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Petra Revisited: An Astronomical Approach to the Nabataean Cultic Calendar

Juan Antonio Belmonte and A. César González García

Abstract: Petra, the ancient Nabataean capital, has been one of our main research objectives since the first field campaign on site in 1996.[1] In December 2015 a new visit to the city was made to coincide with the winter solstice. Historical, ethnographic, epigraphic and archaeological records are compared in order to gain an insight on the Nabataean calendar. From this multi-source analysis two main points arise: the importance of both equinoxes and winter solstice within the lunisolar calendar and the relevance of some processions and pilgrimages. These combined with illumination effects observed and broadcasted at the principal monuments of Petra, and new important hierophanies, predicted in previous campaigns,[2] indicate the relevance of these dates at the time of the Nabataeans. Winter solstice was an important event in the Nabataean cultic calendar when a festival of the main deities of the city, the God Dushara and his partner the goddess Al-Uzza, was commemorated. This probably took the form of a pilgrimage, and related cultic activities, such as ascending from the temples at the centre of the city (presumably from Qsar el Bint and the Temple of the Winged Lions), to the Monastery (Ad-Deir) through an elaborated stone-carved processional way. The relevance of the spring and autumn equinox within the cultic calendar will also be emphasized in relationship to other sacred sites in Petra, such as the Zibb Atuff obelisks, and additional Nabataean sites.

In the two centuries before and after the birth of Christ, the ancient Nabataeans developed a singular culture in the harsh lands of Arabia Petraea at the frontier, then under the influence of the Hellenistic World. For generations, they carved out tombs and palaces for their kings and

[1] Juan A. Belmonte, 'Mediterranean archaeoastronomy & archaeotopography: Nabataean Petra', in A. Lebeuf & M. Ziolkowsky, eds., *Proc. V SEAC Meeting* (Gdansk: Institute of Archaeology, 1999): pp. 77–90.

[2] Juan A. Belmonte, A. César González García and Andrea Polcaro, 'Light and Shadows over Petra: Astronomy and Landscape in Nabataean Lands', *Nexus* 15 (2013): pp. 487–501.

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temples for their divinities in the sandstone slopes of the Shara Mountains and created one of the most fascinating places on Earth, the legendary city of Petra. There, they worshipped, above the rest of the gods, their powerful divinities Dushara and Al-Uzza.

The Nabataeans had a religion inspired by the forces of nature. This was a strange mixture of elements from pre-Islamic Arabs and Hellenistic, Egyptian and Middle Eastern influences. Divinities were often represented by stone blocks (betyls or *neshebet* in Nabataean) although in the late period (S. I-II CE), human or quasi-human forms were developed (Fig. 1).[3] The main male divinity was the god Dushara, or Dushares, very probably an astral god. His name means 'He of Shara', Shara being the mountain range bordering Petra to the east where the neighbourhood of Gaia, or Al-Ji (today Wadi Musa) was located. On certain occasions he seems to be a form of the god Al-Kutba ('the one who writes'). Dushara was identified by classical writers either with Zeus, Ares or Dionysos. Triclinium no. 17 in Bab es-Siq at Petra has an inscription dated 96/95 BCE devoted to Dushara: this is the oldest dated Nabatean inscription and probably the oldest dated betyl of the god.[4] According to Suidas [Theus Ares] 'the god Dushara is worshipped by them for him they honour above all others. The image is a black stone square and unshapen, four feet high by two feet broad − one foot in thickness − (see Fig. 1d). It is set on a base of wrought gold'.[5]

There has been much discussion regarding the head female divinity of the Nabataeans. In Bosra, the northern Nabataean capital during the reign of Rabel II (71–106 CE), the main goddess was Allat (or Al Lat), meaning simply 'The Goddess'. With a hypothetical solar character (As Sams, the Sun, was a female divinity in pre-Islamic Arabia), she has been identified with Athena and Atargatis (the Syrian Goddess). Her name has also been found in Palmyra (Syria), in Iriam (Wadi Rum, Jordan), and in Hatra (Iraq) and is indeed mentioned in the Quran. She is identified with the Alilat of Herodotus (Hist. III.8).

[3] John F. Healey, *The Religion of the Nabataeans: A Conspectus* (Leiden: Brill, 2001).
[4] Robert Wenning, 'The Betyls of Petra', *Bulletin of the American Schools of Oriental Research* 324 (2001): pp. 79–95.
[5] Robert G. Hoyland, *Arabia and the Arabs: from the Bronze Age to the coming of Islam* (Oxon: Routledge, 2001): p. 183.

Fig. 1 The principal Nabataean deities were a male god, Dushara, and a female goddess, Al-Uzza in Petra or Allat anywhere else. Other divinities were also worshipped, Manatu, goddess of fate among them. Panel (a) shows the carved betyls of these three deities at As-Siq. Panel (b) shows a relief of Manatu at Dejebel Madbah. Panel (c) a betyl of Al-Uzza discovered at the Winged Lion Temple. Panel (d) is the relief of Dushara at the Wadi Farasa trail. Panel (e) shows a Roman period female portrait of a deity found at the Qsar al-Bint temple, presumably the goddess Al-Uzza. Panel (f) shows a betyl of Isis-Al-Uzza found in excavations at Ez-Zantur Hill. Finally, panel (g) shows a Roman period young male sculpture, presumably Dushara, also found at the Qsar al-Bint temple. Diagram and images by the authors.

However, in Petra, this name is never found. Instead, inscriptions refer to the goddess Al-Uzza. Her name means 'The Most Powerful' and she was the personification of the planet Venus − often specifically assigned to the Evening Star, identified with Aphrodite and the Cananaean Astarte, and also with the Egyptian goddess Isis.[6] In inscriptions in Petra and Iriam, she is mentioned together with the 'Master of the House', Al-Kutba and, of course, Dushara of whom she could have been his partner or even his mother-cum-consort. It has been argued that Al-Uzza was possibly an alternative manifestation of Allat, e.g., the lion was the totem animal for both deities. Interestingly, she seldom had a double nature, being known as Al-Uzzatan, so that, according to many scholars, Allat and Uzza could go in tandem, being two faces of the same coin.[7]

What seems to be a completely different female personality is Manatu, a deity (or deities, since the word is a plural) who joins Dushara in several funereal inscriptions at Hegra (Median Saleh, Saudi Arabia).[8] She was the goddess of fortune and the numen of the city and is usually believed to be Dushara's daughter. Manatu, as Fate, was conceived as a trio of goddesses in antiquity.[9] It is possible that the moon was one of her manifestations and she could have been represented as three adjacent betyls in several niches across Petra and Hegra (see Fig. 1). Finally, stars were also very important in pre-Islamic Arabia and bright stars and asterisms such as Sirius (Sira') Canopus (Suhail) and the Pleiades (An-Nijm) were broadly used for guiding the caravans, establishing the dates of pilgrimages, regulating

[6] Gerald R. Hawting, *The Idea of Idolatry and the Emergence of Islam: From Polemic to History* (Cambridge: Cambridge University Press, 1999): pp. 141–44. Helmut Merklein and Yvonne Gerger, 'The Veneration Place of Isis at Wadi as-Siyyagh, Petra: New Research', *Studies in the History and Archaeology of Jordan* 7 (2001): pp. 421–32.

[7] See Hawting, *Idea of Idolatry*, p. 144. However, the Holy Quran reports in Sura 53: 'Have thou seen Al Lat, Al-Uzza and the other, Manat, the third one. These are only names that thou and thour ancestors had given to them. Allah has not put any power in them'. According to this, these three goddesses would be different personalities who have been identified as the daughters of Allah. However, this does not necessarily would apply for Nabataean times five centuries earlier. The controversy still continues. See, e.g., Michal Gawlikowski, 'Les dieux des Nabatéens', *Aufstieg und Niedergang der römischen Welt II* 18, no. 4 (1990): pp. 2659–77.

[8] John F. Healey, *The Nabataean Tomb Inscriptions of Mada'in Salih*, Journal of Semitic Studies Supplement 1 (Oxford University Press, 1993).

[9] Hawting, *Idea of Idolatry*, pp. 141–42.

calendars or making weather forecasts.[10] This could have been so in Nabataean times. Following this line of argument, it is worth mentioning that Nabataean Queens were often assimilated with Isis-Al-Uzza and that Sirius, in her name of Sopdet, was the main celestial aspect of Isis.

The Nabataean Kingdom had a lunisolar calendar of Babylonian type inherited of the Seleucid period.[11] We know very little of it apart from a few inscriptions and related historic information that will be discussed in subsequent sections, together with interesting ethnographic sources that will offer a new perspective. This information will give several clues for a coherent interpretation of the archaeological record within the context of cultural astronomy. The final outcome will be a proposal for a comprehensive Nabataean cultic calendar where pilgrimages would have played a most relevant role.

Ancient ethnohistoric sources

Stabro,[12] the great geographer of Amasiya, wrote that the Nabataeans 'worship the sun, building an altar on the rooftop of their houses, pouring libations on it every day and burning frankincense'. These sort of domestic cultic practices presumably had their official counterpart in the numerous high-places still standing in Petra and its surroundings. Some of them are of a size appropriated for a family group or clan, others have a much larger monumental character and, often, are located on mountain and hill tops, possibly related to important festivals.

Historical sources for cult practices in the Levant in the Hellenistic and Roman periods are scarce but most relevant. Lucianus [Dea Siria 49] reports that in the city of Hierapolis-Mambij, in northern Syria, 'the greatest festival they celebrate is that held in the opening of the spring'. Similarly, Procopius [2, 16] informed that the time for festivals 'was the season of the vernal equinox and at this season the Saracens always dedicated about two months to their god'. The Saracens was the name given by late Roman sources to the Arab speaking tribes who inhabited the ancient lands of the Nabataeans and still used, among others, the Nabataean Aramaic alphabet for their inscriptions. Hence, it is highly

[10] Miquel Forcada Nogués, T*ratado sobre los Anwa y los Tiempos de Ibn 'Asim* (Barcelona.: C.S.I.C. Fuentes Arábico-Hispanas 15, 1993).
[11] Mahdi Alzoubi, 'The Nabataean Timing System', *Acta orientalia* 69 (2016): pp. 301–9.
[12] Strabo [Geo 16, 4, 26].

probable that they were somehow related to the Nabataeans of the Kingdom period, if not their direct descendants.

This information can be further extended with the text of Protheus [3] who argued that the grammarian Nonnius reported that most of the Saracens gather at a certain sacred place – not explicitly mentioned − twice each year. The text continues: 'the first of these assemblies extends over a whole month and takes place about the middle of the spring, when the sun passes through the sign of Aries, while the other lasts two months; this they celebrate after the summer solstice'. The arrival of the new moon marked the time for these festivals.[13] To judge from the evidence of pre-Islamic northern Arabia, annual spring festivals are likely to have been held with aspects of pilgrimage attached.[14]

Another clue to the identity of the Saracens and their close ties with the Nabataeans is that the Christian apologist Jerome [Vita Hilarionis, 42-43] reported that they 'arrived at Elusa on the very day that the solemn festival [which] had brought all the people of the town to the temple of Venus; for the Saracens worship this goddess as the Morning Star and their race is dedicated to her cult'. It has been argued that the name of the city of Elusa is actually a Greek spelling for Al-Uzza and that the name of the city actually honoured the greatest Nabataean goddess.[15] Festivals dedicated to the greatest female divinity were amongst the most important in the Levant.

In this sense, the texts of the Christian apologist Epiphanius of Salamis (fourth century CE), who was born at Eleutheropolis (Bayt Jibrin) – a locality in ancient Edom and was hence a native of the region, are very important and elucidating. This is so even considering the time passed from the annexation of the Nabatean Kingdom and that his arguments were written to support his assertions and to show that the cult of the virgin had its pagan equivalences.[16] Epiphanius reported that 'in the idolatrous temple at Petra, …, they praise the virgin with hymns in the Arabic language and call her khaabu … in Arabic; and the child who is born of her they call Dusares. And this is also done that night in the city of Elusa, as it is there in Petra, …, on the very night of the Epiphany [Contra Haeretici, Panarion, 51, 22]. Hence, according to this text, written c. 374–376 CE, the

[13] For an extended discussion of all these topics, see: Hoyland, *Arabia and the Arabs*, pp. 161–252 and note 6.1.
[14] Healey, *Religion*, p. 161.
[15] Hoyland, *Arabia and the Arabs*, note 6.1.
[16] Johannes H. Mordtmann, 'Dusares bei Epiphanius', *Zeitschrift der Deutschen Morgenländischen Gesellschaft* 29 (1875): pp. 99–106.

celebration of the birth of Dushara from the womb of the Virgin Mother (almost certainly his mother-cum-consort Al-Uzza) took place on the 6th January in Petra at dates closer to the winter solstice. This fact strongly suggested that Dushara was also probably considered a sort of solar deity.[17] In the same line of argument, it has been suggested that 'all these evidences may well point towards a solar character of the Nabataean chief god and incline us to consider the "very great festival on the very night of the Epiphany", mentioned in Epiphanius, as a survival of an earlier celebration of the winter solstice among the Nabataeans'.[18]

It rains very little in Petra and when it does, it is in the form of short showers concentrated in the winter months. The Nabataeans developed a fascinating system of water channels and cisterns to take the maximum advantage of this limited rainfall. Some are still functioning today. This system allowed them to develop a flourishing agriculture and to maintain a population of some 30,000 people throughout the year in Petra. It is hence highly possible that one of their most important festivals was celebrated at the time of the winter solstice, close to the period of maximum rainfall. Interestingly, Epiphanius also reports on the religious sect of Peraean Sampsaseans (or *Ash-shamsiun*, worshippers of the sun), 'which were also in Moabitis ad Nabatitis' and who continued the solar cult in the region after the fall of the Nabataean Kingdom [Panarion 53, 1 and 19].

Lastly and most relevantly, Epiphanius also informed that the fourth-century Arab tribes of southern Palestine and Transjordan performed pilgrimage during the month of Aggathalbaeith at a major sanctuary − 'al baeith', The House − in the region [Panarion 51, 24]. This could have been Petra, since Dushara is often called *mr' byt'*, Lord of the House in Nabataean inscriptions. The time of the pilgrimage corresponds to the month of Tishri, the first lunar month after the Autumn Equinox in the Nabataean calendar. The central day of the festival was on the 22nd day of Aggaathalbaeith, roughly corresponding to November 8th in the Julian calendar. This cult strongly resembles the later Muslim tradition of pilgrimage (*hajj*) at the month of Dhu al Hijja to the 'House of God' in Mecca, the Kaaba.[19]

Although it might be argued that all these sources are quite late for our interest, they clearly speak of a well-stablished tradition in the Nabataean

[17] Belmonte, *Nabataean Petra*, pp. 82–88.
[18] Moulay M. Janif, 'Sacred Time in Petra and Nabataea: Some Perspectives', *ARAM* 18–19 (2006/7): pp. 341–61.
[19] Janif, *Sacred Time*, p. 341.

lands that probably ought to be ascribed to earlier practices rooted to the apogee of the Nabatean Kingdom three centuries before. Consequently, we can be confident by assuming that the time of the equinoxes were important markers for the celebration of important pilgrimages in the subsequent lunar months and that a date close to the winter solstice was the moment for the celebration of one of the most important Nabataean festivals - the birth of their main deity Dushara from the 'Virgin' mother Al-Uzza. If this was the case, it certainly ought to be registered in epigraphy and in the archaeological record. We will return to these important issues later.

Petra 'today': the Ethnography

Jewish, Christian and Muslim traditions give a most relevant role to Aaron, Moses's brother. He died at the top of Mount Hor [Numbers 20: 22–29] which has been identified since time immemorial with the highest peak in the environment of Petra: Jabal Hārūn. This mountain has a close topographical relationship to the city as it was the most obvious high-place in the vicinity. The Jabal al-Nabī Hārūn, to give its complete Arabic name, is located c. 5 km south-west of Petra city center, easily attracting attention and stirring the imagination. The Finnish Jabal Haroun Project has carried out archaeological excavations of a Byzantine monastery located on the high plateau of the mountain since 1997. But the existence of the monastery represents only part of the whole spectrum of religious significance accorded to the mountain since Nabataean times, a significance that continued well into the Islamic period. The excavations revealed that the site was initially occupied by a major Nabataean shrine, dated to the apogee of the Kingdom. In the late fifth century CE, a Byzantine monastery was built at the site, but as early as the fourth century CE the mountain began to be associated with the biblical tradition of the Exodus, and attracted Christian pilgrimages.[20]

This importance persisted even after Muslims took control of the region in the mid-seventh century CE. This is demonstrated by the fact that in the beginning of the twentieth century CE some Bedouins still buried their dead with the bodies facing the Jabal, rather than Mecca, a custom clearly

[20] Zbigniew T. Fiema, 'Reinventing the Sacred: From Shrine to Monastery at Jabal Hārūn ', *Proceedings of the Seminar for Arabian Studies* 42 (2012): pp. 27–37.

confronting Islamic tradition.[21] This area was visited by Muslim pilgrims as early as the eighth century and the shrine at the very top of the mountain has a black obsidian stone (the 'Mirror of prophet Haroun') which is set in the north wall of the building and is still kissed by visitors.[22] This resembles the tradition in Mecca but also let us think of the black cult betyl of Dushara. Furthermore, nineteenth-century travelers to the site such as J. Ludwig Burckhardt or Gertrude Bell left clear references of the mountain as a most important landmark: its visibility was enough to sanctify a certain spot to slaughter a victim to Prophet Harun and built heaps of stones piled up. This tradition is perhaps a souvenir of Nabataean times since important high-places, such as the one of Madras, were established with a clear land- and skyscape connections to the mountain summit. Jabal Hārūn was indeed a pilgrimage goal of primordial importance.

In the early twentieth century, ethnographer Tawfik Canaan reported that twice in the year large numbers of Bedouin of many tribes flock to the sanctuary to make a pilgrimage, and to offer their prayers and vows. One of these *mawasim* (to use the local name) was the winter and the other the summer feast. The first falls in February (sic), and the second during the grape season and it was called *Darb an-Nabi Haroun*.[23] Interestingly, when the pilgrims ascend the mountain they sing:

O Aaron we are coming thirsty to you.
In this summer heat driven by thirst.
O Aaron! O great star!
O father of high planets!

This indeed is an astonishing set of verses since they clearly identify a relevant prophet of the monotheistic religions with a celestial body. This could easily be a reminiscence of much earlier Nabataean astral cults and related traditions.

More recent reports have slightly tingled Tawfik's arguments reporting that the two visits to Jabal Hārūn are made as a prayer asking for rain and

[21] Stewart Crawford, 'The Attitude of the Present Day Arab to the Shrine of "Mount Hor"', in George Livingstone Robinson, ed., *The Sarcophagus of an Ancient Civilization* (New York: MacMillan, 1930): pp. 285–300.
[22] Zeyad Al-Salameen and Hani Falahat, 'Religious Practices and Beliefs in Wadi Mousa Between the Late 19th and Early 20th Centuries', *Al Majaq al Urdunia* 3 (2009): pp. 170–204.
[23] Tawfik Canaan, 'Studies in the Topography and Folkrore of Petra', *Journal of the Palestine oriental Society* 9 (1929): pp. 136–218.

to offer Haroun the first grains and fruits. Hence the festivals, and the pilgrimages are made at the beginning of October (certainly the *Darb an-Nabi Haroun*) and in Spring rather than in February which apparently seems more logical.[24] Even today, ritual visits are made to the peak to ask for rain in times of draught.

Apart from the pilgrimage practices to Jabal Hārūn, the inhabitants, both Christians – now foregone − and Muslim Bedouins, of El-Ji (Wadi Musa) performed a procession lead by old and pious women and children at the beginning of the rainy season (i.e., close to the winter solstice).[25] This was called the *Amm al-Ghaith* procession as the goal was to ask the 'Mother of Rain' for showers during the drought season. During the procession, the participants sang:

Oh Mother of Rain!
Rain upon us: wet the mantle of our herdsman
Oh mother of Rain!
Rain upon us, with pouring rain allay our thirst
Oh Mother of rain!
Rain upon us.

Again we might be hearing echoes of a very ancient tradition, certainly pre-Islamic − due to God uniqueness − but not necessarily pre-Christian since Virgin Mary often plays that role in several ancient and modern Mediterranean cultures. It would be reasonable to assume that this is a reminiscence of a Nabataean cult related to fertility. Notwithstanding, a few researchers have claimed that *An-Nabi Haroun* and *Amm al-Gaith* must be Islamized aspects of some of the most important Nabataean deities.[26] From our point of view, if this were the case, they should have been Dushara and Al-Uzza, respectively.

This would mean that Jabal Hārūn might have sacred aspects related to Dushara and, possibly, to Al-Uzza as the main deities of the Nabataean pantheon at Petra. Hence, the festivals and pilgrimages connected to the mountain, even in the present day, would be clear souvenirs of the traditions which were analysed in the previous section. Is the *Darb an-*

[24] Al-Salameen and Falahat, *Religious Practices*, p. 183
[25] Al-Salameen and Falahat, *Religious Practices*, pp. 184–85.
[26] Anti Lahelma and Zbigniew T.Fiema, 'From Goddess to Prophet: 2000 Years of Continuity on the Mountain of Aaron near Petra, Jordan', *Temenos* 44 (2008): pp. 191–222.

Nabi Haroun a reminiscence of the pilgrimage certainly related to the month of Aggathalbaeith? Is the *Amm al-Gaith* procession a modern snapshot of a ritual celebrated since time immemorial in the area of Petra related to the birth of Dushara and the renewal of life and nature through the arrival of the vivifying rains? Is the Spring pilgrimage to the peak summit an echo of the Spring Festival celebrated by the Saracens? The answer to this related chain of questions is not easy. An answer in the affirmative would indeed be fantastic. Ethnographic and ethno-historic sources seem to back up each other but a doubt remains. Let us now turn into epigraphy and architecture for further insight.

The information of epigraphy: Nabataean calendar inscriptions

Nabataean inscriptions from Petra including calendar dates are surprisingly scanty. These include three examples only: an inscription in the shrine of Isis at Wadi Siyyagh dated in the 1st of Iyyar, in the 5th year of Obodas III, a dedication to Dushara found in the ruins of one of the churches, and hence presumably out of place, mentioning the month of Thebet, in the 11th year of Aretas IV, and finally another inscription found in the temple of the Winged Lions, at the city centre, dated to 4 (B)ab of the 37th year of Aretas IV.

However, this is not the case for the southern Nabataean capital of Hegra, today Mada'in Saleh, in the northwest of Saudi Arabia. There, the Nabataeans produced an incredible series of tombs of an outstanding beauty sculpted in the local sandstone for a period a little longer than a century or so with a maximum in the first century CE.[27] Of more than 80 monuments, as much as 22 of them have foundation inscriptions where the date of the tomb dedication was included. Seven months out of twelve possible are mentioned but only a few of them: Nisan, Iyyar, Abib or (B)ab and Thebet (*nysn, 'yr, b'b, Tbt*) are mentioned in several occasions.[28] An analysis of the data (Fig. 2) shows that this distribution cannot be random. For example, the probability that the month of Nisan is just by chance referred to in 8 of the 22 inscriptions is of less than 2% and of some 17% in the case of Iyyar and Thebet. This illustrates that these months should have had a sort of special character within the Nabatean calendar, at least as far as the cult of the dead was concerned.

[27] There is a need for serious archaeoastronomical research on the site, one of our group's dreams. A very preliminary approach can be sketched in: Ioannis Liritzis, F.M. Al Otaibi, B. Castro and A. Drivaliari, 'Nabatean Tombs Orientation by Remote Sensing: Provisional Results', *Mediterranean Archaeology and Archaeometry* 15 (2015): pp. 289–99.

[28] Healey, *Nabataean Tomb Inscriptions*, Appendix 1.

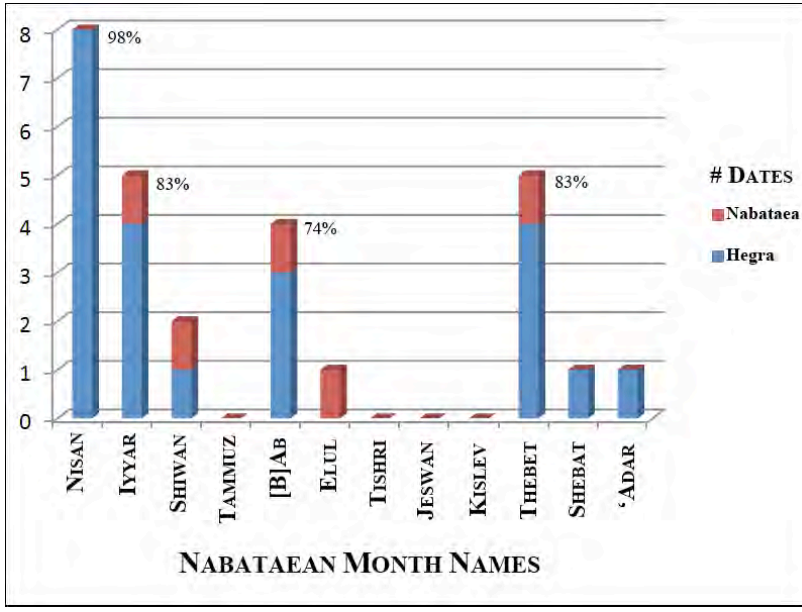

Fig. 2 Histogram of the months of the year mentioned in dated Nabataean inscriptions in the tombs of Hegra and elsewhere in Nabataea, including Petra, during the Kingdom period. Notice the relevance of the months of Nisan, Iyyar, (B)ab or Ab'ib and Thebet which are statistically significant (numbers indicate the probability of the month not being mentioned by chance). See the text for further discussions.

In the Babylonian calendar, the New Year was celebrated on the first moon after the vernal equinox, in Nisan.[29] The New Year at the city of Palmyra was celebrated the eleven first days of Nisan, the month that, in this particular case, included the spring equinox. Besides, the Hebrew New Year, presumably related to Passover on the first full-moon after the vernal equinox, was also celebrated in the first day of Nisan until it was moved to 1 Tishri in the fourth century CE. These historical facts, linked to the epigraphic proofs, strongly suggest that the months of Nisan (perhaps the first of the year including the vernal equinox), Iyyar (which on some occasions would be the first crescent of the year), and Thebet (the lunar

[29] Judith McKenzei, *The Nabataean Temple at Khirbet et-Tannur, Jordan: Final Report on Nelson Glueck's 1937 Excavation* AASOR 67 (Atlanta: American Schools of Oriental Research, 2013): p. 249.

month most likely including the winter solstice) must have been of importance within the context of the Nabataean cultic calendar. Shiwan and specially (B)ab, the first month after the summer solstice and the one including the heliacal rising of Sirius could also be relevant (see Fig. 2).

Interestingly, the few epigraphic sources do agree with what had been stressed in the two previous sections related to ethno-historic and ethnographic sources, emphasizing the importance of the vernal equinox and the winter solstice together with the months related to these two important time markers. Only the absence in the inscriptions of the month of Tishri is indeed challenging. It is now the time to complete the puzzle, moving to the terrain to look for the last clues offered by skyscape archaeology.

Land and skyscape in Petra: pilgrimages and hierophanies

As has been extensively discussed in previous sections, Nabataeans certainly celebrated religious festivals and performed pilgrimages to sacred shrines at the time of these celebrations. However, direct evidence on the terrain has so far been very scanty if it were not for the imposing ascending routes to several sacred sites in various spots of the city of Petra (Fig. 3).[30] The question is how, why and when these pilgrimage routes could have been used.

Petra has an impressive access when coming from the east: the ravine of As-Siq. This was not only the main entrance to Petra but also a Via Sacra in its own sanctity because of its high cliffs and narrow gorge.[31] The large amount of niches – a good number of them including betyls or composite divine images (see Fig. 1) −, and high-reliefs carved on its wall for more than a mile are explicit enough in this sense. Siq has been followed by pilgrims during the *Darb an-Nabi Haroun* for centuries and certainly earlier, and it is still admired today by hundreds of astonished visitors when entering the city.

[30] Lamia El Khoury, 'Nabatean Pilgrimages as Seen Through Their Archaeological Remains', *ARAM Periodical* 19 (2007): pp. 325–40

[31] Wenning, *Betyls of Petra*, pp. 79–95.

Fig. 3 The proposed pilgrimage route − mostly carved on the rock (upper left) − from the city centre (temples of Al-Uzza and Dushara) up to the mountain plateau where the Monastery (Ad-Deir) was sculpted on the sandstone cliffs (upper right) - the route passed by the Lions' Triclinium. This could be the most important Nabataean pilgrimage route in Petra related to Dushara's birth festival from his mother cum-consort Al-Uzza. Diagram is by the authors based upon an image courtesy of Google Earth.

Going out from the Outer Siq, and enclosing the nucleus of Petra to the east and southeast, there are a couple of flattened mountains with summits of slightly different heights. They are called Jabal Madbah and Jabal Khubza; both were reached by impressive mostly rock-carved monumental stairways and their summits were plagued by open-air shrines with conspicuous sky and landscape implications.[32] The latter was a sacred

[32] Belmonte, González García and Polcaro, *Light and Shadows*, pp. 497–502, and Table 1.

space for Dushara and Al-Uzza as demonstrated by local inscriptions and had several high-places scattered on the site which mostly were overlooking the city. They were orientated to the sunsets in early autumn (mid-October), corresponding to the month of Tishri.

Over the highest summit of the Jabal Madbah, there is one of the World's most impressive and best preserved Mountain High Places (a 'madbah', in Arabic) which was erected c. 7 CE. It consists of a large flat excavated court and a couple of rock carved altars. The larger altar is free on its four sides and it is facing west in the direction where the Jabal Hārūn can be seen in the foreground. Sunset over Jabal Hārūn summit occurs in 7/8 October in the Gregorian Proleptic calendar, which corresponds again to a period most likely coinciding with the first lunar month after the autumn equinox, i.e., Tishri, or even the month of Aggathalbaeith of later historic sources. Besides, the possible temporal link with the later tradition of *Darb an-Nabi Haroun* is indeed appealing and fascinating.[33] Near the 'madbah', and facing west, there is a beautiful rock-carved shrine, showing a triple-betyl framed by two pillars surmounted by crescent moons (see Fig. 1). Once again, early autumn sunsets, or the corresponding new moon visibilities, were observable from this spot. Consequently, this sacred area could have acted as a perfect site for ritual celestial observation at the time of autumn or spring pilgrimages.

Noteworthy, the lower and southern summit of this fascinating mountain was completely sculpted by the Nabataeans producing a nearly flat surface over which two large obelisks of more than six metres in height were left. These 'Zibb Attuf' look like memorial *nefeshes* for the dead without a pedestal, similar to those crowning other Nabataean monuments, but probably were neither *nepheses* nor *neshebets* (betyls). They may have been left standing in the quarry in respect and reverence for Dushara or, perhaps Al-Uzza.[34] The carving of these behemoths represented a huge challenge for the abilities of the Nabataean sculptors and there must have been a very important reason for their creation. In this sense, our team discovered two decades ago, and later confirmed, that the two obelisks are orientated precisely E-W ($\delta \approx ¼^{o}$), so that only at dawn or dusk on the days

[33] A huge ceremonial platform with a similar orientation pattern (to the east in this case) has recently been identified in the valley below close to the route to Jabal Hārūn. See, Sara Parcak and Christofer A. Tuttle, 'Hiding in Plain Sight: The Discovery of a New Monumental Structure at Petra, Jordan, Using WorldView-1 and WorldView-2 Satellite Imagery', *Bulletin of the American School of Oriental Research* 375 (2016): pp. 35–51.

[34] Belmonte, *Nabataean Petra*, p. 77; Wenning, *Betyls of Petra*, p. 92.

closer to the equinoxes, the shadow of one of the obelisks would touch the other.[35] This was, and still would be, a perfect astronomical marker.

The centre of the city of Petra spread over a vast area *circa* one km wide between the slopes of Jabal al Khubza and the cliffs of Umm al Biyara. Here, three large free-standing structures (see Fig. 3) were erected by the Nabataeans in the first century CE. Among them are the Qsar al Bint, dated to c. 40 CE, and the Temple of the Winged Lions, dated to 27/28 CE, presumably the temples of Dushara and Al-Uzza, respectively.[36] As shown in Fig. 3, one of the most important pilgrimage ascending routes was the one departing from the area of these temples, at the city centre, and marching up the mountains to a high plateau open to the western horizon where the most imposing monument of Petra was built: Ad-Deir. Here, a possible astronomical orientation related to the time of the winter solstice was discovered two decades ago (Fig. 4).[37]

As the processional way goes up to Ad-Deir there are several attention foci. One of them is the Lions' Triclinium which is located in a chasm beside the path (see Fig. 3). Nicely carved in the sandstone, it has a reworked niche for a cult statue in its back wall (see Fig. 4). Data obtained in 2011 clearly showed that a light and shadow effect could be produced at the niche at the moment of the winter solstice thanks to the light entering across a now worn oculus in the façade.[38] In December 2015 the effect was observed in all its splendour at that precise moment. This hierophany is only produced at sunrise on dates close to the winter solstice since the triclinium would be in darkness for the rest of sunrises throughout the year.[39] Still more, considering the variation of the ecliptic obliquity, the effect must have been still more spectacular in Nabataean times (see Fig. 4). So, either on the way up in the early morning of the day of the pilgrimage, or on the way down at dawn, after a night of celebration at the

[35] Belmonte, *Nabataean Petra*, Table 1; Belmonte, González García and Polcaro, *Light and Shadows*, Table 1.

[36] See, Ian Browning, *Petra* (London: Chatto and Windus, 1989); and Peter Alpass, 'The Basileion of Isis and the Religious Art of Nabataean Petra', *Syria* 87 (2010), pp. 93–113.

[37] Belmonte, *Nabataean Petra*, Fig. 6. Qsar al Bint and the Winged lion temples were also astronomically orientated to conspicuous star and asterisms, Table 1.

[38] Belmonte, González García and Polcaro, *Light and Shadows*, Table 1 and pp. 489–95.

[39] This could be appreciated by McKenzie's team in late January when the effect is not so impressive. McKenzie, *Khirbet et-Tannur*, p. 250.

Deir, the procession could stop at the Lions' Triclinium to glimpse such a spectacle, probably related to the rituals associated with the winter solstice and the birth of Dushara.

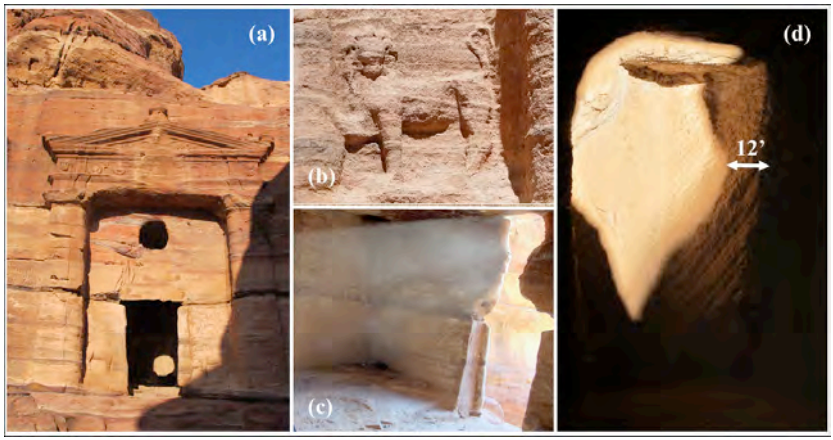

Fig. 4 The winter solstice light and shadow effect at the Lions' Triclinium. (a) Image of the façade with the 'restored' oculus. (b) Relief of one of the lions framing the main gate. (c) The light of the rising sun disk enters through the oculus above the gate. (d) This light illuminates the niche for a divine representation carved of the back of the sanctuary. The effect should have been much more impressive at Nabataean times, when the declination of the sun was 12' lower, with the image of the oculus exactly framing the niche. See the text for further details.

But the final objective of the pilgrimage was certainly Ad-Deir. Is this the temple of one of the Nabataean divinities or the unfinished burial place or cenotaph of one of their last kings? Its use as a church in the Byzantine period and its internal distribution strongly support Browning's assessment: Ad-Deir was 'a prominent festival venue, with an elaborated staged ascent to it and a vast court in front of it'.[40] Its astronomical orientation and the light and shadow effects produced at the moment of the winter solstice both at the môtab for the cult betyls (see Fig. 5) and at the nearby western horizon seem to ratify this line of argument.[41] The Nabataeans worshipped the môtab (*mwtb'*), the podium on which the stele/betyl was erected, the equivalent of the seat or throne of the deity.[42]

[40] Browning, *Petra*, pp. 190–95.
[41] Belmonte, González García and Polcaro, *Light and Shadows*, pp. 495–96.
[42] Healey, *Religion*, p. 158.

Actually, traces of a rock-carved cult betyl, with Dushara's block proportions – possibly destroyed when the site was converted into a church, could still be appreciated at the centre of the môtab. The light and shadow effect of the double sunset phenomenon produced at Ad-Deir reaches its maximum precision and beauty at this position precisely, as we could verify in new observations taken at the moment of the winter solstice in December 2015 (Fig. 5). Interestingly, a very important fact is that the vaulted niche with the môtab was carefully positioned slightly off-centre relative to the doorway so that this impressive effect can occur.[43] It was hence an architectural design.

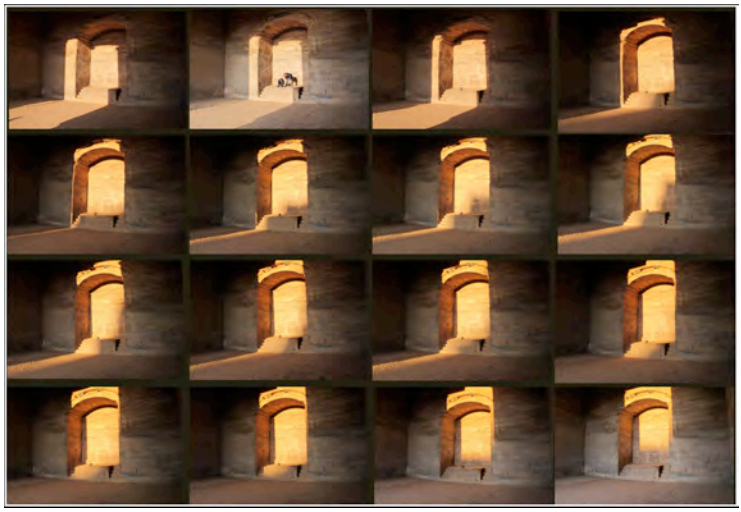

Fig. 5 Winter solstice sunset light and shadow effect in the interior of the Monastery. The first instance of the double sunset effect upon the môtab can be appreciated in the second row. Diagram by the authors.

The hierophany is spectacular and would have been observable for nearly a week before and after the winter solstice. Winter solstice sunset, as observed from the môtab itself, is produced in a peculiar way on a modified rock with the aspect of the head of a lion − the sacred animal of Al-Uzza. At present, the sun sets at least twice, first in the axis of the monument and then re-appears in the northernmost corner of the rock before its final disappearing. It is interesting to note that the anthropic modification of this rock at the area where this phenomenon occurs, as

[43] McKenzie, *Khirbet et-Tannur*, p. 250.

seen from the môtab of Ad-Deir, allows for such observation. The phenomenon would have been still more impressive two thousand years ago when the northern limb of the disk of the sun had a declination close to −23°½.[44] This ensemble of solar hierophanies confirms the idea of the Monastery as one of the most important sacred enclosures of the Nabataean realm and certainly of Petra as the goal of one of the most important pilgrimage routes. Ad-Deir possibly was the ideal place to celebrate 'on the very night of the Epiphany' − in dates close to the winter solstice − the birth of Dushara from his own mother-cum-consort Al-Uzza, the goddess of fertility. Echoes of this ancestral ritual could still be alive in the area of Petra as shown by the tradition of the *Amm al-Gaith* procession.

Conclusion: The Nabataean cultic calendar

The combination of classical historiography, ethnography, epigraphy and the archaeological record, interpreted at the light of cultural astronomy, and the authors would like to insist on that, strongly supports the idea of a Nabataean calendar centered in the cult of their deities and their ancestors framed within the Babylonian lunisolar calendar of the Seleucid Empire, but not fully restricted by it since the Nabataean calendar seems to have started in Nisan.[45] According to our proposal, the principal astronomical milestones of this calendar would have been:

- New Year's Eve on 1 Nisan;
- Full Moon after Spring Equinox (14 Nisan), in a clear parallelism to Jewish Passover;
- 1st Crescent after Spring Equinox (1 Nisan – New Year's Eve − or 1 Iyyar);
- with certain doubts, since evidence is not strong, the 1st Crescent including Summer Solstice (1 Tammuz);
- 1st Crescent after Summer Solstice (1 (B)ab);
- Heliacal Rising of Sirius (Isis) in c. 20/7 Julian. Hence in (B)ab.
- 1st Crescent after Autumn Equinox (1 Tishri);
- Aggathalbaeith in the 1st Lunar Month after Autumn Equinox (most likely Tishri);
- Winter Solstice and the Birth of Dushara, as celebrated during the Epiphany in late Roman times;
- 1st Crescent or Full Moon of Thebet, the lunar month after, or including, the Winter Solstice.

[44] Belmonte, González García and Polcaro, *Light and Shadows*, Fig. 6 & p. 496.

[45] Almost all the calendars of Asia Minor and the Near East in the Hellenistic and Roman Periods began the year in autumn. The Nabatean seems to have been an exception. Sacha Stern, *Calendars in Antiquity* (Oxford: OUP, 2012): p. 236.

These dates would have been the moments for main festivals and celebrations which, in at least three occasions − the two equinoxes and the winter solstice − would have been performed in the form of ritual pilgrimages at attractive sacred spots in the vicinity of the city such as Ad-Deir (and the Lions' Triclinium), the high-places at Jabal Madbah and Jabal Khubza, or the summint of Jabal Hārūn proper. It would indeed be useful to analyse possible agricultural festivals, or any other kind of cultic festivities, but the evidence is so scarce and variegated that a detailed analysis would conflict with the objective of this paper centered on astronomical phenomena as calendar time-markers.

The Nabataean Kingdom had retained a lunisolar calendar of Babylonian type, but in 106 CE the Kingdom was annexed by Emperor Trajan. As implied by Babatha's Archive,[46] a new era was soon initiated 'according to Provincia Arabia' with New Year's Eve at 1 Nisan / Xandikos, corresponding to March 22 in the Julian Calendar and with a fully solar structure (length of 365 days with a bissextile after each four years).[47] Nabataean Lunar dates needed to adapt to these new circumstances, and they did it very well as proved by the Khirbet et-Tannur *parapegma*. However, this is another story![48]

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[46] Stern, *Calendars*, p. 112.

[47] Alan Edouard Samuel, *Greek and Roman Chronology: Calendar and Years in Classical Antiquity*, Handbuch der Altertumswissenschaft 1, part 7 (Munich: Beck, 1972), p. 177.

[48] Juan A. Belmonte, A. César González-García and Andrea Rodríguez Antón, 'Arabia adquisita: The Romanization of the Nabataean Cultic Calendar and the Tannur "Zodiac" Paradigm', invited paper delivered at the *First International Workshop on Archaeoastronomy of the Roman World*, Milan, November 2016, Springer-Verlag, in press.

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