

DAN GIBSON, *Early Islamic Qiblas: A Survey of mosques built between 1AH/622 C.E. and 263 AH/876 C.E. (with maps, charts and photographs)*, 296 pp., Vancouver BC: Independent Scholars Press, 2017<sup>1</sup>

The *Qur'ān* enjoins Muslims to pray toward the 'sacred precincts', which they have considered to mean the Ka'ba in Mecca. This sacred direction is called *qibla* in all the languages of the Muslim commonwealth. Thus mosques should face the Ka'ba, the *mihrāb* or prayer-niche indicating the *qibla*. In fact, Muslims all over the world have been praying toward the Ka'ba in Mecca for over 1,400 years.

The Canadian amateur archaeologist Dan Gibson's new book claims to turn upside down all of what we know about one aspect of early Islamic practice, namely, the observance of a sacred direction (*qibla*) toward the Ka'ba in Mecca. He believes that Islam began in Petra, not Mecca, and that the focus of Muslim prayer for the first two centuries was toward Petra, not Mecca. As evidence for this he attempts to show that dozens of early mosques face Petra with remarkable accuracy. His revolutionary ideas ignore what modern scholarship has established about the early *qibla*. He has misunderstood most of the data at his disposal, comparing medieval mosque orientations with modern directions of Petra and Mecca. In brief, he has wrought havoc with information that he cannot master, and has — wittingly or unwittingly — produced an amateurish, non-scholarly document that is both offensive to Muslims and also an insult to Muslim and Western scholarship. None of the mosques investigated by Gibson has anything to do with Petra. Nor, indeed, has early Islam.

Dan Gibson produced what he thought was evidence to show that the earliest mosques — say from the first century and a half of Islam, that is, from the early 7<sup>th</sup> century to the late 9<sup>th</sup> century — were actually facing Petra, not Mecca. He purports to document when the *qibla* was changed away from (his true) Ka'ba at Petra to (everybody else's true) Ka'ba at Mecca. Most Muslims and most West-

1. A first reaction to this book appeared as "From Petra back to Mecca" (2017) at [www.academia.edu/34703712/](http://www.academia.edu/34703712/). It then seemed necessary to publish "The Petra fallacy" (2018), at [www.academia.edu/37957366/](http://www.academia.edu/37957366/) (2018).

erners who know anything about the subject would say that his “findings” are absurd. And indeed they are.

Gibson published his book *Qur’ānic Geography* in 2011. In it he proved to his own satisfaction that the *Qur’ān* contains so few references to actual locations, including Mecca, that its origins must lie elsewhere, namely, Petra. Gibson’s findings are as new to Nabataean Studies as they are to Islamic Studies. The authoritative *Encyclopaedia of Islam* has no entry for Petra, for nothing of consequence in early Islamic history happened there. Gibson then briefly discussed some 30 early mosques which, according to him, face toward Petra and not toward Mecca; his argumentation was weak indeed, not least because he did not present any orientations. The bibliography included not a single work on the *qibla*.

Gibson’s new book contains a dazzling array of information and plans of some 60 early mosques, treated more or less in chronological order, but therefore not by region, and is intended to show how the earliest mosques faced Petra, then between Petra and Mecca, then the “false” *qibla* toward Mecca, with variations on this theme.

Such revolutionary findings, if true, would challenge both historical studies and also the Muslim community at large. However, Gibson disdains the few modern studies on the *qibla* that have come to his attention, but he has a strong conviction and an ultimate purpose: to show that Muslims are misguided and naïve enough to have prayed in the wrong direction for over a millennium. Gibson appears on the scene at the same time as the English historian Tom Holland, the self-styled “leading writer of the Ancient World”, who has had the audacity to claim on the basis of one very dubious late medieval non-Arabic text, that Muslims have been praying at the wrong times for over a millennium. Both Gibson and Holland write in total ignorance of orientalist research on the institutions of the *qibla* and prayer times over the past century. The Christian lunatic fringe has already adopted this very useful arsenal of ‘weaponry’ from Gibson and Holland in its fight against Islam.

Gibson was inspired to undertake his survey of early mosques not only because of his pro-Petra inclinations but because he wanted to disprove a claim I made some 40 years ago that medieval mosques are not always oriented toward Mecca as we moderns think they should be. He begins his book by quoting from my very technical 1986 article “Kibla (astronomical aspects)” in the *Encyclopaedia of Islam* (without attributing it to me), first omitting what I wrote that even though the *qibla* might have been calculated by a competent mathematician the accuracy of the result would depend on the accuracy of the geographical data he had at his disposal. He then quotes me, again not by name, as follows (p. 1):

[King writes:] Another reason why mosques may be incorrectly aligned is that their qiblas were not computed from geographical data at all but were inspired by tradition. Thus, for example, mosques in the Maghrib and the Indian subcontinent generally face due east or due west, respectively. Likewise, in early Muslim Egypt the qibla adopted was the azimuth of the rising sun at the winter solstice. Several mosques in Cairo face this direction, which was favored as the qiblat al-ṣaḥāba, but which is about  $10^\circ$  off the qibla computed mathematically using mediaeval geographical coordinates ... No survey has yet been made of the orientation of mediaeval mosques. Such a survey would be of considerable interest for the history of Islamic architecture as well as the history of science.

Gibson wishes to ingratiate himself with Muslim readers by showing by means of a survey of early mosque orientations that these early mosques are correctly aligned, but the catch is that they are correctly aligned toward the modern direction of Petra. But they are not. The quoted passage asserts that “the *qibla* of the Companions of the Prophet (who built the first mosque in Egypt)” was toward winter sunrise, not Petra. Gibson errs in thinking that the *qibla* is toward the Black Stone, rather than toward the Ka‘ba itself.

Gibson completely misunderstands my findings on the determination of the *qibla* and mosque orientations. Essentially I found that the Muslims for the first two centuries used folk astronomy, particularly astronomical horizon phenomena, the cardinal directions and solar risings and settings at the solstices; the reason they did this was because the Ka‘ba itself is astronomically aligned and they wanted to face an edifice, the Ka‘ba, not the town of Mecca. These early procedures were extremely ingenious. Thereafter they also used *qiblas* based on geographical coordinates and mathematical procedures. I claim that all mosques face the *qibla* in ways most of which we can only now understand. I also say that early mosques do not always face the directions we moderns think they should. Now comes Gibson to claim that they face Petra—and accurately at that.

Gibson’s book is not a scholarly work, for its text is of the kind one would expect from a first-year college student. Where my works are quoted and misquoted it is unclear who is the author. Gibson is not competent to write on early Islamic history, and often misinterprets the few serious sources he does consult. He writes (p. 127) that:

Much has been written over the last thousand years on the topic of how Muslims can correctly identify the *qibla* direction when they pray. From about 900 until 1800 thou-

sands of Arabs [!] wrote thousands [!] of books and articles on how this could be done using astronomy and geography. Despite this, there is still disagreement on the technique used by the earliest Muslims. In relation to finding the *qibla* direction, King and Hawkings [*sic*] divide Islamic history into two parts. First, they suggest that the earliest Muslims used “folk astronomy” to determine the *qibla*, and King claims they were wildly inaccurate. For the second section (9<sup>th</sup>-16<sup>th</sup> century), King and Hawkings [*sic*] note that “the techniques of folk astronomy were employed by the legal scholars to determine the *qibla* ...”. but the era really belongs to the mathematicians. It is on this second era that King, Kawkings [*sic*!], Hogendijk and others focus most of their attention.

First, what I actually wrote is that there are altogether some 10,000 medieval manuscripts, in Arabic, Persian and Turkish still surviving which deal with astronomy and mathematics, and that we know of some 1,000 scholars who worked on these two vast subjects over the centuries. Those remarks of mine did not refer to the *qibla* at all.

Second, there is no disagreement about the *qibla* techniques used by the first generations of Muslims. It is obvious that, without knowledge of mathematics and geography, they would have used simple techniques of folk astronomy, knowledge of which was widespread before the advent of Islam. No-one has ever objected to what I have written on this (until Gibson).

Third, Gerald Hawkins (famous for his astronomical analysis of Stonehenge) had nothing to do with the *qibla*. He and I wrote a joint paper on the astronomical alignment of the Ka‘ba, Gerald using satellite images and myself using medieval texts.<sup>2</sup> Our conclusions from the two sources were the same! Gibson fails even to mention the astronomical orientation of the Ka‘ba, which was of prime importance for mosque orientations, because mosques are oriented toward the Ka‘ba, not toward Mecca. (For Gibson, of course, the “real” Ka‘ba was in Petra!)

Fourth, Gibson cannot understand that the *qibla* was determined either using folk astronomical techniques from the 7<sup>th</sup> to the 21<sup>st</sup> century (not just till the 9<sup>th</sup> century!) or using mathematical methods from the 9<sup>th</sup> to the 21<sup>st</sup> (certainly not from the 7<sup>th</sup> century!). For example, a controversy has raged in recent years between two factions of Muslims in the US, one who believe that the *qibla* is toward

2. Gerald Hawkins & David A. King, “The astronomical orientation of the Ka‘ba”, *Journal for the history of astronomy* 13 (1982): 102-109, repr. in King, *Astronomy in the service of Islam*, Variorum, 1993, XII.

south-east (look at a map of the world) and the other who believe that it is toward north-east (fly Saudia to KSA from JFK!).

Fifth, Jan Hogendijk's contribution is worth more than a passing mention. As a leading historian of Islamic mathematics he has contributed a great deal to our understanding of how Muslim scientists worked on the qibla-problem, always using medieval manuscripts.<sup>3</sup>

Finally, Gibson claims that I wrote that mosque orientations were "wildly inaccurate". But I never wrote this, not least because it is not true.

I counter Gibson's agnotological *tour de force* with the simple argument that the earliest Muslims could never have aligned mosques accurately toward the modern direction of Petra, or, for that matter, toward the modern direction of Mecca either. It is even easier to demolish Gibson's necessary back-up thesis, which is that the first generations of Muslims had all of the necessary technical equipment — trigonometry, geometry, geographical coordinates, astronomical instrumentation — to derive the direction of Petra accurately for any locality from al-Andalus<sup>4</sup> to China. Since this equipment in fact became available to the Muslims in al-ʿIrāq only in the late 8<sup>th</sup> and early 9<sup>th</sup> century, Gibson's attempt to fabricate the evidence for an earlier epoch falls flat.

The first thing to make clear is that early mosques cannot be expected to be oriented in the modern direction of Mecca (or Petra), and they should not be labelled "incorrect" if they do not face that direction. Alas, we still find an occasional architectural historian who dares to write something as naïve as: "this mosque is incorrectly aligned toward Mecca", when he or she has no idea what the medieval *qibla* was in that location, and which *qibla*? or whose *qibla*? For in each major centre there were several *qibla* directions used over the centuries, sometimes associated with particular interest groups. The subject of the *qibla* and orientations of religious architecture is extremely complicated, but we are begin-

3. It was Jan Hogendijk who was able to verify my hypothesis that the mathematical theory underlying the cartographic grids on the three 17<sup>th</sup>-century Mecca-centred world-maps from Isfahan, too sophisticated for that milieu and certainly not of European inspiration, went back several centuries. He found the underlying theory in 10<sup>th</sup>- and 11<sup>th</sup>-century works on conic sections from Baghdad and Isfahan. See his "Het mysterie van de Mekkawijzers van Isfahan", *Nieuwe Wiskrant* 22:2 (2002: 4-11, available at [www.fisme.science.uu.nl/wiskrant/artikelen/222/222december\\_hogendijk.pdf](http://www.fisme.science.uu.nl/wiskrant/artikelen/222/222december_hogendijk.pdf)).

4. The term al-Andalus refers to that part of the Iberian Peninsula under Muslim hegemony at any time.

ning to understand it.<sup>5</sup> It could take a mighty step backward with the appearance of this new book, because even the basics of how the *qibla* was determined and how it was applied to religious architecture over the centuries are not generally known, certainly not to most Muslims, and not to most Westerners involved with Islamic architecture either.

Mosque orientation is far more complicated than Gibson thinks. Why, for example, does the Great Mosque of Córdoba, built in the 780s, face the deserts of Algeria rather than the deserts of Arabia? Why does some medieval architecture in Cairo have different alignments for the insides and the outsides of the *qibla*-wall? In Samarqand, why do some religious edifices face due west and others due south? Historians of Islamic architecture are notoriously ill-informed on the subject of orientations. They even ignore what some historians of Islamic science, with access to medieval Arabic texts on the *qibla* in different regions, have contributed, and they ignore what some urban historians have written after measuring orientations in the light of our knowledge of which *qiblas* were accepted in those regions.

Before the 9<sup>th</sup> century Muslims used exclusively tradition and folk astronomy — notably, astronomical risings and settings — to find the *qibla*. Early Islamic religious architecture, however, was often laid out in accordance with the foundations of pre-Islamic religious edifices. The general direction of Mecca, as indicated by the road leaving a given location toward Arabia, would sometimes suffice.

We should not forget that the *qibla* is toward the Ka‘ba, and not toward Mecca. The rectangular base of the Ka‘ba is itself astronomically aligned, with its main axis toward the rising of Canopus and its minor axis toward summer sunrise and winter sunset. In a society without serious geographical notions or mathematical science beyond commercial arithmetic, how does one locate a distant edifice to face it? The answer is astronomical alignments, of which the cardinal directions are the most obvious, less so sunrise and sunset at the winter and summer solstices, but also risings and settings of select *qibla* stars.

Muslim efforts to view the world about the astronomically-aligned Ka‘ba resulted in a colourful tradition of sacred folk geography, with sectors of the world

5. KING, “Astronomical alignments in medieval Islamic religious architecture”, *Annals of the New York Academy of Sciences* 385 (1982): 303-312, repr. in *idem*, *Astronomy in the service of Islam*, Aldershot & Burlington VT: Variorum, 1993, XIII, and *idem*, “The orientation of medieval Islamic religious architecture and cities”, *Journal for the history of astronomy* 26 (1995): 253-274, with a new version in *idem*, *In Synchrony with the Heavens*, 2 vols., Leiden: Brill, 2004, VIIIa: 741-771.

around the Ka'ba associated with segments of the perimeter of the Ka'ba and their *qiblas* being defined in terms of astronomical horizon phenomena. The scholars who favoured such *qibla* methods by folk astronomy for over a millennium were invariably scholars of the sacred law in addition to being knowledgeable in folk astronomy.

By the beginning of the 9<sup>th</sup> century the Muslims had acquired the geographical knowledge (mainly from Greek sources) to realise what the *qibla* problem involved and the mathematical knowledge (mainly from Indian and Greek sources) to solve it — within medieval parameters. The solutions were trigonometrical or geometrical, either simple and approximate, or complicated and accurate, within the limits of the accuracy of medieval geographical coordinates. Thereafter mosques could be oriented in the mathematical *qibla* directions if a competent person were involved in the layout. The scientists took the problem to its natural (medieval) conclusion, with tables of *qibla* values for the whole Muslim world and cartographic grids centered on Mecca with which one could simply read off the direction and distance to Mecca for any locality.

Not only do we have access to what the astronomers and legal scholars wrote on the determination of *qibla*, we also have discussions of the palettes of *qibla* values that were used in such medieval centres as Córdoba, Cairo, and Samarra. What has failed us is a survey of mosque orientations from one end of the Muslim world to the other, although some areas (al-Andalus, the Maghrib, Turkey) have already been well-served.

Historians of Islamic architecture, with a few notable exceptions, are clueless about orientations, not knowing what people in past centuries thought was the *qibla* in any given place, and most not being able to measure orientations properly anyway. For both of these shortcomings they can be (almost) forgiven. Yet some colleagues in architectural history still persist on ignoring orientations altogether, which is particularly annoying when the orientation has been deliberately changed from the orientation of neighbouring edifices (as in Cairo). Now with satellite imagery anybody can zero in on any mosque and actually visualise its orientation. And with the way open to just anybody, Dan Gibson has measured many of the significant mosques and — innocent of most research in the history of Islamic architecture and the history of Islamic science — has come up with some very challenging conclusions.

Gibson is not to blame for his basic premise that Islam did not begin in Mecca. It goes back over 40 years ago essentially to three Arabists (Wansbrough and his students Crone & Cook) at the University of London (SOAS), who expressed the daft

“revisionist” idea — though they were serious — that the origins of Islam were not in Mecca, but somewhere else in N.W. Arabia. The latter two of these, in their unfortunate 1977 book *Hagarism*, “written by infidels for infidels”, claimed to have proven this by demonstrating that the earliest mosques in Egypt and Iraq indeed faced N.W. Arabia rather than Mecca. I was happy to point out to Cook in person that the Egyptian mosques faced winter sunrise and the Iraqi mosques faced winter sunset, so one could hardly expect them actually (in modern terms) to face Mecca. By 1991 Crone and Cook had retracted parts of their wretched book (alas not in print), Crone admitting that “we were young, and we did not know anything”. But their playful nonsense caused a lot of damage, and the “revisionists” continue to work with disregard for the early Muslim sources (but less for the contemporaneous Christian ones).

In his 2011 book *Qur’ānic Geography* Dan Gibson claimed that Islam started in Petra, not Mecca. I will not comment on this except to remind the reader that his starting point was the long-disproved premise of Crone & Cook. Gibson, like his predecessors, has no idea that the mosques faced astronomically-defined directions, so that they might not *actually* face Mecca (those who built them certainly intended them to face the *qibla* toward the Ka‘ba in Mecca). He played around with the orientations of various early mosques but was clearly out of his depth.

In his new book, based on articles that have appeared on his website ([www.nabataea.net](http://www.nabataea.net)) over the past few years, Gibson sets out to prove that early mosques face Petra, not Mecca. He presents satellite images of dozens of early mosques, and for each he gives the actual orientation, the direction to Petra, the direction to Mecca, and, just in case, the direction to Jerusalem. Of course, these three directions are the **modern** values, unattainable to anyone before modern times, which is unfortunate because both the information presented and his conclusions based thereon are all invalid, since modern directions based on modern coordinates are totally irrelevant to the study of early mosques.

Gibson’s “discovery” that most early mosques face accurately toward the modern direction of Petra is fortuitous because the first generations of Muslims had no means whatsoever for finding the direction of Petra accurately to within a degree or two, not least because they had no access to any geographical coordinates, let alone modern ones, and no mathematics whatsoever. He overlooked the fact that many of his mosques are aligned either cardinally or solstitially. That the early mosques do not face Mecca as we moderns think they should is hardly surprising, because the early Muslims had no means to find the direction of Mecca accurately either, though they did this as best they could with the means at their disposal. It is of little interest to compare medieval orientations with modern di-



rections based on modern geographical knowledge and accurate trigonometric formulas. Modern values of directions from one place to a distant other one are irrelevant to investigating the orientations of historical edifices. I repeat this in the hope that even Gibson may understand.

The satellite images collected in this volume will surely be deemed useful by some. However, anyone who ventures to use the raw materials Gibson presents should do so with extreme caution.

None of the mosques which Gibson thinks were built facing Petra has anything to do with Petra, nor do those he vainly finds facing “between Petra and Mecca”. I shall not demonstrate this for all of the mosques he investigated (pp. 11-114), but the following examples should suffice to show that not only are his interpretations erroneous, but also that the whole idea of assessing the “errors” of medieval orientations by comparing them with modern directions is flawed. In particular, even readers non-versed in numbers will recognise that Gibson has “discovered” that certain mosques have an orientation associated with Petra, but we know that they were laid out in accord with pre-Islamic religious edifices (Damascus, Jerusalem, Córdoba). Inevitably, problems arise when one investigates mosques that have been rebuilt in different directions.

Gibson’s section on how he derived the orientations is risible. Nevertheless, I shall risk using his orientations, assuming that they are more or less accurate, which is not always the case (see Tunis below). In his analysis, it suits his purpose to continuously ignore the cardinal and solstitial bearings and pre-Islamic fundamentals. It now suits my purpose to use his modern directions to Mecca and to Petra even though they are irrelevant to any historical investigation, but they are necessary to counter his interpretations of the mosque alignments.

In the following overview of Gibson’s findings, all orientations and bearings are given to the nearest degree clockwise from 0° at north, 90° at east, 180° at south, and 270° at west. The reader should keep in mind that I have not measured a single mosque myself.

### *China*

We find that the Mosque in Guangzhou (China), which Gibson claims was built in 627 [!], although the present edifice is apparently no later than the 15<sup>th</sup> century, supposedly faces Petra to within 3°, Mecca to within 7°. Gibson claims it was deliberately laid out to face Petra. One could contend that it was built by eager

Muslims from Petra, who had no ships and who must have arrived in China on a flying carpet. But how did they know where they were? Where Petra was? Did they really know about great circles on the terrestrial globe? In fact, the early date for this mosque stems from a legend without credibility. To confirm the Petra victory, Gibson needs to fabricate some distortions of standard knowledge regarding the history of science, which he will do in a future chapter. In fact, the orientation of the mosque probably results from laying it out towards summer sunset, taken as the qibla for China in various schemes of Islamic sacred geography.

### *Egypt*

For the Mosque of ‘Amr in Fustāt, first erected in 642, no information is given on orientations but our author claims it faces Petra. This contradicts medieval sources which say that the *qiblat al-ṣaḥāba*, “the *qibla* of the Companions of the Prophet”, was toward winter sunrise. Although Gibson does not mention them, the late-10<sup>th</sup>-century al-Azhar and al-Ḥākim Mosques are laid out in the *qibla*-direction computed by the Caliph al-Ḥākim’s astronomer Ibn Yūnus, namely, 127°. For the Mosque of Ibn Ṭūlūn, founded in 876, Gibson gives the orientation as 145°, with Petra at 84° and Mecca at 136°. He states that this is a Mecca-orientation, and so it is. But it is not the first *qibla* in Egypt, namely winter sunrise (117°), and it is not the later mathematically-computed *qibla* (127°). Indeed, a legend claims that the inspiration for the orientation of Ibn Ṭūlūn’s Mosque involved the orientation of the Prophet’s Mosque in Medina and another maintains that the *miḥrāb* was laid out by the Prophet Muhammad himself whilst Ibn Ṭūlūn was asleep.

In 1984 I published a paper showing how the axis of the Fatimid city of al-Qāhira, laid out alongside the Roman Red Sea Canal, which was fortuitously perpendicular to this first *qibla* (117°), and the later mathematically-derived *qibla* (127°) both influenced the development of the Fatimid city of Cairo founded in 969 and the later Mamluk city and funerary suburbs.<sup>6</sup> In some edifices the outside is oriented perpendicular to the city axis, that is, toward the old *qibla*, and the inside is oriented in the new *qibla*, 127°; one can see the 10° difference at the

6. KING, “Architecture and astronomy: The ventilators of medieval Cairo and their secrets”, *Journal of the American Oriental Society* 104 (1984): 97-133, updated in *idem*, *In Synchrony with the Heavens*, viib: 773-823.

windows. These results are, of course, quintessential to an understanding of urban development and religious edifices in medieval Cairo, but they have not yet been exploited by any historian of medieval Cairene architecture.

### *Yemen*

The Great Mosque in Sanaa (Yemen) from 705 at  $334^\circ$  is pointing toward Petra at  $334^\circ$ , Jerusalem at  $335^\circ$ , Mecca at  $326^\circ$ . But lo! its major axis is parallel to that of the Ka'ba in Mecca (and it even has a miniature Ka'ba inside).

### *Jerusalem*

The al-Aqṣā Mosque in Jerusalem, dated 709, faces  $170^\circ$ ; with Petra at  $173^\circ$  and Mecca at  $157^\circ$  Gibson would have this facing Petra, but it is clearly oriented in the same direction as the *al-Ḥaram al-sharīf* complex, which is off the cardinal directions by  $10^\circ$ . The *qibla* of Jerusalem according to medieval astronomers was about  $135^\circ$ , a far cry from due south, and need not concern us here (but architecture historians should take note).

### *Jordan, Syria, Lebanon*

The Umayyad Mosque in Amman, from 701, may face  $183^\circ$ , with Petra at  $194^\circ$  and Mecca at  $161^\circ$ , but the mosque was clearly intended to face due south, certainly not to face Petra. The Khirbat al-Minyā complex, built in 706, is at  $183^\circ$ , so Gibson favours and orientation toward Petra at  $182^\circ$  (Mecca is at  $161^\circ$ ). The complex was obviously intended to face due south. The Mosque at Khirbat al-Mafjar, built in 714, faces  $180^\circ$ , which Gibson sees as facing Petra at  $181^\circ$ , rather than Mecca at  $159^\circ$ . Another example is the Mosque at Ba'albek, dating from 740. It faces  $177^\circ$ , with Petra at  $190^\circ$ , Mecca at  $165^\circ$ , and the line from Petra to Mecca at  $178^\circ$ . For Gibson it faces the last of these. All of these mosques are trying to tell us that they face south, and that those who built them took south as the *qibla*.

Gibson introduces the interesting idea that some mosques face “between Petra and Mecca”. The Umayyad Mosque in Damascus (Syria) built in 709 (not from scratch) is at  $177^\circ$ , with Petra at  $193^\circ$  and Mecca at  $165^\circ$ ; therefore, “this mosque

points between Petra and Mecca". The Mosque was in fact built on the site of a Byzantine cathedral, itself replacing a Roman temple, which was cardinally aligned. The *qibla*-wall is off due south by  $3^\circ$ . Many Syrians throughout the Middle Ages and up to this day thought the *qibla* in Damascus was due south. Actually the *qibla* in Damascus according to medieval astronomers was about  $150^\circ$ . The Mosque in Ba'albek from 740 faces likewise  $177^\circ$ , more or less due south, and certainly not deliberately "between Petra and Mecca".

### *Iraq*

Gibson adds to the falsehoods that have been committed by Creswell onward, including Crone & Cook, about the Mosque at al-Wāsiṭ. This was originally built in 706 and then demolished and rebuilt in between 1009 and 1155 in a completely different direction, at about  $50^\circ$  further south. The first Mosque faces about  $245^\circ$  and the second Mosque faces about  $195^\circ$ . Creswell said the first Mosque first faced Jerusalem; Crone & Cook said it first faced an unidentified site in N.W. Arabia; Gibson now says it was first built deliberately facing "between Petra and Mecca". Whoever knows anything about the ways the earliest Muslims found the *qibla* one is not surprised to find the first mosque facing winter sunset: this was taken as the *qibla* by the first generations of Muslims in al-'Irāq. The second mosque was oriented in a *qibla* for Wāsiṭ that had been derived by someone familiar with (medieval) geographical coordinates and mathematics (we find  $201^\circ$  in a 15<sup>th</sup>-century Central Asian geographical table with medieval *qiblas* for over 250 localities; of course, we do not need the modern *qibla* for Wāsiṭ). The orientation of the two mosques has never been previously explained in modern times.

The Mosque of Basra (Iraq), dating from 721, is at  $184^\circ$ , with Petra at  $203^\circ$ , Mecca at  $164^\circ$ . Gibson has it deliberately facing "between Petra and Mecca" at  $183^\circ$ . In fact, the mosque was built facing due south and a  $4^\circ$  error is not bad for that time.

### *Central Asia, Indian subcontinent*

For the Cheraman Juma in Kerala (India), supposedly built in 629 [!], we have the mosque at  $305^\circ$ , with Petra at  $304^\circ$ , and Jerusalem at  $306^\circ$ , whereas Mecca is at

230° (with an incorrectly-marked pointer). Gibson favours a Petra orientation. I see no obvious explanation.

The Mosque at the site of Banbhore (Pakistan) dates from 727. It faces 266°, with Petra at 289°, Mecca at 268° and Jerusalem at 292°. For Gibson this mosque faces toward Mecca, indeed he thinks it is the earliest known mosque that faces Mecca. It does indeed face Mecca, but not in the way Gibson thinks. For it faces due west, which is the direction the builders took for the *qibla* toward Mecca. The first mathematical determination of the *qibla* known to us comes from Baghdad *ca.* 825. The lists of *qiblas* for hundreds of locations from one end of the Muslim world to the other that were available in Greater Iran from the 15<sup>th</sup> century onwards do not include Banbhore, which was destroyed in the 13<sup>th</sup> century.

The Bībī Hānum Mosque in Samarqand, *ca.* 1400 and thus later than Gibson thinks, is at 262°, which he says is 2° off the direction to Petra (and 22° off the direction to Mecca), but in fact the mosque is a careless 8° off due west, which the Ḥanafī school of religious law took as the *qibla* (the Shāfi‘is preferred due south). In 1983 I published a medieval text on the different *qiblas* used in Samarqand and measured some of the mosque orientations.<sup>7</sup>

### *Oman*

Two early mosques in Oman of uncertain date face 293°/296°. Gibson shows a small error in orientation to Petra (2°) and a larger error (26°/29°) for Mecca. For him, the mosques face Petra. In fact, they both face summer sunset (about 295°), and those who built them intended them to face the Ka‘ba at Mecca.

### *al-Andalus*

The mosque that “takes the cake” in its orientation is the Great Mosque at Córdoba (Spain), built in 784. For Gibson the Mosque is at 157° (actually it is at 152°), with Petra at 91° and Mecca at 100°. Gibson finds that it is parallel to the line between

7. KING, “Al-Bazdawī on the qibla in early Islamic Transoxania”, *Journal for the History of Arabic Science* 7 (1983/1986), pp. 3-38, repr. in *idem, Islamic Astronomy and Geography*, Aldershot & Burlington VT: Ashgate - Variorum, 2012, IX.

Petra and Mecca, which is at  $155^\circ$ , representing a modest error of  $2^\circ$ . (Remember, at that time these folk had very limited geographical and mathematical knowledge.) In fact, the Mosque was laid out in accordance with the late-1<sup>st</sup>-century Roman orthogonal street-plan of the suburb of Colonia Patricia,, which has an identical orientation, and the curious *qibla* was never changed whenever the Mosque was later enlarged. Now the major axis of the Mosque is conveniently “parallel” to the major axis of the Ka‘ba, or, to put it another way, the qibla wall is “parallel” to the NW wall off the Ka‘ba. The major axis is solstitially aligned, as it the case of the Ka‘ba. So why change the *qibla*? Some schemes of sacred geography indicate that when one is in Mecca, facing the NW Wall of the Ka‘ba, one is standing in the *qibla* of al-Andalus. Thus when one is back in al-Andalus one faces a direction “parallel” to the major axis of the Ka‘ba, and that direction was popular in al-Andalus and the Maghrib.

For all orientations in the whole of al-Andalus the writings of Alfonso Jiménez, Mònica Rius and Julio Samsó are indispensable. My own paper on the Mosque in Córdoba in this issue of *Suhayl*, which has a detailed bibliography, should remind Gibson that mosque orientations are more complicated than he thinks.

### *al-Maghrib*

For the Maghrib Gibson could have spared himself considerable embarrassment by consulting the works of Monica Rius and Michael Bonine, which deal with orientations there, using respectively medieval Maghribī texts and geophysical analysis.

The Mosque of ‘Uqba ibn Nāfi‘ in Qayrawan, erected in 670 and rebuilt in 836, faces  $151^\circ$  [Bonine:  $147^\circ$ ] with Petra at  $97^\circ$  and Mecca at  $111^\circ$ . Gibson concludes that it is parallel to the line between Petra and Mecca, at  $155^\circ$ , with an error of  $4^\circ$ . The Mosque called al-Zaytūna in Tunis, built in 732, faces  $154^\circ$  [Bonine:  $145^\circ!$ ], with Petra at  $100^\circ$  and Mecca at  $113^\circ$ , and Gibson finds that it is within  $1^\circ$  of the line between Petra and Mecca at  $155^\circ$ . The Ribāṭ or Fortress at Sousse (Tunisia), dated 770, with a small mosque, faces  $183^\circ$ , and was clearly intended to face due south, The neighbouring Great Mosque, from 850, faces  $162^\circ$  [Bonine:  $163^\circ$ ], with Petra at  $98^\circ$  and Mecca at  $112^\circ$ . Gibson thinks it was deliberately laid out “parallel to a line drawn from Petra to Mecca’ at  $155^\circ$ . Once upon a time I would have said that the orientations were more likely inspired by that of the Córdoba, but now we know that the latter was inspired by the orthogonal street-plan of the suburb of Colonia Patricia outside Roman Corduba.

Bonine found that the Great Mosques at Qayrawan, Tunis, Sfax, Monastir, Mahdia and Hammamet (but not Sousse) are all at 145°-147°, and observed “when the evidence of a Roman cadastral survey is found associated with this cities, it then appears that the *qibla* and the Islamic city structure has therefore been determined by the pre-existing Roman system”.<sup>8</sup> It is not always worthwhile to seek a Nabataean connection.

### *A new era begins*

With the Great Mosque of Samarrā (Iraq), built in 847, we are at the beginning of a new era. The Mosque is at 198°, Petra at 244° and Mecca at 197°. The Mosque has been laid out in the *qibla* of the astronomers, and the man who computed it was probably Ḥabash al-Hāsib, the most innovative astronomer of the 9<sup>th</sup> century, some of whose works containing tables for the latitude of Samarrā have survived. Gibson accepts that the Mosque is oriented toward Mecca. By this he means that the “true” *qibla* toward Petra has been abandoned and the Muslims have started to pray toward their “false” *qibla* in the direction of Mecca.

For all of these early mosques mentioned above, from China to al-Andalus, one thing is clear, namely, that Gibson’s claim that early mosques facing Petra is nothing more than wishful thinking. For all of these early mosques and for many hundreds of other, later mosques the investigation of their orientations would also be worthwhile. All mosques are oriented in the *qibla*, and the challenge for us moderns is to measure the orientations properly and identify the diverse ways that were used for finding the *qibla* in each location. For example, Alfonso Jiménez has measured the orientations of all mosques in the Iberian Peninsula and Mònica Rius has made a major contribution by investigating astronomical and legal texts on the *qibla* in al-Andalus and the Maghrib.<sup>9</sup>

8. Michael E. BONINE, “Romans, astronomy and the qibla: urban form and orientation of Islamic cities of Tunisia”, in J. C. Holbrook, R. T. Medupe and J. O. Urama, eds., *African Cultural Astronomy – Current Archaeoastronomy and Ethnoastronomy Research in Africa*, Berlin: Springer, 2008, pp. 145-178, esp. p. 176.

9. Alfonso JIMÉNEZ, “La qibla extraviada”, *Cuadernos de Madīnat al-Zahrā’* 3 (1991): 189-209, and Mònica Rius, *La Alqibla en al-Andalus y al-Magrib al-Aqsà*, Barcelona: Institut “Millás Vallicrosa” de Història de la Ciència Àrab, 2000.

Gibson now proceeds (pp. 135-171) to claim that his early Gibsonian Muslims were equipped to derive the “*pibla*” (my word) to Petra accurately. In a desperately hopelessly-muddled and utterly-puerile chapter he describes a palette of procedures that he claims his early Muslims could have used to find the *pibla*.

He promises to correct my suggestion that before they encountered mathematics of one sort or another, the Muslims used the techniques of folk astronomy, that is, astronomical alignments. He writes (p. 131):

So instead of King’s proposed two categories (poor early techniques followed by more accurate mathematical techniques) I would like to suggest a slightly different scenario. From my reading of Islamic writings, I have come to the conclusion that the art of determining the qibla direction came out of early navigation, not mathematics. In the ancient past the Arabs sought for methods to help them guide their camel caravans across the trackless deserts of Arabia. They needed to know where cities lay over the horizon in order to guarantee that their caravans arrived at the correct city, and not one of an enemy.

The categorisation is Gibson’s, not mine, because the Muslims used folk astronomy, inherited from the pre-Islamic Arabs, *alongside* mathematical astronomy for over a thousand years. Gibson imagines that *qibla* determinations “came out of early navigation”, neglecting to say precisely what documents he means, where he found these documents, or precisely what he found in them. I know of no such documents.

Three examples of Gibson’s “evidence” must suffice. Gibson claims they used the astrolabe. But he does not know what an astrolabe is, and he mistakenly thinks one can use an astrolabe to find the *pibla*. He ignores the well-documented encounter of the Muslims with the astrolabe in N. Syria in the 8<sup>th</sup> century. We actually have two astrolabes from the 8<sup>th</sup> century, and all astrolabes from before 1100 have been published. He also introduces the Arab windrose, but this was used only in Arab navigation, certainly not for finding the *qibla* to Mecca or the *pibla* to Petra. Of these two devices he writes (p. 159):

Early astrolabes were based on the Arab compass that used the rising and setting of different stars [!]. The astrolabe below has both a front side and rear side, so that calculations can be made [??]. The astrolabe was also known as a windrose [!].

But even with such instruments, the Arabs needed mathematical knowledge, and Gibson claims they had all they needed (p. 170):



... The Arabs of Muḥammad's time had access to the basic concepts of spherical trigonometry [!] which deals with the relationships between trigonometric functions of the sides and angles of the spherical polygons [!] (especially spherical triangles) defined by a number of intersecting great circles on the sphere. Spherical trigonometry is of great importance for calculations in astronomy, geodesy and navigation. The outside circle of numbers on the Arab compass demonstrate that the Arabs had access to spherical trigonometry and used it regularly [!].

This is utter folly, given that spherical trigonometry was developed by Muslim mathematicians only in the 10<sup>th</sup> century. Gibson has no idea what spherical trigonometry is but does not mention *plane* trigonometry at all, which was indeed important for the first mathematical determinations of the *qibla* in the 9<sup>th</sup> century.

Gibson's is truly a revolutionary reappraisal of Arab capabilities in the 7<sup>th</sup> and 8<sup>th</sup> centuries. His "spherical polygons" boggle the mind. He clearly has no idea what trigonometry is. His theories turn the history of science upside down. They force a rewriting of the early history of Islam. And they are, of course, complete nonsense.

Gibson mixes up astrolabes, spherical astronomy, simple nautical devices, Babylonian geometry and  $\sqrt{2}$ , the so-called "Theorem of Pythagoras", poetic meters, pigeons, and more, and although he shows considerable ingenuity at producing all of these out of the bag, his entire chapter (pp. 135-171) is a pathetic attempt to justify his Petra theory.

He even makes a bold but fanciful claim that mosques in Syria, Iraq and Iran could have laid out accurately toward Petra using homing pigeons (p. 169):

So it is possible that *qiblas* were set without any science or math, just by transporting a number of homing pigeons from Petra, and releasing them at the construction site a few at a time until an accurate direction could be established.

Part of his conclusion (pp. 170-171) reads:

... during the time of the founding of Islam, the Arabs... taking celestial bearings and using mathematical solutions ... had an understanding of basic formulas for spherical trigonometry. With this knowledge, it comes as no surprise that the *qiblas* of early mosques [toward Petra] all over the ancient world are accurate to within several degrees.

For Gibson, Muslim scientific skills in later centuries regressed, whereas, in fact, for several centuries further they advanced (p. 170):

The Arabs of the ninth to fifteenth centuries would become the world leaders in algebra which simplified trigonometry [!!]. However, as time passed, the earlier methods of establishing the *qibla* direction were lost [!], leaving us to wonder, exactly how the early Muslims could have calculated their *qiblas* [to Petra] so accurately. ... ..z

There were no “earlier methods” other than folk astronomical procedures and adapting pre-Islamic edifices. Nothing was “lost”. Gibson thinks that the Muslims in later centuries who wanted to align mosques toward Mecca were less successful than the Gibsonian Arabs with their mosques facing Petra (p. 131):

This data seems to indicate that not only were the early Arabs accurate in determining their *qibla* direction [toward Petra], there seems to be a breakdown in technique as the accuracy of [the orientation toward Mecca of] later mosques lags behind those of earlier mosques [oriented toward Petra].

He gives no evidence of ever having worked on any mosque after about 850. He ignores all the research over the past 100 years that shows how the mathematics of *qibla* determinations developed over the centuries.

In 14<sup>th</sup>-century Damascus, the mathematical problem of finding the *qibla* for the whole Muslim world was solved for all time with the splendid table of al-Khalīlī, giving accurate values to degrees and minutes for each degree of latitude and each degree of longitude difference from the meridian of Mecca, the most sophisticated trigonometric table from the entire medieval period. In 15<sup>th</sup>-century Samarqand a table was compiled with entries for each of 275 localities from al-Andalus to China, giving longitudes and latitudes, as well as accurately-computed *qibla*-directions and distances to Mecca. From 17<sup>th</sup>-century Isfahan we have three world maps centred on Mecca, so devised that one can read off the *qibla* accurately for any locality in the Muslim world (the underlying cartographical theory was developed several centuries earlier). These are all highly impressive by medieval standards. What people did with this information is another matter.

It would still be useful to have a survey of the orientations of all significant medieval Islamic religious architecture chronologically by region. Probably the most rewarding regions will be Iran and C. Asia. And with the imagery now available, there is less need now for volunteers to work *in situ*. Someone with Gibson’s

talent at finding the images should be involved. But the orientations should be interpreted in the light of present historical knowledge of the *qibla* in different regions over the centuries. (Modern *qibla* values might be included, but are relevant only for modern mosques.) Gibson's book can serve as an example of how *not* to conduct such a survey.

Gibson's bibliographical citations throughout the book leave a lot to be desired: many are inconsistent and incomplete. The article by Gerald Hawkins and myself on the astronomical alignments of the Ka'ba is missing, deliberately suppressed (because Gibson's "Ka'ba" was at Petra, and a pre-Islamic astronomically-aligned Ka'ba at Mecca is an embarrassment to his theories). Likewise my articles dealing with orientations of Islamic religious architecture are omitted from the bibliography. On Islamic architecture there is only K.A.C. Creswell's early overview and a few serious studies of individual edifices.

On the history of Islamic astronomy and mathematics there is not a single item. On Islamic navigation at least the excellent study by Gerald Tibbetts is cited. On Islamic astronomical instruments there is one amateur history of the astrolabe from the Internet. Not a single study of Islamic folk astronomy is included. Anton Heinen's excellent study of Islamic folk cosmology is quoted in a footnote but does not appear in the bibliography. The enormous volumes edited by Clive Ruggles on ethnoastronomy and archaeoastronomy are overlooked altogether, as are the writings of Juan-Antonio Belmonte on the archaeoastronomy of Petra. In fact, most works relevant to the topic at hand have not been consulted, and most of the works cited in the bibliography are irrelevant as are many in the footnotes.

To the unwary, Gibson's book at first sight looks like a monument to what can be achieved by an eager and innovative amateur in Islamic history, even without serious knowledge of classical Arabic and without critical training in Islamic Studies. It is in fact a giant complex of scaffolding around an imaginary Ka'ba in Petra, the scaffolding more than ready to collapse. Its publication, however, is a monumental disaster for historical studies (and more so for the entire Muslim community) mainly because there are so few people around who have the necessary background to judge it for what it is worth, namely, no more than some nice pictures. There are other parts of the book that others more qualified than I must address, and I hope that they will not fall for the author's conclusions about early mosque orientations.

Gibson, having in his opinion established that Muslims have been praying in the wrong direction for well over a millennium, expresses his hope that Muslims will now see the light (p. 272). But, in reality, they have less to worry about than he thinks. All of Gibson's investigations of early medieval orientations using

modern data and modern mathematical methods are of no historical value. His efforts to show that the Muslims from China to al-Andalus must have had all the necessary technical equipment to find the modern direction of Petra accurately to within a degree or two are ridiculous. Fortunately, his mission has self-destructed. But he has yet to realize this, and continues his investigations regardless of criticisms. So he has recently published various references to Petra in the *Qur'ān*, unknown to most *mufasssirūn*,<sup>10</sup> and four Ka'bas, three unknown to most Muslims.<sup>11</sup> A spreadsheet of his throbs with new mosques which he thinks face Petra, whether they are actually cardinally or solstitially aligned he does not care.<sup>12</sup> His followers will surely believe everything he writes.

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10. <http://thesacredcity.ca/Petra%20In%20The%20Qur%27an.pdf> (accessed 2018).

11. <http://thesacredcity.ca/Four%20Kabas.pdf> (accessed 2018). Gibson leaves out Sanaa.

12. <http://thesacredcity.ca/QiblaData.html> (accessed 2018)