

“And the New Moon Rose Over Us”:

The Fiqh and Science of Islamic Moon-Sighting

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Muslims living in the West are often confronted with annually recurring community disputes pertaining to the identification of Islamic dates and thus too to the proper commemoration of Islamic festivities. Not uncommon are unsightly scenes of divided communities and split families at periods which are otherwise meant for collective reflection and brotherly celebration. The root of the problem lies in the absence of any consensus on how, in the absence of authoritative institutions and governmental determination, to determine the onset of the Islamic month, given in particular the traditional insistence that the first visibility of the lunar crescent is to determine the beginning of the month. In the present article, I look briefly at this problematic and the various solutions that have been suggested to remedy it.

I - The Lunar Year and the Islamic Calendar

A lunar calendar is a calendar that is based on phases of the lunar cycles. Unlike most lunar calendars (such as the Hebrew¹, Hindu and Chinese together with the bulk of known calendars used in antiquity), the Islamic calendar is not lunisolar but purely lunar to the extent that it does not allow intercalary months (typically a thirteenth lunation) to be added to bring the calendar into synchrony with the solar year (and thus the seasons). The use of an intercalary month (Nasi) was explicitly prohibited in the Revelation, in the words, “The number of months with Allah has been twelve by His ordinance since the day He created the heavens and the earth.” (Qur'an 9:37). Likewise, the prophetic Farewell Sermon reiterated the thirteenth intercalation in the twelve months as “an impious addition”, and thus diachrony became the norm and synchrony antinomial.

There are several diverging ways of expressing the lunar month.² The moon's orbital period, assuming a non-rotating frame and geocentrism, averages 27.32166 days (27 days, 7 hours, 43

¹ In 358 CE, the Hebrew calendar went from a lunar to a solar-lunar, as Hillel II agreed to Roman demands to give up the authority to proclaim the New Moon and to fixing the lunar calendar in relation to the solar. The present Hebrew calendar has six different length of years (respectively 353, 354, 355, 383, 384 and 385 days), partly born out of a desire to reconcile Jewish festivals with seasons, and partly to avoid have festivals on Fridays or Saturdays (which could lead to the horror of two Sabbaths in a row).

² For instance, the draconic month or nodal month is the period in which the Moon returns to the same node of its orbit; the nodes are the two points where the Moon's orbit crosses the plane of the Earth's orbit. Its duration is about 27.21222 days on average. Opposed to this, is the tropical month, which is defined as the time for the Moon to return to the same ecliptic longitude, i.e. measured from the equinox; it is slightly shorter than the sidereal month at 27.32158 days. Finally, an anomalistic month is the Moon's orbital period measured from perigee to perigee - the point in the Moon's orbit when it is closest to Earth. An anomalistic month is about 27.55455 days on average.

minutes, 11.6 seconds). This is known as a sidereal month and is, in practice, measured by observing how long it takes the moon to pass a fixed star on the celestial sphere. However, given the earth's own rotation (at uneven speeds), the synodic month is the most common way of expressing the lunar cycle. A synodic month corresponds to the period from one astronomical new moon to the next and is somewhat longer than the sidereal month, in the present era averaging 29.53059 days (29 days, 12 hours, 44 minutes, 2.8 seconds).³ A new moon, in turn, is defined to occur when the moon has the same ecliptic longitude as the sun, as seen from the (imagined) center of the earth, thus in theory when the sun, moon and earth are positioned in a rectilinear line.⁴ The period consisting of twelve synodic months, amounting to 354.36708 days, is oftentimes referred to as the 'lunar year'.

Even for peoples in the premodern period, it would not be too difficult to establish a pattern-producing rule for the lunar calendar.⁵ A quick, but not precise, rendition would be to define a common (non-leap) year as having 354 days, divided as 6 months of 29 days and 6 months of 30 days, whether in a regular or irregular sequence. Every third year, moreover, would be a leap-year wherein 5 months would be hollow, i.e. have 29 days, and 7 months would be full, i.e. have 30 days, for a total of 355 days, thus having an average lunar year of 354.33 days.

On a purely *prima facie* consideration, this would appear to accord with the Quranic verses, "And the Sun and Moon follow set courses" (Qur'an, 55:5), and, "It is He who raised [...] the moon as a light and measured for it stages" (Qur'an, 10:5), as well as "And the moon, We have measured for it mansions to traverse" (Qur'an, 36:39). Nor is the use of fixed arithmetical rules a new phenomenon, for a similar system was introduced and enforced by the Fatimids under General Jawhar in 969 CE (whose heirs in the form of the Dawoodi Bohras still follow the calendar), even as it was resisted by the generality (*jumhur*) of Muslim scholars, who insisted that the Islamic calendar related to the topocentric visibility of heavenly bodies, as a reminder of the Creator.

³ This is the average, whereas the actual time from new moon to new moon can vary from 29.2679 to 29.8376 days due to the elliptical rather than circular nature of the orbit. This affects the speed of the moon (which moves faster when in perigee, i.e. closest to the earth). Moreover, the earth's own rotation is variable (fastest in perihelion, i.e. when closest to the sun) while the spin rate also does vary (and is overall slowing down), such that long-term predictions are further impeded. See Bradley Schaefer, "The Length of the Lunar Month," *Archaeoastronomy*, no 17 (1992), pp. 32-42.

⁴ A synodic month is longer than a sidereal month because the earth is orbiting the sun in the same direction as the moon is orbiting the Earth. Therefore, the sun appears to move with respect to the stars, and it takes about 2.2 days longer for the moon to catch up with the apparent position of the sun.

⁵ Detailed calendars were in existence well before the Caliphal period of Umar I in which Muslims engaged with the problem of unifying dates. The early calendar of the Roman Empire was lunisolar, containing 355 days divided into 12 months beginning on January 1, with a thirteenth month added every two years to keep it in relative accord with the actual solar year. Nonetheless, by 46 BC, the calendar was some three months out of alignment, and Julius Caesar would oversee its reform. Consulting Greek astronomers in Alexandria, he created a solar calendar in which one day was added to February every fourth year, effectively bringing the average year to 365.25 days, close to the solar year's length of 365.2422 days. This Julian calendar was used throughout Europe until AD 1582, when it was corrected for 11 days of cumulative misalignment by the Gregorian calendar (11 minutes of annual misalignment over 16 centuries!).

While the simple 3-year cycle I have suggested above is as rudimentary as it is parsimonious, it will lead to misalignment within a few centuries. The tabular Islamic calendar deriving from the Fatimids, on the other hand, is good for at least two millennia (so much for awaiting the Mahdi!). The reason for the increased precision is that it runs on 30-year cycle (with 11 leap years at uneven intervals) rather than my simpler 2-1 cycle, suitable for public consumption. In the tabular calendar, the odd numbered months (including Ramadan) have 30 days and the even numbered months have 29 days (including Sha'ban, contrary to the stipulation in the ahadith), except in a leap year when the 12th and final month has 30 days. This neat division of full and hollow, needless to say, is not in correspondence with the actual sighting were series of 3 hollow and 4 full months are theoretically possible.

Indeed, developing calendrics based on the the lunar cycle is one thing, establishing a clear correspondence to the formation of the lunar crescent is quite another. There are two sticking points here: one, there cannot be a universally valid date for first-visibility sighting and, two, if a given location was chosen as a good starting point at a given point in time, it would soon prove to be a non-match for subsequent lunations as the first visibility point moves (westwards) with each lunation. The distinction between basing the Islamic calendar on the lunar cycle per se as opposed to the manifestation of the lunar crescent on the horizon is pivotal, because according to the Sunni majority the moon orbit is not a time-manager, rather the crescent is an indicator of religious obligation. Indeed, amid Islamic jurists, the sighting of the crescent is considered the very *illa* (effecting or operative cause in Shariatic law) for the discharging of a number of religious obligations, from fasting to festivity, from prayer to pilgrimage. To this extent, tabular forms of conversions (as used now by Microsoft) miss the point and are largely religiously redundant.

II - Astronomical vs. Visible New Moon

The primary sources of the Shar' establish the viewing of the lunar crescent (*hila*) as the determinant of the commencement of the Islamic moon, as distinct from astronomical conjunction of the moon. Hence we read in the Scripture itself, "So whoever of you witnesses [the crescent on the first night of] the new month [of Ramadan], let him commence the fasting " [Qur'an 2:185]. Here the witnessing (*mushahada*) implies that of sighting or observing (*ru'ya*), according to Ibn Abbas and the lexicalists, and not calculating the astronomical newmoon. The formulation ("let him commence") also seems to express this act of observing to be a local or regional practice, not a globally binding one.

Further we learn that the crescent marks periods of worship, "They ask you [O Messenger] about the new crescents [*ahilla*]. Say: "These are indeed signs to mark the [worship] periods for mankind and for hajj" [Quran 2:189]. Here the *ahilla* (plural of *hila*) refers to the crescent, not the astronomical new moon (*muhaq*, lit. effacement) which is never immediately visible.⁶

⁶ Verse 2:189 goes on to state, "And it is not from piety to enter the houses from the back, but piety is in the consciousness of Allah. So enter houses through the proper doors." Notwithstanding the *asbab al-nuzul*, Abdurrazak Ibrahim interprets the 'backdoor' to mean the astronomical newmoon and the 'property door' to mean the formed

The prophetic statements in the hadith corpus too support the ostensible case for the observance of the moon to signal the beginning of the new month. Thus in a well-known narration, Ibn ‘Umar reports in relation to Ramadan, “Do not fast until you see the new moon, nor cease fasting until you see it [again]” (Muslim, cf. Bukhari). It also appears that arguments that privilege the calculation of the astronomical new-moon over the sighting of the visible new-moon go against the explicit Prophetic command: “Do not precede the month [by starting to fast] until you complete the count [of thirty] or you see the crescent [hilal], then fast and do not end your fast until you see the crescent [hilal] or you complete the count [of thirty days]” (Nasa’i and Abu Dawud).

In the absence of visual ascertaining of the new moon, a clear principle was elucidated, stipulating that no month could be more than thirty days: Abu Hurayra reported the Messenger [salla’Llahu ‘alayhi wa sallam] to have said: “Observe fast with its sighting [ru’ya], and discontinue the fast with its sighting, and if it is overcast [such that no visibility is established], then continue the fast for the thirtieth day” (Bukhari, Muslim). Ibn ‘Umar, likewise, reported that Allah’s Messenger (upon whom be peace) made mention of Ramadan and with the gesture of his hand, he said: “The month is thus and thus [signaling thirty and twenty nine]. He then said: Fast when you see it, and break your fast when you see it, and if the weather is cloudy count it [the month] for thirty days.” (Muslim, cf. Bukhari).

The contemporary Shaykh Hamza Yusuf, makes an interesting, if speculative, point in analyzing this hadith:

The Prophet [salla’Llahu ‘alahy wa sallam] chose not to state any numbers when showing the number of days in a lunar month, as if to deter people from thinking about enumeration specifically when it comes to determining the lunar months. Hence, instead of saying the words “twenty-nine and thirty,” the he used his blessed hands, showing with his fingers, how many days are possible in the month, as if to emphasize using the most basic and fundamental human ability of sight. It is as though he were saying, “Look, see, perceive with your eyes the month, even upon my hands.” This insistence upon sighting the moon illustrates so well ‘the sense in Islam that it is the immediate surrounding conditions, rather than any theoretical ones, that reflect the Divine will of God in its relation to men, and that it is these which should determine the sacred acts.’⁷

Exegetes and jurists have established on the basis of the above-quoted ahadith, and similar narrations, that the obligation pertains to viewing the new moon, using the term ru’ya for viewing. To avoid doubt, ru’ya, in turn, was defined as “that which is seen by the eye” (man ra’a min ‘ayn), which disallowing two understandings: First, that the viewing of the crescent is functional or incidental, as a verification of the birth of the new moon, and second that the ‘seeing’ could be by means of intellect

crescent. See A. Ebrahim, “Crescent Observation and the Visibility of the Hilaal,” paper presented at the Third Islamic Astronomical Conference, Amman, Jordan (October 2003).

⁷ H. Yusuf, “Ceasarian Moon-Births” (2006), online at www.zaytuna.org/articleDetails.asp?articleID=100.

or knowledge (in this instance, ideas such as *ru'ya bi'l 'ilm* or *ru'ya bi'l 'aql*, as such, appear to be modern departures from the canon).

Imam al-Qarafi (d. 1285), the eminent Maliki jurist and a scholar of astronomy, did believe that astronomy was decisive (*qat'i*), yet wrote in his magisterial work, *The Divergences* (*al-Furuq*) that the non-reliance on calculation was a requirement of the law rather than a consequence of lacking know-how:

Why is it that we can determine prayer times by calculation and the use of instruments, yet in the case of crescent moons for the determination of our Ramadans, it is not permissible to use instruments and calculation] according to the accepted position [of the *fuqaha*]? The difference is that God has stipulated in our devotional practice [of fasting] the sighting of the crescent moon and if that is not possible then the completion of thirty days of Sha'ban, and He did not stipulate the astronomical new moon. On the other hand, in the case of prayer times, He stipulated simply the entrance of the times. Hence, [from the point of legality] we are able to determine them by any means possible. For instance, a prayer is conditional upon the occurrence of the sun's postmeridian phase. [With the Islamic lunar month] however, it was not linked with the conjunction's separation but with its physical sighting. And should the crescent be obscured, we complete thirty days.⁸

Indeed, the viewing of the crescent is established by the Shari'a as a form of worship, or at the very least a prerequisite for it, not as a means of measuring time.⁹ As far as abolishing the visibility condition and going to calculated moon cycles, a contemporary scholar argues that this does away with the entire edifice of the sacred law:

To change the revealed criterion of a *hukm wad'i* [explicit command]—namely the *sabab* (cause) of the *wujub*, or obligation, of the fast of Ramadan from *ru'ya* (i.e. sighting) [which] is unequivocally, explicitly, and exclusively pronounced in the text—to a different criterion (i.e. the birth of the moon) is not within the framework of established Islamic jurisprudence.¹⁰

This remains the canonical position. Imam Nawawi (d. 1278), for instance, insisted that the holy month was determined not on the basis of the moon's orbit but rather on the act of its sighting, "Fasting does not become incumbent by the calculations of the astronomer, neither on him or on others" (*Rawdat al-Salihin*). Ibn Muflih (d. 1361) went as far as to denounce those who went by calculated months as missing the operative cause (*illa*) and therefore the obligation, "Those who fast

⁸ Cited in *Ibid*. Emphasis added.

⁹ As the astute reader would be able to discern, my formulation here signals that the *ru'ya* mirrors the *wudu*—in both cases jurists differ on whether this is part of worship or a prerequisite to it (there is a difference in the degree of *fardiyya* of course, with the latter generally being *'ayn*, not *kifaya*).

¹⁰ M. Maghraoui, "An Islamic Legal Analysis of the Astronomical Determination of the Beginning of Ramada," (2007). Online at www.zawiyah.net/paper.pdf.

by stars and calculations will not be counted [as having fulfilled the obligation], even if they are correct!”¹¹ His senior within the Hanabila, Ibn Taymiyya (d. 1328) was characteristically forceful, “There is no doubt in that the Sunna and the consensus of the Companions confirm the impermissibility to place reliance on astronomical calculations [...] The one who relies on these is one who has deviated in the Shari’a. He is an innovator [mubtadi] in the affairs of religion” (Majmu’ al-Fatawa).

In terms of legal category, observing the horizon is fard al-kifaya on the 29th of each Islamic month, that is to say a communal obligation which is only discharged if someone does it on behalf of the community, though he who does the discharging earns particular merit.¹² In a hadith, the Messenger of Allah (‘alayhi salawatu’Llah) is reported to have said, “The best of God’s servants are those who watch the sun, moon, stars, and shadows in order to remember God” (al-Hakim).

The debate between proponents of regional validity of sightings (ikhtilaf al-matali’) vs. those who argue for the universal validity of sighting (ittihad al-matali’) is largely redundant, with the scholarly modus vivendi being that an easterly/earlier sighting is followed but a westerly/later sighting is not.¹³ This is, as Ibn Taymiyya explained in his fatawa, because of the earth’s rotation, whereby the horizon is everything to the east. The Maliki jurist before him had already insisted that, in principle, there was no limitation on the how far east the moon could be sighted: once sighted it couldn’t disappear.¹⁴ The

¹¹ The Hilal Sighting Committee of North America, “A Refutation to [sic] ISNA/Fiqh Council’s Decision To Disregard the Qur’an and the Sunna and to follow Astronomical Calculations for Beginning an Islamic Month” (2006), p. 7. The collective fatwa of twelve religious scholars in North America, this document concluded with the statement: “The Islamic month begins after [the] crescent moon (called hilal) becomes visible after the sunset on the 29th of the previous month (in [its] absence we complete 30 days). It is NOT permissible to begin Ramadan or any other Islamic month on the basis of astronomical calculations”.

¹² See the definitive fatwa of the Shafi’i mufti, Dr Muhammad Afifi al-Akiti, “Hisab & Ru’ya or Matla’ al-Budur”. Online at <http://www.masud.co.uk/ISLAM/misc/moonsighting.htm>. He adds that it is fard ‘ayn for the traveler and the resident in a location where the knowledge of the lunar cycle is not widespread.

¹³ Ibid. Shaykh Afifi al-Akiti himself notes this in a sighting report: “The three of us attempted to perform the obligatory sighting of Shawwal after Maghrib on Thursday 9 September (the 29th day of Ramadan for the UK). The horizon is partially cloudy and we were not able to sight the crescent. Still, we received news of positive sightings to the East of the UK from Indonesia and South Africa. This news, despite not being able to sight locally, makes it sufficient for those in the UK to celebrate their ‘Id al-Fitr tomorrow, on Friday 10 September, by following the basic rule [dabit] in Islamic Law in this matter that whenever it is known that the crescent has been positively sighted in the East, westerly sighting inevitably follows, but not the other way round.” (<http://moonsighting.com/1431shw.html>). This is an important concession, because the Shafi’is have traditionally been the firmest in relying on independent sighting within the distance of qasr.

¹⁴ For example, Ibn Rushd and Ibn Juzayy considered the distance to be considered for a regional sighting to be as great as the distance between Islamic Spain (al-Andalus) and Madina, a distance of over 3,000 miles. Ibn Abd al-Barr, the great Maliki Hadith master, considered the distance acceptable to be united by a single sighting to be from al-Andalus to Khurasan in Iran, a distance of over 4,000 miles.

ramifications of this, in particular for communities at high northern latitudes, are immediate: Whereas the local sighting would most often occur at third sunset after conjunction, they can choose to follow verified easterly sightings at the earlier sunset (typically, the second sunset after conjunction, occasionally the first).

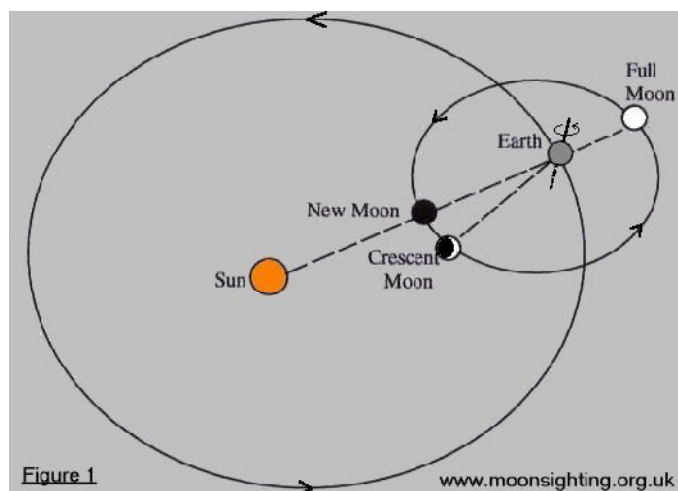
While this difference between local and global sighting is no longer a key bone of contention, the current fault line in the debate remains between those who argue for a sighting-based methodology, as per the nomocentric tradition, and those who find this simple idea either too perplexing or too unpredictable.

III - Scientific Conditions for the First Visibility of the Lunar Crescent

Since the earliest treatises on the science of falakiyyat (astronomy) in the Muslim world, scholars have concurred that there is a paradox between the relative predictability of the orbit of heavenly bodies and the commonplace unpredictability of the manifestation of phenomena on the horizon. It was never difficult to establish the birth of the new moon with absolute (qat'i) certainty—today astronomical newmoon can be computed with a similar accuracy to sunset—whereas the calculation of when the new moon would be visible became a speculative (zanni) science. As al-Biruni (d. 1048) wrote, “The computation of the appearance of the new crescent is a very long and difficult procedure.” Indeed.

In the first two days after solar-lunar conjunction, the young crescent appears very low in the western sky after sunset, and must be viewed through bright twilight, whilst also setting shortly after sunset. The sighting of the lunar crescent within one day of the conjunction is usually most difficult, for the crescent is thin, has low surface brightness, and can easily be obscured by the twilight. The time the crescent becomes visible depends heavily on location and varies from one month to another. Below is simplified representation of the orbits which are involved:

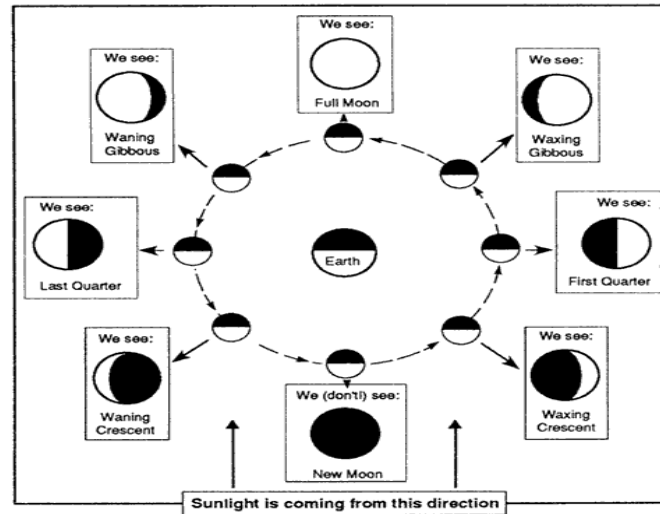
Fig 1: The Inter-relation of Orbits



Driven by an intellectual challenge, astronomers have since the Babylonians three millennia back (and probably the Indians before them) tried to establish minimum criteria which would if not predict then at least establish the likelihood of the visibility of the new moon under set ideal conditions. By lunar visibility is meant sightability, or the crescent's potential to be sighted in an ideal scenario, not a confirmed sighting (which is hostage to a host of contingencies such as atmospheric conditions, including temperature, altitude, humidity, and pressure).¹⁵ As the United States Naval Office explains on its Oceanography Portal,

The prediction of the first sighting of the early crescent moon is an interesting problem because it simultaneously involves a number of highly non-linear effects. [...] Effects to be considered are the geometry of the sun, moon, and natural horizon; the width and surface brightness of the crescent; the absorption of the moon's light and the scattering of the sun's light in the earth's atmosphere, and the physiology of the human vision.¹⁶

Fig 2: The Eight Phases of the Moon



The composite of the centuries of research are five key conditions (variations of geometric variables) for the materialization of the waning crescent. They are as follows:

1. Age of the crescent: Since the Babylonians, the one basic condition for first visibility of the lunar crescent related to age of the moon, which is the time-period the moon needs to continue in orbit to move out of alignment between the earth and the sun. The Babylonians stipulated that

¹⁵ Moreover, there is the added complexity of the optimal time of conducting sightings, because “If the observation is made too soon after sunset then the twilight sky may be too bright to pick out the faint crescent moon. The observer has to wait until the contrast between the crescent moon and twilight sky has increased sufficiently for the Moon to be seen.” See B.D. Yallop, “A Method for Predicting the First Sighting of the New Crescent Moon,” NAO Technical Note, No 69 (2004), p. 3.

¹⁶ See www.usno.navy.mil/USNO/astronomical-applications/.

it had to be, in terms of post-conjunction age, minimum 24 hours old.¹⁷ Modern sightings have shown that younger crescents, in extreme cases down to 12 hours (using telescopic aid), 13 and half hours (using binoculars), and 15 hours (unaided eye), can be sighted (though the latter is exceedingly rare: The record of 15 hours was obtained in 1990, the previous record of 15 hours and 24 minutes having been in place since 1871).¹⁸ Although modern astronomers shy away from using age (except as a proxy for other criteria), age does remain a good layman's tool for determining when to expect sightings, and certainly when to rule out sightings. Allowing for the setting of future records, we can set the limit for acceptable sighting at 12 hours post-conjunction, under which sightings must be deemed erroneous.

2. **Sunset-Moonset Lagtime:** Naturally the narrow waxing crescent cannot be viewed if overexposed to sunlight. Hence, even the Babylonians insisted that the new moon had to remain on the horizon a minimum of 48 minutes after the setting of the sun, so as to minimize refraction and enable the sighting of the faint crescent. Muslim astronomers of the Abbasid period (such as the ninth century al-Khwarizmi and the thirteenth century Ibn Tariq) retained the Babylonian lagtime condition. In the modern period, astronomers such as the Malaysian professor Muhammad Ilyas, have proposed a variegated lagtime condition, arguing in effect that the further north of equator the higher the value was required. According to Schaefer, who bases his data on 130 years of observations, the shortest interval ever recorded between sunset and moonset for an observed crescent is 22 minutes.¹⁹ Allowing again for future records to be set, we can comfortably rule out sightings with lagtimes under 18 minutes.
3. **Altitude:** In 1910 Fotheringham and in 1911 Maunder independently developed a moon visibility criterion based on a dataset of documented positive or negative sightings over Athens over a period of 20 years. Both found interest in the moon's altitude (angular distance above the horizon) at the time of sunset and stipulated degrees for how much above the horizon the moon had to be located to enable visibility of the crescent. Fotheringham suggested 12 degrees at sunset in worst case scenarios (i.e. where there were no relative azimuth difference between the sun and the moon) and 11 degrees where the relative azimuth was 15 degrees, while Maunder suggested 11 degrees as a worst case scenario, down to 8 degrees in cases of 15 degree relative azimuth. Schoch in 1930 supported Maunder's last figure and revised the former to 10.4 degrees, and this revision became the basis for Yallop's now-standard divisions of visibility zones.²⁰

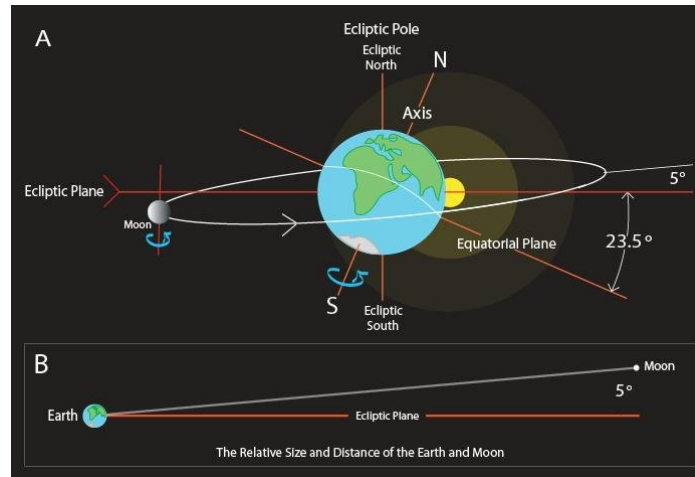
¹⁷ Fatoohi, Louay J., Stephenson, F. Richard & Al-Dargazelli, Shetha S., "The Babylonian First Visibility of the Lunar Crescent: Data and Criterion," *Journal for the History of Astronomy*, 30 (1999), pp. 51-72.

¹⁸ See Bradley Schaefer et al, "Records for Young Moon Sightings", *Quarterly Journal of Royal Astronomical Society*, vol. 34 (1993), pp. 53-56; and Z. A. al-Mostafa and M.N. Kordi, "A new local observation record for a young moon from Saudi Arabia," *The Observatory*, Vol. 123 (2003), pp. 49-50.

¹⁹ B.E. Schaefer, "An Algorithm for Predicting the Visibility of the Lunar Screscent," in I. Ahmed (ed), *Proceedings Of the Lunar Calendar Conference* (Herndon, Virginia: IIIT, 1988).

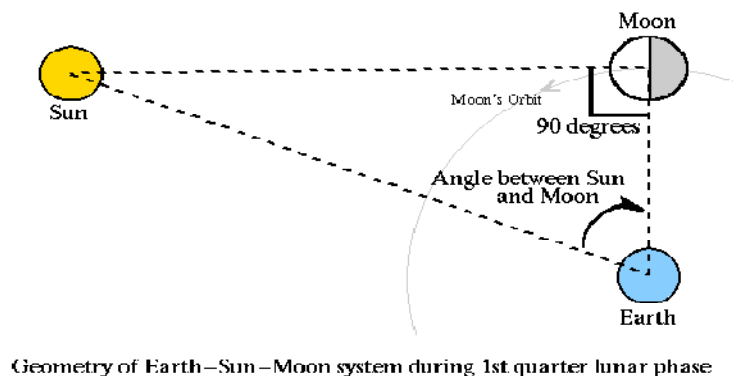
²⁰ Rita Gauthschy, "Last and First Sightings of the Lunar Crescent," Swiss Natural Science Foundation: www.gauthschy.ch/~rita/archast/mond/mondeng.html.

Fig 3: Visualizing the altitude signifier:



4. Elongation: Bearing in mind that the orbit of the moon is non-circular and in fact distinctly elliptical (with an eccentricity of over 0.05), the criteria of elongation expresses the angular separation (or arch of light) between the sun and the moon (centre-to-centre). At conjunction, the moon can pass directly in front of a sun, in which case a solar eclipse will take place, or can have a degree of separation of up to 5.5. In 1931, the French astronomer André Danjon stipulated 7 degrees to be the limit under which the moon would not be viewed by the naked eye. This was only modified to 6.4 degrees in 2004, based on the large dataset of the International Crescents' Observation Project.²¹ Higher elongation, which also means higher age, may sometimes compensate lower (under 10 degree) altitude. However, the Danjon limit can only be a variable of exclusion, and has no predictive value; put differently, it is a necessary, but not sufficient condition.

Fig 4: Visualizing the elongation signifier



²¹ Muhammad S. Odeh, "New Criterion for Lunar Crescent Visibility," *Experimental Astronomy*, vol. 18 (2004), pp. 39-64.

5. Crescent width: Finally, in 1977, Bruin's condition of crescent width was introduced, as a proxy of the minimal brightness required in the non-dark sky, which he identified as .5 minutes (later revised to .25 by Ilyas, corresponding to 1.5% illumination). As this criterion is topocentric, it is a function of location and angle, not mere age. The eleventh century Ibn Yunus had already begun work in this direction. However, the width is not a clear correlate of brightness. Schaefer's 1988 attacks the problem as an astrophysical one, in which he attempts to define a quantity R which constitutes a logarithmic measure of the moon's visibility, based on a host of parameters such as the transparency of the atmosphere, the site's altitude, the geographical latitude, the temperature, the relative humidity (which absorbs the flux of light), the aerosol content and the time of the year.²²

Cumulatively, geocentric altitude, elongation, and crescent illumination dominate the scientific debate, with papers typically modifying the values of one criterion or the other without fundamentally changing the import of geometrical calculus. In recent decades, institutional astronomers, including some based at the Royal Greenwich Observatory and the South African Astronomical Observatory, have independently identified composite variables on the line of the above to chart territorial zones of visibility across world maps in a spectrum from impossible, to improbable, to possible, to probable zones of sighting.

Current online Crescent Calculators, including the widely used MoonCal by Dr Monzur Ahmed, are extensions of these.²³ All use variations of the last four variables, though with slightly different values, to develop maps that divide the world into several zones along a spectrum where the crescent is, for example, (a) easily visible, (b) is visible under perfect conditions, (c) is visible with optical aid, (d) is possibly visible with optical aid, (e) is unlikely to be visible with optical aid, (f) and is not visible.²⁴ While such calculators can negate sightings and also establish the likelihood of visibility, they cannot provide absolute certainty of positive sightings, as they all operate on ideal assumption of no atmospheric pollution, clear sky, and trained eyes.

IV - The Saudi Folly, or Why the Emperor has no Clothes

Notwithstanding the common Muslim's assumption that the Kingdom of Saudi Arabia follows the visibility rules laid down in the Qur'an, Sunna and Islamic tradition, the Saudis have long been committed to predictability over authenticity in determining the Islamic Calendar. Since King Fahd, the Kingdom has managed its civil, and now also religious, affairs, on the basis of a calculated

²² B. E. Schaefer, "Visibility of the lunar crescent," *Quarterly Journal of the Royal Astronomical Society*, vol. 29 (1988), pp. 511-523.

²³ Ahmed's Moon Calculator is now released in Version 6.0: <http://www.ummah.net/ildl/mooncalc.html>.

²⁴ Perhaps Khalid Shaukat's www.moonsighting.com is the most used of these websites, with nearly 4.8 million hits since 1996.

calendar known as the Umm al-Qura calendar, currently administered from the Institute of Astronomical & Geophysical Research of the King Abdulaziz City for Science and Technology (KACST) in Riyadh. The calendar has a few institutional active followers (Islamic Society of North America, the European Council for Fatwa and Research, the Fiqh Council of North America etc), but millions of effective followers (all those who end up following the Saudi lead).

Though the natural lunar cycle has presumably remained the same, in the last twenty years alone, the Umm al-Qura calendar has kept changing its principles of application. Prior to 1975, the rules on which the calendar was based were not publicly disclosed. From 1395-1419 AH (1975-1999 CE) the architects of the calendar determined a new month on the (entirely arbitrary) principle that in cases where astronomical new moon occurs less than 3 hours after Saudi midnight, the lunar month will begin at the previous(!) sunset, otherwise at the sunset following that. This rule, which allowed for the Islamic month to begin even prior to astronomical conjunction, much less any established visibility, led to the Umm al-Qura month beginning 2 or 3 days prior to actual first visibility. For instance, the month of Dhu'l-Hijjah was begun on sunset of 17 March in 1999, although the age of the moon was minus 3 hours, 19 minutes (i.e. the lunar conjunction had not even taken place), the altitude was minus 3.3 degrees and the moonset before the sunset!²⁵

After years of confusion and contestation, where Saudis and diaspora communities were routinely celebrating Eid al-Fitr in Ramadan, the Saudi authorities belatedly decided to abandon the flawed rule and, from 1420-22 AH (1999-2001 CE), a replacement rule was implemented. This stipulated that the new month would begin if moonset occurred after sunset at Mecca (longitude 39.50 degrees east; latitude: 21.25 degrees north) on the 29th night of the previous month, otherwise it would count as a 30-day month, and the next month begun accordingly. While conceding that the moonset occurring after sunset is an important criterion for determining the visibility of the new crescent, the new criterion remained nevertheless somewhat arbitrary, for moonset times alone, as we have seen, are not a sufficient criterion for establishing the visibility of the moon, and the choice of a distinct location, however revered, to form the basis of a universal calendar too appears ill-conceived.

Still, even in Mecca, the revised formulation did not lead to visible new moons at the first night of the Umm al-Qura month,²⁶ and, on occasion, an Umm al-Qura month would still commence before the

²⁵ See A. Ebrahim, "Crescent Observation and the Visibility of the Hilaal," paper presented at the Third Islamic Astronomical Conference, Amman, Jordan (October 2003).

²⁶ An interested visitor was allowed to follow the Hilal Sighting Committee of Mecca, the most easterly of the then six committees, in 2000. This is what he reported: "In the case of Eid-ul-Fitr 1420H, I myself went with the Makkah committee to a sighting point on a hilltop of Shamesi outside the city of Makkah [...]. Neither we, nor any of the other five committees sighted the hilaal. But we came back to Haram Shareef and were astounded to hear the announcement that Eid-ul-Fitr was the next day. In fact, moonset was before sunset in Makkah for Thursday evening! In this case, the error was quite brazen. Later I learned that Sheikh Yusuf al-Qaradawi issued a Fatwa indicating that Muslims who celebrated Eir 1420H on Friday following the Saudi announcement should make up one missed Ramadaan fast." Dr Salman Z. Shaikh, "Which Hilaal to Follow? Reasons for Islamic Date Confusion and Their Solution," p. 4.

astronomical new moon (as moonset occurring before sunset is not conditioned by the occurrence of the astronomical new moon to begin with!²⁷). The months of Dhu'l-Hijjah of 2000, 2001 and 2002 were no better than in 1999 under the old calendric determinants, with a lunar ages of merely 2 hours, low or negative altitudes, and no or negative lagtime.²⁸ In other words, the new system was as broken as the old.

Highly embarrassing for a country which claims to lead the Muslim world in all matters Islamic, this contrived rule too had to be abandoned after a mere two years. Since 2002, the principles of the Umm al-Qura calendar have been modified to stipulate the simultaneous fulfillment of two conditions: moonset must be after sunset in Mecca and geocentric conjunction (i.e. astronomical new moon) must have taken place before sunset, likewise at Mecca. Having taken 27 years to reach this simple formula, the calendar is still rather imprecise, hitting it right approximately one out of five times (or 20.6% to be exact).²⁹ This is because, firstly, even the Babylonians knew that a single minute is not a sufficient lagtime, nor is a single minute of post-conjunction age sufficient to establish a crescent. A simpler formulation, such as second sunset after conjunction begins the new month unless visible earlier eastwards, would (for all its flaws) have had more accuracy.

At the same time, the Saudis, under pressure from their own and foreign 'ulama, announced that they would invite reports of sighting and take decisions on that basis. In 2002 and 2003, ostensibly sighting were taken into consideration, but now the worldwide Muslim community had to experience perhaps the biggest fraud. Note, for example, the announcement of the Saudi authorities for 2002: "The beginning of the month of Dhu'l-Hijjah of the year 1422 AH has been proved by the testimony of a number of upright witnesses in different location on the night of Wednesday, 13 February 2002. Because of that the Standing [wuquf] at Arafah [9 Dhu'l-Hijjah] will be on Thursday 21 February 2002."³⁰ Now, something must be dramatically wrong with the numeracy skills in Riyadh, if 13 plus 9 equals 21!

The same obfuscation happened the following year, when the Saudi Press Agency carried an official statement to the effect that the moon was sighted on the night of Sunday 2 February, and "therefore" 9 Dhu'l-Hijjah would be on 10 February 2002: now 2 plus 9 equalled 10. To astute observers it was clear that the dates were "orchestrated and manipulated to be perfectly aligned with the so-called

²⁷ These anomalous month beginnings were caused by the fact that the sun and the moon do not set perpendicularly at the latitude of Mecca and, when the moon is near its most northerly ecliptic latitude, moonset can occur after sunset even before the sun and the moon are in conjunction.

²⁸ Ebrahim, "Crescent Observation", op.cit, pp. 6-9. In all cases, the fact that earlier months were begun early led to a knock-on effect. After the 30th day of the Dhu'l-Qa'dah, the Saudis had only two options: to admit that the previous month was not accurate in the Umm al-Qura calendar or to hoodwink the world by declaring an early hajj. They chose the latter.

²⁹A survey of 15 years of the Umm al-Qura calendar shows that in only 20.6% of the cases, does the Umm al-Qura date coincide with the first visibility of the new moon under ideal atmospheric conditions: Robert H. Van Gent, "The Ummul Qura Calendar of Saudi Arabia": www.phys.uu.nl/~vgent/islam/ummalqura.htm.

³⁰Ebrahim, "Crescent Observation", op cit.

‘civil’ Umm al-Qura calendar,” which, should anyone be in doubt, “is not based on hilaal sighting and therefore cannot be termed an Islamic calendar.”³¹

What is surprising, however, is the international resilience of Saudi legitimacy, as if the moon were a Saudi colony. That the Saudi pronouncements on this have not long since lost all credibility is a textbook example of cult-like socialization: something the Prophet (alayhi salamu’Llah) simultaneously warned against and predicted, when he spoke of Muslims following the example of the Biblical peoples.³² Muslims in the West, for unexplained reason, retain a nostalgic and naïve view of the Balad al-Haramayn, the Lands of the Sanctuaries, and its Islamic propriety, as if it remained a Caliphal domain. Naively, many believe that the Saudis actually are extremely sharp-eyed and are recurrently the only nation to see the new crescent, while the moon mysteriously disappears when not sighted further east much later (i.e. across the Atlantic at sunsets 10-14 hours later)! Yet, as the earth spins from west to east, the zone of visibility pertaining to the newborn crescent spreads eastwards (with an increasingly wider north-south belt as the zone spreads eastwards). In other words, a confirmed viewing will always be reconfirmed further west, whereas a non-viewing to the east can still lead to a viewing later in the west. In short, if Rio doesn’t spot the moon 7,000 miles southeast, 7-9 hours later, Riyadh didn’t see it either.

V - Considering the Case of the Coming Eid al-Adha

Typically, the moon’s visibility extends within the shape of a global parabola, taking around at least two sundowns to cover most of the world, going from east towards west. It should be noted that a lunar date is always at least two solar dates, as the solar date is fixed by the International Dateline in the Pacific Ocean and the date begins at mid-night locally, while the lunar dateline is in monthly flux but is determined by the earliest visible crescent and the date begins after the local sunset.

It is well-known that the newborn crescent first appears at a different point in the moons orbit each month with the lunar dateline moving westwards every month. This may be over the over Africa on month, over the Atlantic the next, then the Americas and the Pacific oceans the next, then Australasia. On this, Zaid Shakir writes, “This divergent pattern is a manifestation of the justice of Allah. Eventually, every land will have the honor of first sighting the crescent moon. To fix the timing of all of the Islamic occasions, Ramadan, Eid al-Fitr, Hajj and Eid al-Adha on any one country, year after year, with total disregard of the actual sighting, is an extremely problematic practice”.³³

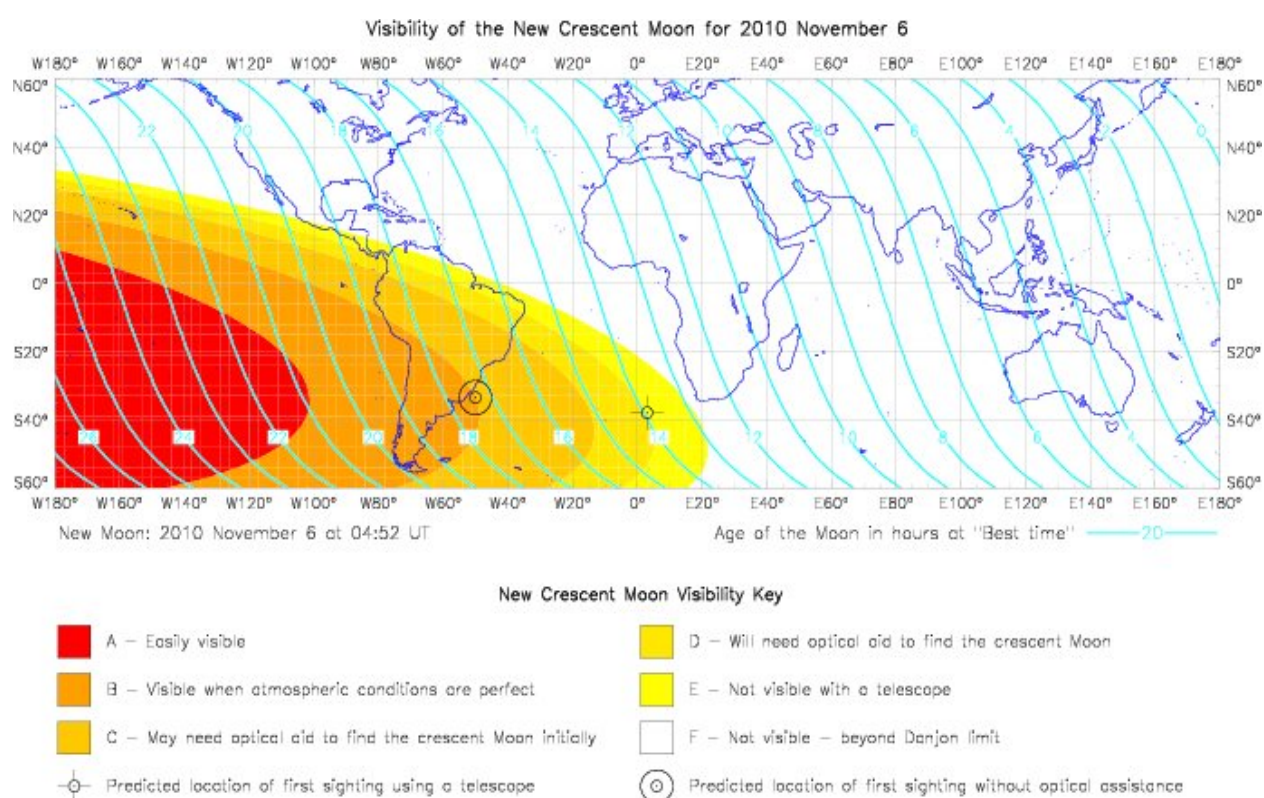
³¹ Ibid, p. 10.

³² The hadith in question is related in Bukhari: “You will follow the [erroneous] ways of those before you handspan by handspan and arm’s breadth by arm’s breadth to such a degree that if they went down a lizard’s hole, you too would go down the hole.” Consider the aptness of this, in relation to the Jewish abandonment of moonsighting and development of a calculated calendar (based on conjunction), which incidentally is often identical to the Umm al-Qura months. To compare, see www.chabad.org/calendar/view/month_cdo/jewish/Jewish-Calendar.htm.

³³ Z. Shakir, “Dhul Hijjah and Eid al-Adha” (2006): <http://www.hilalcommittee.com/articles/article15.html>.

Although the moon is first seen at a different place every month, lands with latitudes south of the equator do tend to have a general advantage, due to the earth's rotational axis, whereas those with extreme northern latitudes will establish local visibility at the earliest two sunsets after conjunction and often three (though, as mentioned, they can follow confirmed easterly sighting to begin the month). Bearing in mind that Saudi Arabia is 25 approximately degrees north of equator, it doesn't have a particularly unique location for early moonsighting, unlike for instance the belt of Mauritius, Madagascar, South Africa, Uruguay, Argentina and Chile.

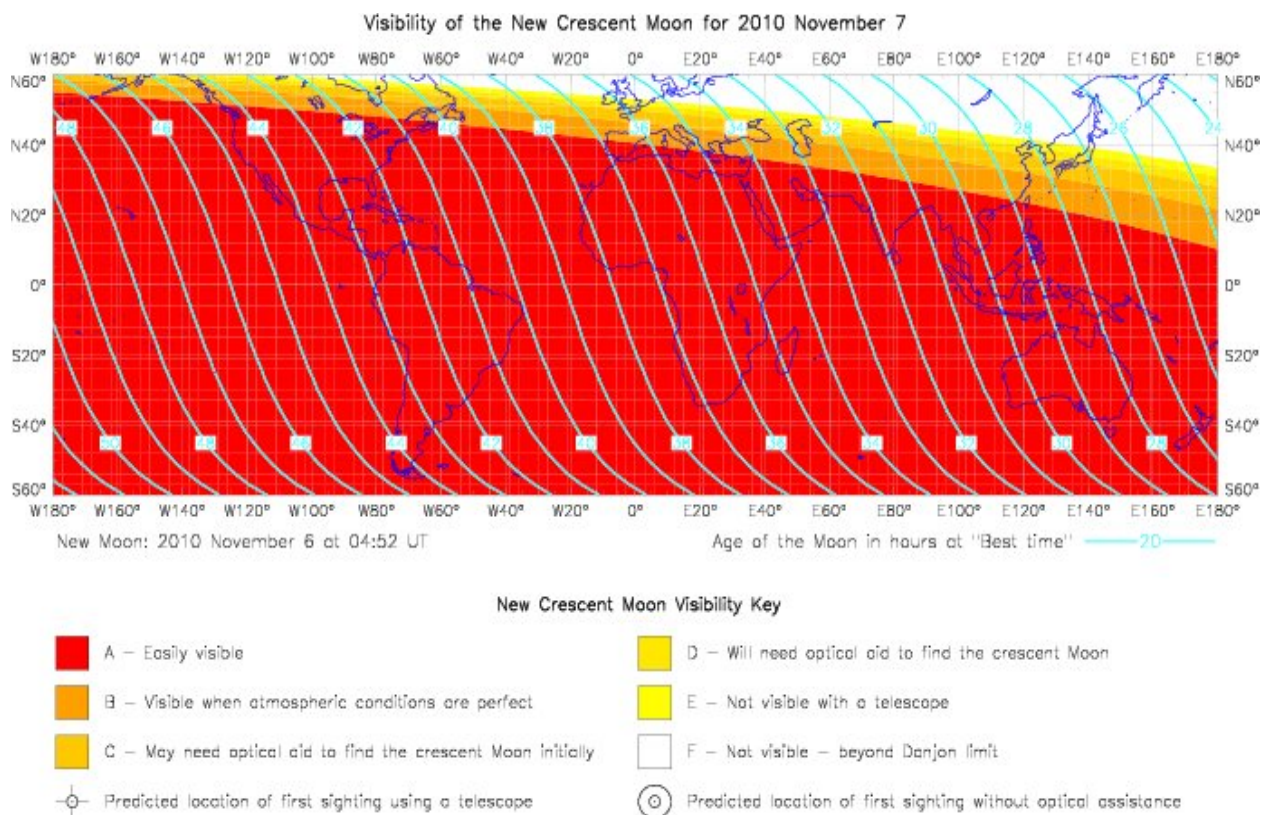
If past is precedent, the coming Eid al-Adha too may see communities divided. [Note: This paper was written in October 2010, but its predictions came true as we shall see below] The Astronomical New Moon, i.e. conjunction, takes place on 6 November 2010 at 04:52 UT. At this time the moon is, needless to remind, invisible. The question is how the visibility zone lies for the first sunset after conjunction. The following shows a visibility map (taken from www.crescentmoonwatch.org):



In most parts of the world, the moon will not be sighted at the first sunset with the possible exception of South America (by which time it will be well into the night in Europe, hence non-followable). Both in Saudi Arabia and in Britain, the new moon will under 11 hours old at sunset, and impossible to sight both by naked eye observations and with optical aid. [N.B. update 7/11: As predicted the moon was not sighted anywhere in Asia, Africa or Europe, see www.moonsighting.com for reports]. According to the map, based on Yallop's criteria, Uruguay is the first place on earth which will see the moon, using telescopes, if the atmospheric conditions are perfect, otherwise Argentina or Chile or the Micronesian Islands in the South Pacific.

It is, however, possible that the above map is slightly conservative as the D-zone does not hit South Africa (this is because the scan is for local sunset times, whereas the optimal time may be slightly later than sunset depending on the value of the moonset lagtime). In parts of South Africa, most importantly Cape Town, which with their southerly latitude has a privileged sighting location (and is furthermore east of the UK horizon, so followable), moonset is indeed after sunset. With an age under 13 hours (and only .2% illumination) however, the moon is very unlikely to be sighted, though if sighted (as a record-early sighting) it would be acceptable, indeed sufficient, for the UK to follow. [N.B. update 7/11: As expected the moon was not sighted in South Africa either on the evening of 6/11, neither in Durban nor in Cape Town, but was sighted the following night in a vast belt from the Micronesian Islands to Australia, to India, to Saudi Arabia, to South Africa. Hence 1 Dhu'l-Hijja is verified to correspond with 8/11. Again see www.moonsighting.com for open reports, though the author has sought independent verification]. Both in terms of time difference and eastwards location, the South African horizon is, in general, the only horizon European Muslims need to be concerned about, and in the long term institutional relationships need to be developed with observatories or moonsighting committees in South Africa and, if longer warning, but more uncertainty, is required, Mauritius.³⁴

³⁴ Often Morocco, as the nearest 'Muslim land', is mentioned as a horizon which can or should be followed from the UK (cf. even in the learned fatwa by Shaykh Afifi al-Atiki). Morocco is actually west of the Prime Meridian (Greenwich line) by a few degrees, for example precisely 5 degrees for Fez. Although sunset can be before that in the UK, depending on season, it can also be later. Hence in a fatwa question posed to the Darul Ulum Deoband, a UK organization asks what it should do after following Moroccan sighting announcements became discredited when they received the report too late in the night to act upon, and members of the congregation began insisting on following Saudi announcements in the future. The brief legal responsum to the 3-page detailed query was rather unsatisfactory, "You should enforce with full strength the practice of following Moroccan sightings"! (Darul Ifta, Darul Ulum Deoband, 18 Safar 1424, available online as "Fatawa on errors in following Saudi moon sighting in Britain"). In fact, the responsum should have encouraged the community to follow a more suitable, earlier, and easterly, horizon such as the one I suggest in this paper.



In the absence of an unlikely South African sighting, the first of 1st of Dhu'l-Hijjah begins on the local sunset of 7 November for most of the world, including all of Europe, (which is to say that 8 November corresponds to 1 Dhu'l Hijjah) and the 10th of Dhu'l-Hijjah, the day of Eid al-Adha, will be on Wednesday the 17th of November. The Wifaq al-'Ulama's position has already [viz. in October 2010] been published in support of Eid on 17th November, citing the above evidence.³⁵

Still, the Umm al-Qura calendar has, unsurprisingly, erred to put 7 November as 1 Dhu'l-Hijjah, thereby scheduling the Day of Arafah for the 15th of November and Eid al-Adha for the 16th. [N.B. update 7/11: As expected the Saudis have followed the prepublished Umm al-Qu'ra calendar and disregarded the non-sightings of its own six sighting committees in announcing Dhu'l-Hijjah a day early. In so doing they have counted both Shawwal and Dhu'l-Qa'da as months of 29, thus disregarding even the average length of the synodic month—an error not even the Hebrew calendar makes for the month in question!]. This is certainly wrong for the location of Saudi Arabia (regardless of South African sightings, for South Africa is west of Saudi Arabia) and most of the Muslim world. We are therefore bound, once again, to see the worldwide community split, in particularly those who erroneously regard Eid al-Adha as Eid al-Hajj and insist on doing Eid on the basis of Yaum al-Arafah in Saudi Arabia.

³⁵ Wifaq al-'Ulama, "Research on the Visibility of the Moon of Zhulhijjah 1431AH", statement online at http://www.wifaqululama.co.uk/articlespdf/zhj_1431_moon_Eng-Urdu-arabic.pdf. When I wrote to them about the slim possibility of a sighting in eastern South Africa, they concurred, though stated it was not taken into consideration because it was very unlikely and would require a telescope and lots of luck.

In reality, the hajj was instituted by the Messenger of Allah ('alayhi salawatu'Llah) seven or nine years, depending on various report (e.g. Bayhaqi) after the legislation of the Eid al-Adha, so the early community of the Companions knew of Eid al-Adha without the hajj. Indeed, the hajj is not related to the Eid (as the pilgrims well know, for they are not obliged to pray Salat al-Eid), and the sacrifice on the 10th of Dhu'l-Hijjah (Yaum al-Nahr) predates the hajj, so cannot depend on it.³⁶ Moreover, the fuqaha are in agreement on Eid al-Adha being on the 10th of Dhu'l-Hijjah of the local horizon, irrespective of the hajj, as this was the Sunna of the Messenger [salla'llahu 'alayhi wa sallam] himself.

It is well-known that even in the Caliphal period, the dates of Arafah were not announced to Muslims outside of Mecca, and local sightings were followed wherever Muslims lived, regardless of the position elsewhere. Based on the Prophetic practice and the consistent practice of the Companions, no madhhab ever obligated the Muslims all over the world to fix their Eid al-Adha by the Hajj date in Mecca. Rather to override the local conditions to celebrate Eid on what amounts to the 8th or 9th or 11th of Dhu'l-Hijjah is indeed considered wrongful innovation (bid'a) of our age by the jurists. For example, both Shaykh Ibn Baz and Shaykh 'Uthaymin, independently, argued that there was no evidence to fix the local dates according to the announcement of hajj; rather Muslims outside Saudi Arabia were commanded to follow the sighting of their local horizons or follow their national authorities. The latter was the most insistent: "It is obligatory for you to follow the sighting of the new moon in the place where you are", he states in an edict, and even for Eid al-Adha "you must abide by the city you're living in," rather than Mecca.³⁷

VI - Al-'Ulama bayn al-Sufaha: The Scholars vs. The State

Having witnessed the serial fiasco that is the Umm al-Qura calendar, the consensus of the learned 'ulama lies in proscribing the blind following of Saudi Arabian announcements in determining Islamic dates. Critically, even the leading scholars of Saudi Arabia itself have issued serial edicts against non-Saudis following the Umm al-Qura calendar. For example, the Saudi Shaykh, Ahmad al-Dawaish, reiterated the scholarly opinion:

The Prophet [salla'Llahu 'alayhi wa sallam] made the beginning of the fast conditional upon the confirmed sighting of the crescent of the month of Ramadan, and its end conditional upon the confirmed sighting of the crescent of the month of Shawwal; he did not connect this to calculations of the movements of starts or other heavenly bodies. This is how it was

³⁶ "Determination of the Proper Date to Celebrate Eid al-Adha": http://muslim-canada.org/eid_al_adha.html.

³⁷ Shaykh Saleh Al-'Utahymin, "Al-Aqalliyat Al-Muslimah" [Muslim Minorities], Fatwa No.23. For the hajjis, by necessity, other rules apply, in light of the hadith, "Make Hajj when the Pilgrims make Hajj" (Tirmidhi). For the pilgrims, even when the Saudi authorities err, they are obliged to follow the authoritative announcement and for them, and them alone, their practice would be correct in the light of the Shari'a. Cf. M. Afifi al-Atiki, op. cit. , who mentions the fiqh principle behind this conformity: "Someone who follows the only local option or the national authority, even when, falak-wise, the day is physically wrong, is not wrong, fiqh-wise. This is known as the fiqh rule of 'conforming with the local community' [muwafaqa ahl al-bilad] above other considerations, and in this, there is wisdom."

done at the time of the Prophet [salla'Llahu 'alayhi wa sallam], during the rule of the Khulafa' al-Rashidun, at the time of the four Imams [founder of the existing Sunni madhahib], and during those three centuries which the Prophet [salla'Llahu 'alayhi wa sallam] said were the best. Referring to calculations of the lunar months to start and end periods of worship, instead of actually sighting the crescent, is an innovation [bid'a] that has no good and has no basis in the sacred law. (Fatawa al-Lajnah al-Daimah)

In a veiled critique of the Umm al-Qura calendar's errors in beginning the month on calculated nights, despite lunar eclipses (at luni-solar conjunction), Shaykh al-'Uthaymin declared, "If a person claims that a month began in the same night as an eclipse took place after sunset, then it is like a person who claims that [...] the sun would rise before dawn, or like a baby will show up before it gets out of its mother's womb."³⁸

The Headmufti Ebrahim Desai of the well-known Ask Imam website was more forthright. In a question about whether UK Muslims ought to follow Saudi announcements, he declared, "Unfortunately, the Saudi criterion for of commencing a new month is incorrect and has no basis in Shari'a. It is not permissible for the Muslims of [the] U.K. to follow Saudi sightings."³⁹

The resident religion editor of Arab News, Adil Salahi al-Jaidy, likewise received a question which began as follows, "Some people in my home country do not begin the Ramadan fast according to their country, they follow Saudi Arabia." To this, he replied, "[T]heir practice is wrong, because it does not have a solid basis. If we were to extend their practice to its logical conclusion, we should offer prayers according to the timings in Saudi Arabia, rather than our own timings."⁴⁰ He goes on to paraphrase the hadith of Kurayb.⁴¹

³⁸ Fatwa dated 30/01/1412, available online: www.albalagh.net/general/eclipse_fatwa.html.

³⁹ Fatwa dated 16/12/2006, available online: www.askimam.org. Fatwa no. 14806.

⁴⁰ Responsa dated 11/09/2006, available online:
<http://archive.arabnews.com/?page=5§ion=0&article=86399&d=12&m=9&y=2006>

⁴¹ The hadith is narrated in Muslim, Tirmidhi Abu Dawud, Nasa'i, Ahmed, Bayhaqi and Daraqutni (with variants), and relates as follows: Kurayb reported that Umm Fadl, the daughter of Harith, sent Fadl to Damascus. While in Syria, the month of Ramadan commenced, and he witnessed the new moon of Ramadan. When he returned to Medina at the end of the month, Abdullah ibn 'Abbas informed him that they had seen it a day later in Medina and thus begun the fast later. Ibn Abbas stated, "We will continue to observe fast till we complete thirty [days] or we see it [the new moon of Shawwal]. When Kurayb objected, "Is the sighting of the moon by Mu'awiya not sufficient for you?" Ibn Abbas replied, "No, for this is how the Messenger of Allah instructed." What the scholars have deduced from this Hadith is, as Ibn Rushd writes in his *Bidayat al-Mujtahid*, that a location outside the qasr distance of a confirmed sighting is not obliged to (yet free to) follow the reported easterly sighting. Among the Ahnaf, al-Kasani and al-Zala'i, concur. Note also that the scholars differentiate between Ramadan and other months, for the conditions of completing the old month: In clear skies, the new moon of Shawwal [and the other ten months, apart from Ramadan] must be sighted in a ru'ya amma [see p. 19], hence Ibn 'Abbas' insistence that they would continue till the sighting was established or the count complete.

These are not recent reactions. As early as February of 1981, the Islamic Jurisprudence Council of the Saudi-established Rabitat al-‘Alam Islami, led by none other than Shaykh Ibn Baz and Shaykh Saleh al-‘Uthaymin, declared, “As far as the promoters of unification of the beginning of the fasting month and its end are concerned, they are in opposition to what is established by Shari’a and sound understanding.” Arguing against universalizing the horizon (ittihad al-matali’), the Council stressed that “the books of most Schools of Jurists (madhahib) are full of opinions in favour of the difference of horizons [ikhtilaf al-matali’] because of the vast evidence in the Shari’a in that regard”. The senior scholars concluded—in opposition to the Umm al-Qura calendar—that “Islam has established the visual sighting of the new moons over all other means” of determining the beginning of the month, and “for every country, there is its own sighting” (unsurprising, in the light of the Hadith of Kurayb, whereby the Medinites would not follow the Syrians even when the Caliphate moved to Damascus).

Similarly, the well-known Head Mufti of the Deobandi stream within the South Asian Hanafis, Taqi Uthmani in his Contemporary Fatawa, reported on the collective verdict of another juristic council, namely the Islamic Fiqh Academy, consisting of over a hundred Shari’a scholars, who met to discuss the question of the Islamic calendar in Jordan in October of 1986: “The Academy adopted the resolution and recommended that all Muslim countries should determine all the lunar months [...] This resolution represents the consensus of Muslim jurists throughout the world.”⁴² He also makes the interesting point that the much-desired unity of the umma lies in the uniformity of its founding and cardinal principles, not its uniformity of timing. Even the Sahaba would not seek to synchronize their Eidayn, rather their unity lay in their adherence to the Revelation and the Prophetic way.

VII - The Mother of All Moons? Trust, but Verify

The regional Saudi moon-sighting committees are, in effect if not in fact, defunct, as they have no privileged position either to report sightings (negative or positive) nor to determine the announcement of the months. Tending to be unable to see a moon where the Umm al-Qura calendar has invented one, they have over the years been sidelined and have only been kept on paper due to the pressure of the Majlis al-Ifa’ al-‘Ala [High Council for Fatwa] and to safeguard the legitimacy of the system. Yet, it is not a practice to sight for the moon each month, but only the months of Ramadan, Shawwal and Dhu’l-Hijjah, as such disallowing the fundamental rectification of the calendar. Moreover, the state invites sightings only for the evening of the 29th of these three months as defined by the Umm al-Qura calendar, which given that it typically falls a day or two early has led to lay people on occasion sighting the waning (i.e. old) moon and reported it as the new. When this has happened (around four times in the last decade), it has only added insult to injury and led to a further injection of error, as a month which was scheduled as a 30-day month had to be cut short to a 29-day month (but the following month is then turned from a 29 to a 30 day month, and the calendar is saved from revision!).⁴³

⁴² Taqi Usmani, “Determination of Eid al-Adha,” http://www.albalagh.net/qa/moon_qa.shtml.

⁴³ Muhammad Khan, “Crescent Sighting Using the Uml [sic] al-Qura Calendar in Saudi Arabia.”

The professional astronomers, on the other hand, often report the moon visible only a day after the Umm al-Qura, and on occasion two days later (see moonsighting.org for reports).⁴⁴ [N.B. Update 7/11: So too for the Dhu'l-Hijjah moon of 2010, where the Sighting Committees only saw the moon the evening after the new month was declared]. Even for the layperson living in Saudi Arabia, the litmus test of the errors in official dates is that the moon remains visible at the final days of the month, where it should otherwise be invisible, and that full moon falls on the 16th or 17th of the month, both indicators that the month is out of sync and was begun too early.⁴⁵

As indicated, allowing all and sundry to report on sightings is certainly not panacea. Lay people, whose eyes are untrained and who do not have adequate preparation, make an astounding number of errors in sighting, mistaking planes, birds, clouds, reflective light, or even their eyebrow hair for the new crescent (the last-mentioned case is from a hadith). Schaefer, who did much to popularize crescent-hunting, found that approximately 15% of reported sightings by enthusiasts were mistaken or “simply illusions”.⁴⁶ Likewise Guessoum and Meziane, based on an examination of reported sightings in Algeria between 1963 and 2000, found the rate of “impossible sightings” to be 17.4% (these alleged sightings clearly violated basic laws of astronomy and were deemed patently mistaken by the astronomers). The trend of mistaken crescents is upwards, as Muslims eyes are no longer accustomed to watch the night sky or perhaps the gaze of the overly keen see moons where there are only clouds, in particular if cash incentives are involved.⁴⁷ Nearly all of these are “positive” errors, i.e. reporting a non-existent crescent, rather than “negative” errors, omitting an existent crescent. The authors call for the establishment of verification mechanisms, which, to my mind, needs to engage with principles as well as procedure.

⁴⁴ The same visitor who joined the official Mecca sighting committee in 2000 [see fn. 26], was a guest of the Riyadh sighting committee six years later. Here is his report: “I am currently in Riyadh. Yesterday, Wednesday, Dec. 20 evening I went with the official Riyadh Moon sighting committee. Of course there was no chance of Hilal anywhere here and the 6 Official Hilal sighting committees of Saudi Arabia (near near Makkah, Riyadh, Qassim, Hail, Tabuk and Asir), each of which includes an Islamic Scholar, an Astronomer, a City council representative and volunteers) all reported negative sighting, as expected. Even the Moonset was before Sunset in Saudi and that is why even the Ummul Qura Calendar also put DhulHijja start for Friday, Dec. 22 and Eid ul Adha for Dec. 31, 2006. But unfortunately, as is often the case, Saudi Justice Dept. has announced start of Dhul-Hijja incorrectly for Thursday, Dec 21; Hajj on Dec 29, and Eid-al-Adha on Dec 30. Also I met the Br. Hamza al-Muzani (a Saudi writer) who had written in Saudi Al-Watan Newspaper of Thursday, 10 Dhul-Hijja 1425 AH in the article ‘Testimonies of the Impossible’ that last year Eid ul Adha witnesses were found to be over 80 years old. I found that after writing that article, they put a false charge on the author of making fun of the beard of the Chief Justice and sentenced him to 4 months in prison and 200 lashes!” (see Dr Salman Z. Shaikh’s testimony: <http://moonsighting.com/1427zhj.html#eid-sighting>).

⁴⁵ In fact, these were conditions that the Hanafi lead mufti, Rasheed Ahmad Ludhyanwi, mentioned in his letter of complaint to Saudi authorities, adding also the inability of sighting the moon further West (i.e. the Maghreb region, or across the Atlantic), when that should be easy at genuine sightings, and finally the fact that sometimes the moon became invisible even in Saudi Arabia the day after its phantom sighting (Ahsanul Fatawa, Vol. 4, p. 418).

⁴⁶ Muhammad Shahid Qureshi, “Computational Astronomy and the Earliest Visibility of the Lunar Crescent,” p.17.

⁴⁷ N. Guessoum and K. Meziane, “Visibility of the Thin Lunar Crescent: The Sociology of an Astronomical Problem.”

The ‘ulama too have called for the setting of criteria for the acceptability of sightings, much like the muhaddithun agreed on principles by which hadith narrations would be accepted.⁴⁸ It goes without saying that sightings which contract laws of the physical world cannot be accepted, except when being reported mutawatir as ru’ya amma (that is to say a mass-sighting, or ru’ya by al-jamm al-ghafir, which is to say sightings by an overwhelming number). In fact, in the Hanafi school, this is a general requirement stipulated by the Sahibayn: Imam Abu Yusuf, Qadi of Baghdad, required 50 witnesses per town; while Imam Muhammad ibn Hassan al-Shaybani required a several witnesses from every mosque in town. Imam Ibn Hajar from the Shafi’i school concurred and noted that if astronomical specialists agreed that a given sighting is impossible, “then the testimony is rejected,” and only if the astronomers differed, would it be accepted (Tuhfat al-Muhtaj).

As such, reports for sightings after moonset, before conjunction, and with negative altitude or elongation are not to be accepted. Indeed, Mufti Afifi al-Akiti goes to some length to dispel the myth that all reports must be Islamically accepted.⁴⁹ The evidentiary law of the Shari’a cannot go against the accepted laws of physics except by mass testimony, for the laws of physics are the Sunnan [regular practice] of Allah. Conversely, Imam Subki long since argued that calculations could be used to negate erroneous reports of sighting, on the basis that sightings were indefinite (zanni): “If one or two witnessed sighting the crescent, whereas the judgement of computation is that it is impossible to sight the crescent, the testimony is not accepted, since astronomical computation is definite while witnessing are probablistic [zanni] and [the fiqh maxim applies] ‘the probable cannot contradict the definite’.”⁵⁰ Elsewhere Imam Subki describes the conditions for a valid testimony of moonsighting, namely that it must be “physically [hissan], rationally [‘aqlan] and religiously [shar’an] possible.” Otherwise, it is rejected.

In explaining this, Shaykh Afifi al-Atiki states that, “From a fiqh perspective [...] it is vital to distinguish between the two kinds of hisabs: (1) hisab qat’i and (2) hisab zanni”, i.e. the definitive calculation and the probabilistic calculation. The former is used to negate the possibility of sighting in cases where alleged sightings contradict physical possibilities, whereas “the latter—for example, computational predictions of visibility—can only be used to estimate, but not by itself, to establish the new lunar month, even when nine out of ten times they have been proved to be correct.”⁵¹ In other words, astronomical calculations are brought to bear on the negation of impossible sightings in a definitive sense, whereas their import on establishing the projected visibility is only probabilistic and therefore does not overrule the necessity of sighting. To strike this balance, more narrow criteria of visibility need to be established, such as required lagtime, required age, and required elongation. The present paper, based on its review of the current evidence, would suggest that leeway be given for future record viewings and the required lagtime be set at 18 minutes, required age at 12 hours minimum, and required elongation at 6 degrees. Singular sightings which violate these parameters should not be accommodated.

⁴⁸ See for instance the Resolution of a group of scholars from North America: www.ramadan.co.uk/san-jose-07.pdf.

⁴⁹ Muhammad Afifi al-Akiti, “Hisab & Ru’ya or Matla’ al-Budur”, op. cit.

⁵⁰ Ibid.

⁵¹ Ibid.

VIII - Conclusion: Synchronous vs. Diachronous Time

The debate on setting the Islamic calendar is a compounded one, to the extent that scholars disagree first on the legitimacy of calculation on the making of the Islamic calendar and second on what is properly to be calculated. On the modernist end, some have called for the abolition of crescent sighting altogether and argued that lunar conjunction should be the basis of the definition of the start of the new month (a simple, but unsatisfying, formula of beginning the month at the first sunset after lunar conjunction, regardless of visibility conditions). The problem with this position is that it goes against the established texts, which in turn convey ideas of sacral periods for worship. Opposed to this perspective is that of those who question the import of calculation altogether, adhering instead to the traditional practice of monitoring the skies. The problems with this position relate both to verification and to planning. Third is the group, who wish to use calculated methods of establishing lunar visibility (rather than conjunction), but they are not unified in their criteria nor is their predictions typically born out (like the Saudi Umm al-Qura calendar). Finally, we have the group who argue for retaining calculations but only to establish negative sightings, which is to say to eliminate possibilities of error. On this basis, calculations establish the contingent possibility of visibility (*imkan al-ru'ya*), rather than being a substitute for sightings. This seems to be the pragmatic middle position between the calls for abolition of the visibility criterion, the calls to go purely by calculation, and the insistence that calculation has no merit.

The debate has real implications for the religious life of the Muslim. The concept of sacred time is integral to the religious cosmology of Islam— notions of the consecration, sanctity and superiority of selected time permeates Muslim life in practices such as the predawn prayer, the pre-maghtib time of Fridays, the days of Ramadan, the night of *lailat al-qadr*, the fasting of *ashura*, *yaum al-arafah* and the full-moon days (*ayyam al-bayda*). It is quite plausible to make the argument of the observant pious that all attempts at inducing calculations have so far led to incalculable spiritual losses: In the blind following of the Umm al-Qura calendar, Muslim worshippers eliminate from their worship the dedicated times of mercy and recompense revealed in the sacred law. In celebrating *Eid al-Adha* a day early, on the 9th of *Dhu'l-Hijjah*, Muslims fail to take advantage of fasting on the day which expiates for sins of two years; by commencing Ramadan early, they not only fast of the prohibited *yaum al-shaqq* but they mistake for even the odd nights in which is hidden the night better than a thousand months, and by beginning *Shawwal* early, they miss a day of compulsory fasting. Indeed, in this consistent negation of divine mercy, the orthodox may well fear the interference of sinister forces: by inducing persistent errors in our calendar, *Shaytan* has accomplished what he would otherwise not be able to. Certainly, the Prophetic warning was stark: “Among the signs of the end of time is that when the crescent will be seen with the eye, it will be said, ‘This is two days old!’” (*Daraqutni*, *Tabarani*).

We need not accept the details of the radical pietist argument to reject the calls for predictability, for they manifest only our detachment from religion and from nature. Those who crave predictability and practicability, follow the earlier Judeo-Christian reasoning to abandon their own Prophetic practice, namely that “observation is idyllic, but totally impractical. The modern world requires plans

for religious observances to be made months, or even years, in advance”.⁵² Indeed, the respected Muslim astronomer, Khalid Shaukat, resounds a similar theme in his argument for a fixed calendar, “We are living in a time when we have to plan Eid and Ramadan way ahead of time, and we cannot remain uncertain until the last moment.”⁵³ Arguably, though, such arguments lose sight of the point of the Islam’s injunction to scout for the crescent, namely the precise anticipatory unpredictability.

In being bound by the moon’s self-disclosure for his worship lies a reminder of man’s helplessness qua creation, his inability to conquer nature, and his status as a subject of the very same Creator who moulded the heavenly bodies. Sighting for the moon reconnects us to the nature and the natural order we are otherwise much alienated from, whilst reminding us of God’s workmanship: “Verily in the creation of the heavens and the earth, and in the alteration of night and day, there are signs for those who reflect.” Islam is the religion of the nature. The effects of the lunar cycle and its phases are evident in numerous life forms—fish, insects, mammals, and plants. Effects of new moon and full moon in the human body are experimentally known. In the female human, the monthly period is linked to both fertility and motherhood, the former preceding the other as the new moon precedes the crescent.

There is no Luddism in the Islamic rejection of predetermined calendars, rather a theological choice. As the Malikite faqih, Qadi Abu Bakr Ibn al-Arabi (d.1148), argues, “it is not permissible to rely on astronomers and mathematicians, not because their findings are not true but because people’s beliefs must be protected from an association with celestial motions.”⁵⁴ Adhering thus, to, the absolute monotheism of Islamic doctrine, according to which ‘causes’ are only apparent regularities, the sighting of the moon is a practice which is integral to worship itself. From this perspective, it does not appear entirely coincidental that scientists since the Babylonians have made pitiful progress in predetermining the appearance of the moon on the horizon: Perhaps divine wisdom had chosen the exact phenomenon which scientists could not colonize. Nor should we forget the radical egalitarianism in the moonsighting praxis: it is for all and sundry to equally participate in, requiring no esoteric knowledge, no refined equipment or access to resources, no privileged status or position, except a patient submission to the laws of nature.

In this treatment of the subject, Shaykh Hamza Yusuf shows impatience with the impatience of the ‘engineer’s mindset’ when it comes to the determination of the Islamic months:

God has hidden from us the power to predict the actual appearance of the crescent moon on the first day. Even modern scientists admit this. Yet, we wish to fit God’s plans into our plans instead of fitting our plans into God’s. Convenience store Islam is the Islam of the day, where we can buy a pre-packaged Islam that fits into our busy schedules. But Ramadan is God’s month; it is a time of slowing down and reflecting, of looking at our

⁵² Statement of the Active Church of Christ, cited, unapprovingly needless to say, by Yusuf, in “Caesarian Moon-Births”, op. cit.

⁵³ Khalid Shaukat, “A Suggested Global Islamic Calendar,” p. 3. Disappointingly, Shaukat suggest the basic idea of going by conjunction.

⁵⁴ Cited in Yusuf, “Caesarian Moon-Births,” op.cit.

lives and questioning ourselves, “Are we in harmony with God’s creation. Are we bypassing signs right before our eyes?” God has veiled Ramadan’s greatest night from us, and if He chooses to ask us to inconvenience ourselves just a little bit for His sake to seek out Ramadan’s onset, then praise be to God. I find it altogether odd that a month that is meant to teach us patience and is called “the month of patience,” is no longer patiently waited for by eager Muslims to see what God has in store for them tonight or perhaps tomorrow night. I believe sighting the moon is an intended purpose of Ramadan.⁵⁵

Unpredictability is the point. Modern man is all too acclimatized to the imperial mindset of synchronous time: everything must fit together, happen at his will and penciled into the diary. We insist, wrongly, that time is linear, that it needs measuring, taming, used as a resource. Yet, the Islamic conception of time is, in part at least, synchronous. It is about finding the divine in the chaotic, about creating meaning in a world of anxious overstimulation. For ancient man, the moon was a symbol of subtlety. In its method of projecting light, illumination is gained by passive means, by reflection. Where the sun boldly bears down its blaze upon a given subject, the moon softly submits, allowing its gossamer glow to reemerge from esoteric solitude to that of gentle luminary. The moon is hidden from us, until such time that Allah wants, as a reminder that it too is prostrating before the Almighty.

⁵⁵ Ibid.