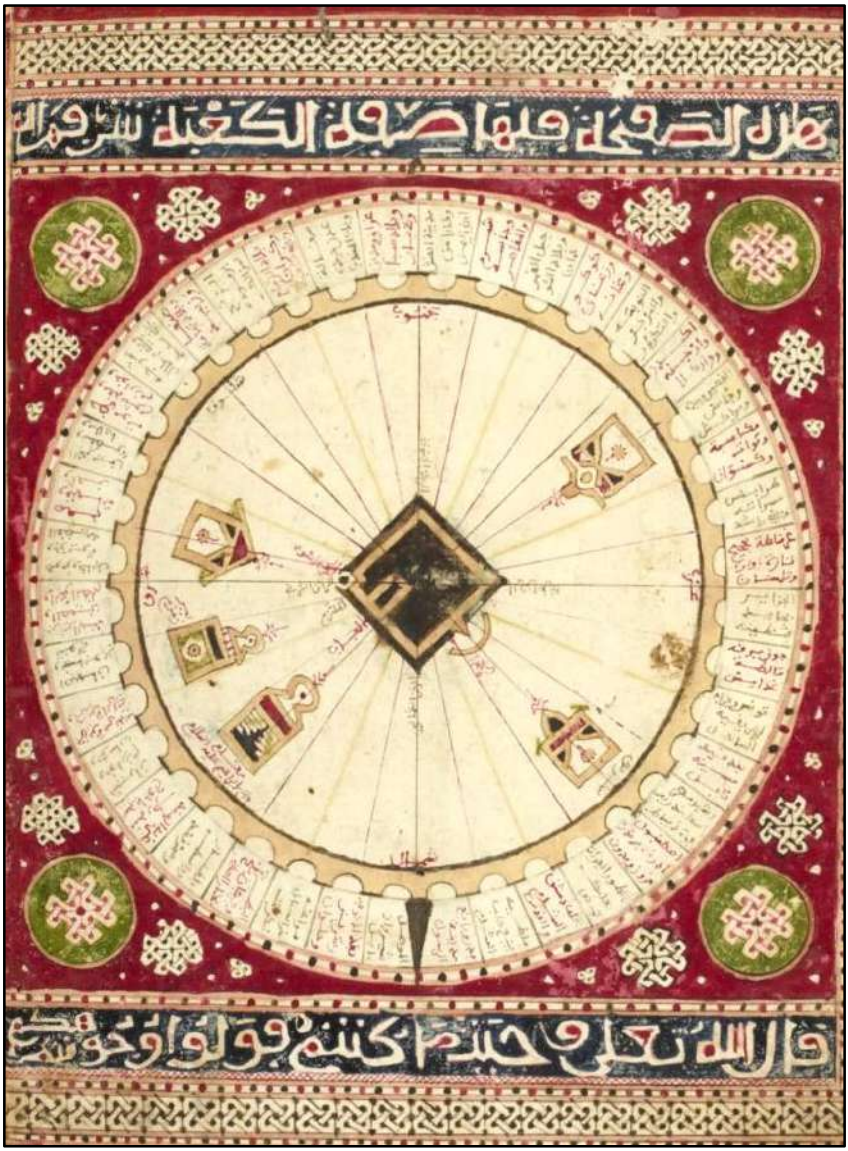

Figure 4 Forty sector scheme of sacred geography with the Ka'ba edifice located at the centre by sixteenth century cartographer al-Sifāqsī. Manuscript ,1551 CE. From Bibliothèque Nationale de France, Arabe 2278, fol.2v. Reproduced with permission.

As stated by King, Muslim scholars who attempted to locate the *qibla* belonged to two distinct traditions; mathematical astronomy and folkloric legislative astronomy.[81] The scheme of 'sacred geography,' King explained, was devised by the 'legislators' who sought simple and practical methods to determine the qibla.[82] The 'scientists' on the other hand, King elaborated, determined the direction of the *qibla* along great circles of the terrestrial sphere, applying complex trigonometric and geometric methods.[83] The methodical dichotomy between the two traditions still exists, King observed, for in North America the 'scientists' maintain that the *qibla* is located to the north of east, whereas the 'legislators' believe that the *qibla* is south of east.[84] S. Kamal Abdali wrote that the faulty judgement of the 'legislators' resulted from viewing the earth as a flat map; labelled by King as 'naïve folk geography.'[85] Apparently, legislative scholars favoured the 'straight' path and flat map over the 'curves of nature', since as Ingold wrote, linear lines were always associated with superior morality.[86]

Alternatively, King noticed that beginning from the eighth century Muslim 'scientists' developed different projections to help them determine the *qibla*.[87] A map projection, according to John P. Snyder, is a representation of a portion of a spherical earth on a two dimensional plane.[88] The popular Mercator projection, Snyder wrote, is a two dimensional flat map intended mainly as a navigational map to be used with rhumb lines; paths with a constant bearing

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[81] King, Reflections on some New Studies, p.44; King, Astronomy for Landlubbers, pp.212-213

[82] David A. King, 'Two Iranian World Maps for Finding the Direction and Distance to Mecca', Imago Mundi, 49 (1997), [hereafter King, 'Two Iranian World Maps']: p.64

[83] David A. King, 'Two Iranian World Maps', p.64

[84] King, Reflections on some New Studies, p44; Abdali, p.1; Massasati, 'Mapping the Direction to Makkah', p.93

[85] Abdali, p.1; King, Reflections on some New Studies, pp.44-45

[86] Ingold, pp.152-153

[87] David A. King, World Maps for Finding the Direction and Distance of Mecca: Examples of Innovation and Tradition in Islamic Science (Leiden: Brill, 1999): p.56

[88] John P. Snyder, Flattening the Earth: Two Thousand Years of Map Projections (Chicago: University of Chicago Press, 1997), [hereafter Snyder]: p.1

relative to the magnetic north.[89] Yet the rhumb lines favoured by 'legislators' do not give directions accurately, Abdali observed, since meridians in reality are not parallel, but converge at the North Pole.[90] In contrast, globular map projections which include azimuthal projections, Snyder noted, were first developed by the illustrious Muslim 'scientist' al-Biruni (973-1048 CE) in his attempt locate the *qibla*.[91] The word azimuth is actually derived from the Arabic *al-sumūt* which translates to 'directions' according to Snyder and ibn Manẓūr.[92] Thus as Snyder stated, azimuthal projections provide accurate directions from the centre point of the projection.[93] An important feature of this map, Abdali noted, is its use of great circles to determine direction.[94] Abdali pointed out that any two points on the globe are connected through a great circle that runs across the surface of a sphere dividing it into two equal sections.[95] When it comes to *qibla* computation, Abdali added, the shortest path between the two is taken.[96] Therefore, the line of the great circle becomes synonymous to Ingold's line of 'transport,' in which the destination and the point mark the 'moment of completion.'[97]

One of the best known azimuthal projections, Snyder pointed out, is the 'Mecca projection' (fig. 5) developed in 1909 by James I. Craig (1865-1952).[98] In this projection, Abdali observed, the angle of the *qibla* is found by drawing a straight line from any location to Makkah.[99] Although this projection works well for locations close to Mecca, Snyder and Abdali commented, its distortion

[89] Snyder, p.96; pp.156-157; Abdali, p.12
[90] Abdali, pp.12-13
[91] Snyder, p.14; abū al-Raīhān Moḥammad bin Aḥmad al-Bīrūnī,, Al-Qanūn Al-Mas'ūdī Or the Mas'ūdic Canon, vol.2 (Hyderabad: Matba'3at Dār al-Ma'ārif al-'Uthmānīa, 1954), pp.526-528.
[92] Snyder, p.16; ibn Manẓūr, vol.2, p.46
[93] Snyder, p.16
[94] Abdali, pp.21-23
[95] Abdali, p.11
[96] Abdali, p.11
[97] Abdali, p.77
[98] Snyder, p.227
[99] Abdali, pp.22-23

increases in distant locations rendering it is useless for the Americas.[100] Egyptian Topographer Ḥussaīn Kamāl al-Dīn (1913-1987) addressed this problem by developing an azimuthal projection that encompasses the seven continents, enhancing it with an outer ring of azimuthal degrees (fig. 6).[101] Makkah, which is represented with the letter 'M,' Kamāl al-Dīn wrote, is located at the centre.[102] Thus, connecting any point on this projection to the point 'M' and extending the line to the outer ring gives the direction of Mecca, he explained.[103] Kamāl al-Dīn also designed another solution that innovatively combines the Mercator projection with great circles, resulting in curved lines that converge at Makkah (fig. 7).[104] The worshipper should identify the closest line to his location, he clarified, and then pray towards the angle specified next to that line.[105] The two other points in which the lines converge on either side of this projection fall on the pacific island of Muroroa, Kamāl al-Dīn added, the point exactly opposite Makkah on the other side of the globe; also known as its antipode.[106] A person living on Muroroa could pray towards any direction, Kamāl al-Dīn and Massassati opined.[107] Another unique projection was developed by Massassati who envisioned 'Prayer Circles' that start from around Makka, increasing in size till 90 degrees away from Makkah, and then decreasing and stopping at Makkah's antipode (fig. 8).[108] To face the Ka'ba, Massasati explained, the worshipper should follow the 'Prayer Direction Circles,' which are lines perpendicular to the 'Prayer Circles.'[109]

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[100] Snyder, p.228; Abdali, p23
[101] Kamāl al-Dīn, pp.315-317
[102] Kamāl al-Dīn, p.315
[103] Kamāl al-Dīn, p.315
[104] Kamāl al-Dīn, p.326
[105] Kamāl al-Dīn, p.327
[106] Kamāl al-Dīn, p.325
[107] Kamāl al-Dīn, p.301; Massasati,'Developing a Prayer Circles', p.13
[108] Massasati,'Developing a Prayer Circles', p.13
[109] Masassati,'Developing a Prayer Circles', p.13

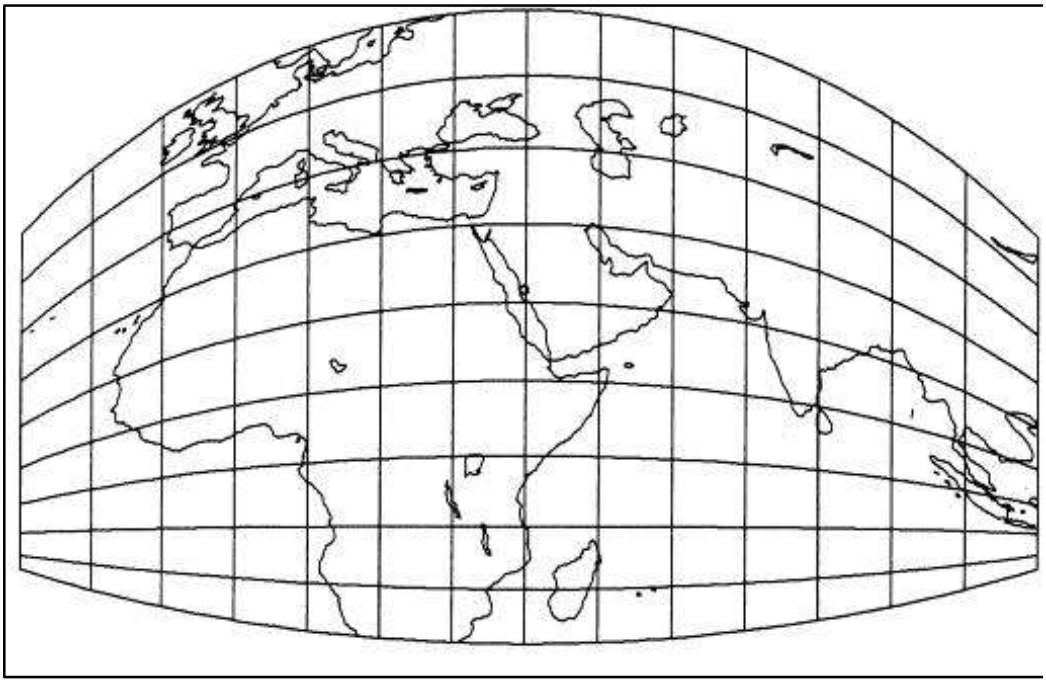

Figure 5 The Mecca Projection centred on Makkah. Illustration in John P. Snyder, Flattening the Earth: Two Thousand Years of Map Projections (University of Chicago Press, 1997), p.228. Image courtesy of The University of Chicago Press. © 1993 by The University of Chicago

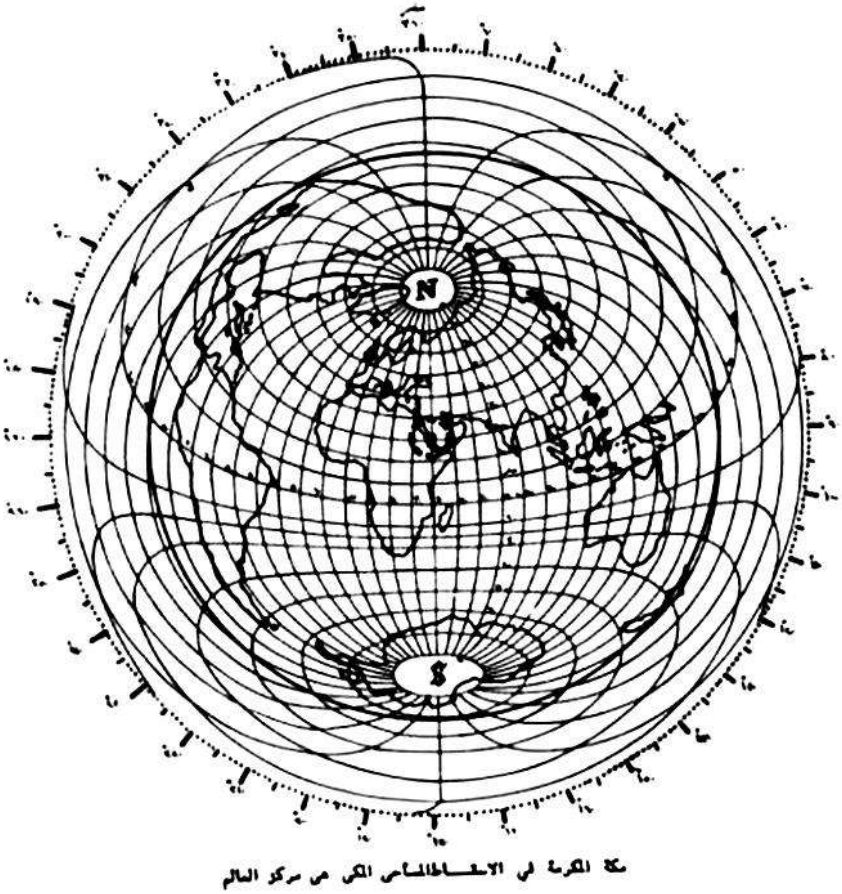

Figure 6. Makkah-centred azimuthal projection surrounded with an outer ring of azimuthal degrees by Ḥussaīn Kamāl al-Dīn. Illustration in Ḥussaīn Kamāl al-Dīn, 'Makkah-Based Earth Projection and the Determination of the Qibla', Islamic Research Journal, 2 (Shawāl 1395 – Rabīʿ al-Awwal 1396 hijrī), p.316. Image courtesy of Portal for the General Presidency of Scholarly Research and Ifta'

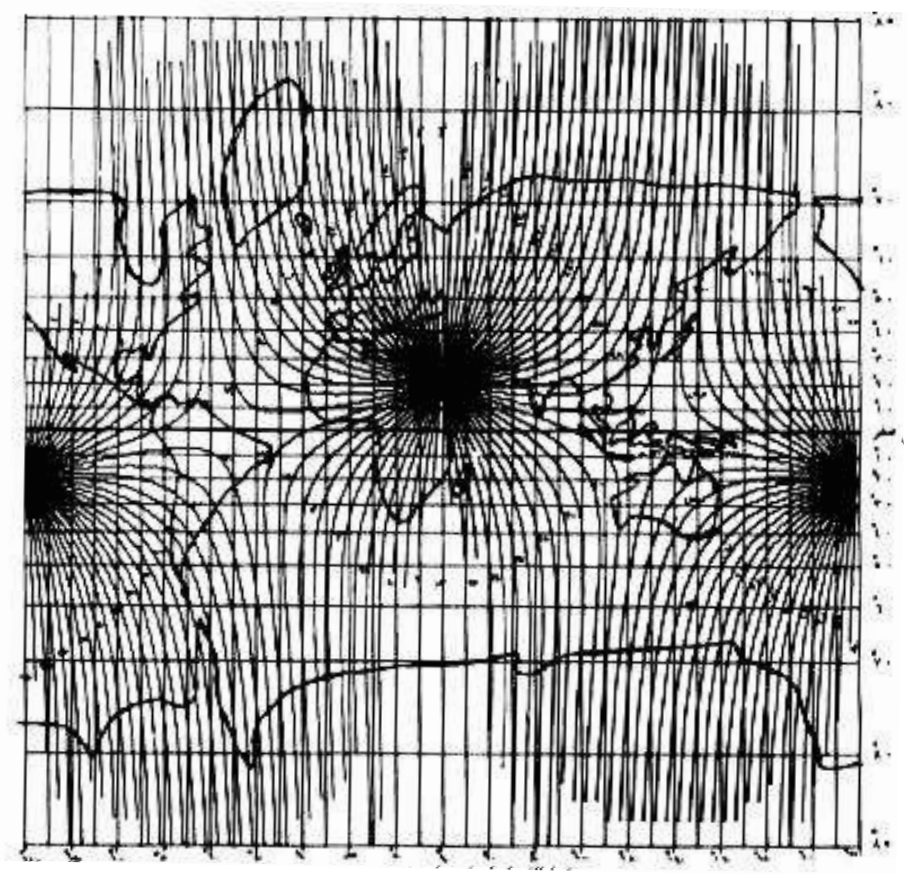

Figure 7. Makkah-centred Mercator projection combined with the arcs of great circles by Ḥussaīn Kamāl al-Dīn. Illustration in Ḥussaīn Kamāl al-Dīn, 'Makkah-Based Earth Projection and the Determination of the Qibla', Islamic Research Journal, 2 (Shawāl 1395 – Rabīʿ al-Awwal 1396 hijrī), p.326. Image courtesy of Portal for the General Presidency of Scholarly Research and Ifta'.

Figure 8. Makkah-centred projection with Prayer Circles and Prayer Direction Circles by Ahmad S. Massasati. Illustration in Ahmad S. Massasati, 'The Making of Prayer Circles (PC) and Prayer Direction Circles (PDC) Map', Journal of Humanities and Social Sciences 20, no.1 (April 2004), p.13. Image courtesy of College of Humanities and Social Sciences (CHSS), United Arab Emirates University.

It is evident hence that both the medieval and modern, legislative and scientific, perception of the world was significantly influenced, if not modelled, by the Islamic faith as epitomised by the centrality of Makkah in the Muslim's life. The House of Allah, or the Ka'ba in Makkah, was clearly the navel of the flat earth of the unsophisticated legislative scholar, cartographer, historian and

geographer, from which the rest of the world extended into segmented sectors arranged around this 'axis mundi'. Similarly, Makkah maintained its locational supremacy in the complex spherical geography of the mathematician and scientist. In contemporary Islamic azimuthal cartography, Makkah acquired a polar position that reflected its centrality, becoming the merging points of the 'Prayer Direction Circles' that guided the worshipper to his or her *qibla*.

Conclusion

Supplemented by the theories of Eliade, Durkheim and Ingold, part one of this paper first explored the metaphysical and theological significance of Makkah, looking at the historical accounts of its 'cosmicization.' This section also addressed the concepts of *al-ḥarām*; the spatial and temporal realm of sacredness and the 'threshold' that encompasses it; and the role of the *qibla* as an 'axis mundi' and ubiquitous portal to *al-ḥarām*. Part two of this paper then presented how the subsequent need to locate the *qibla* in an expanding Islamic empire contributed to modern day geography, starting with azimuthal projections which were developed by al-Bīrunī for that purpose. In addition to considering the *qibla* debates between what King classified as the 'scientific' and 'legislative' traditions, this paper examined how Makkah's centredness was reflected in two-dimensional maps and globular projections in medieval and modern times.[110] The metaphysical centrality Makkah symbolised is clearly reflected in the variety of innovative Makkah-centered cartographical solutions, in which the modern geographical coordinates of parallels and meridians were superseded and replaced with lines and arcs that connected the Muslim to his or her spiritual terminus, the *qibla*.

[110] King, Reflections on some New Studies, p.44; King, Astronomy for Landlubbers, pp.212-213

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