# THE PANTHEON AS A TIMEKEEPER

## ROBERT HANNAH

[The author is Professor of Classics at the University of Otago, NZ. He has a particular interest in archaeoastronomy—his book *Time In Antiquity* was reviewed in the September 2009 *Bulletin*. Ed.]

While spherical, conical and plane sundials were the most popular in Graeco-Roman antiquity, other types, or sub-types, existed. One of these is the 'roofed' spherical sundial, which captured the sunlight within a shadowy, concave interior.[1] A well-preserved example has been found in a Roman house in Baelo Claudia in southern Spain. A plaster cast of it is on display in the local museum there, while the original is now in the Museo Arqueologico Nacional in Madrid (Figs. 1a, b).

The stone block has been carved out into a hollow hemisphere, with a small aperture let into its top surface. Sunlight filtered through this hole on to the hemispherical surface inside. It is economical to cut away the front plane of the stone block, so that the interior of the dial captures only that part of the sky that is occupied by the sun in the course of the year. The interior incised lines represent the passage of the sun on four particular occasions in the year but utilising only three lines: the summer solstice at the bottom of the dial face, the winter solstice at the top, and the two equinoxes, using the same single line between the solstices. In addition, lines criss-cross with these tropical lines to represent the twelve unequal, seasonal hours of the day.


*Fig. 2. The Pantheon, Rome: the north entrance.*

I recently argued the case – first put forward by Oudet – for viewing the Pantheon in Rome (Fig. 2) in a fashion similar to the roofed sundial.[2] The building as it survives is a reconstruction, built from the foundations upwards, from soon after AD 110 under the emperor Trajan, and completed by his successor Hadrian by AD 128. The building's central axis is skewed just 5.5° from true north, so that the entrance faces almost directly north. A columned porch leads through a vestibule into a huge, shadowy interior, over 43 metres in height and as much in diameter. The building's form is essentially that of a sphere with its lower half transformed into a cylinder of the same radius (Fig. 3). Direct sunlight penetrates the interior only through a large,

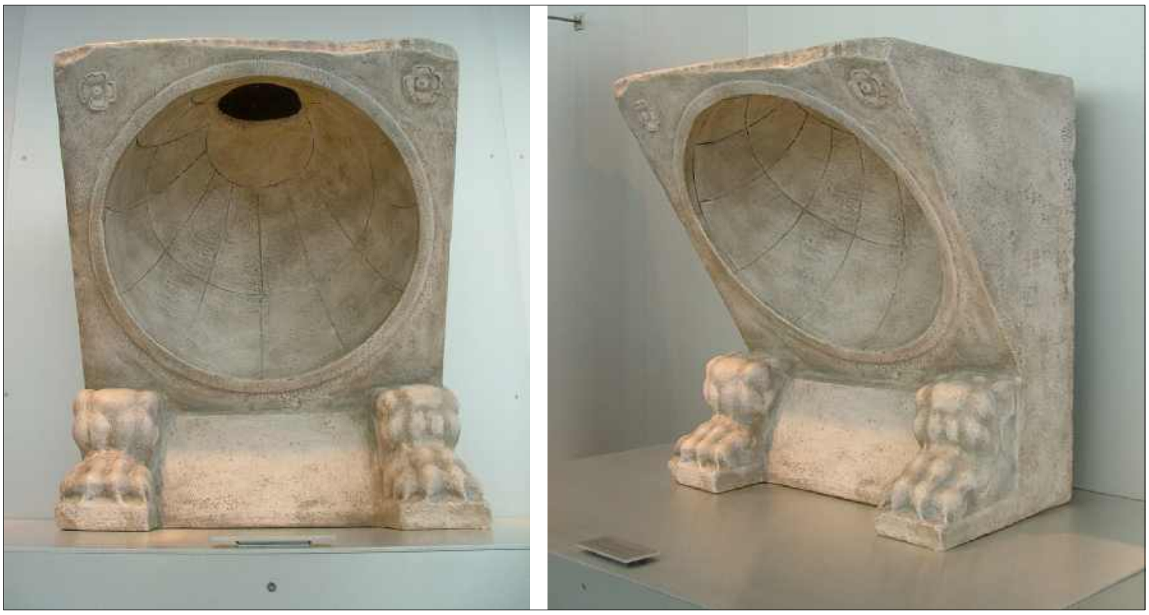


*Fig. 1a, b. Plaster cast of a roofed spherical sundial, Baelo Claudia, Spain.*

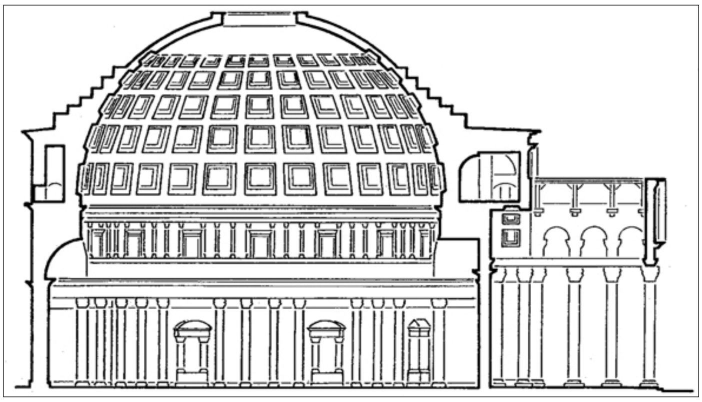


*Fig. 3. North-south section through the Pantheon (north is to the right).*

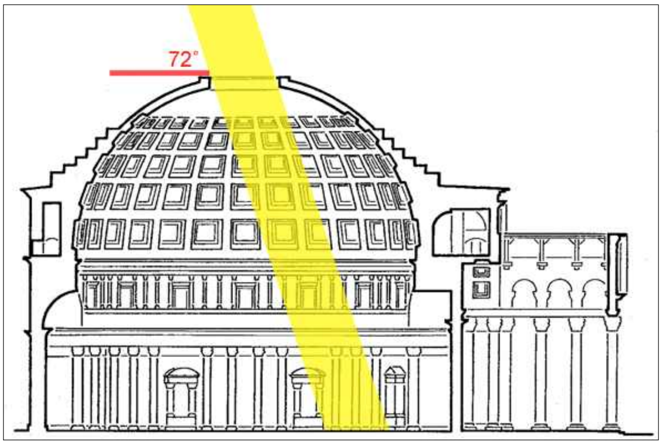
9 metre-wide *oculus* in the centre of the domed roof. Otherwise indirect sunlight can enter the building, but only through the large, north-facing doorway, when it is open.

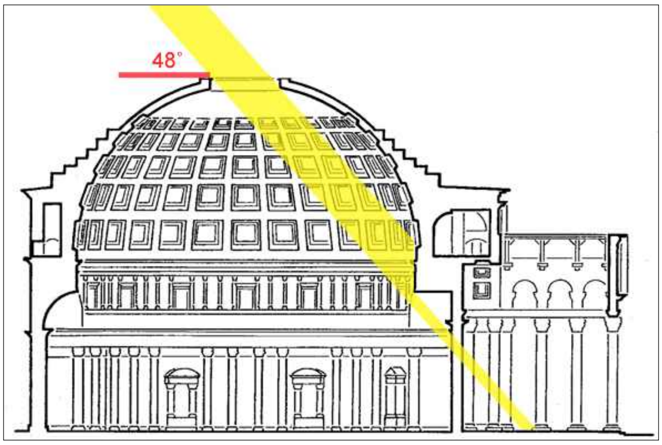
The fall of direct sunlight through the *oculus* into the essentially spherical building leads to the comparison with a roofed sundial. In that frame of mind, if we concentrate on the passage of the midday sun inside the Pantheon, we find that the sun spends six months of the year, in spring and summer, falling below the level of the dome (Fig. 4 shows this at the summer solstice). In autumn and winter, on the other hand, the sun spends six months lighting the surface of the dome (Fig. 5 illustrates this at the winter solstice).

The shift from one semester to the other is marked by the passage of the sun at the equinoxes in March and September. At this point the noontime sun shines partially just below the dome, passing through the grill over the entrance doorway and falling on the floor of the porch outside (Fig. 6). More significantly, however, the centre of this equinoctial, midday circle of sunlight lies on the interior architectural moulding, which marks the base of the dome (Fig. 7).

Whether formal similarity to a roofed sundial is deliberate or not, and whether this type of sundial was in some way an influence on the architecture of the Pantheon, remain speculative. Nevertheless, it must have been a deliberate choice of the architect that the light at the equinox should fall on the ceiling precisely at the base of the interior of the hemispherical dome, that is, on its equator, where the dome appears to end and the cylinder begins. The equator of the interior of the dome has been emphasised for some reason.

It seems to me that thinking of the Pantheon very much as a form of sundial that marked time may provide us with an explanation for this curious emphasis. What sort of time the building kept, though, is not obvious. On a practical level, it seems to make sense only at midday, and then only on certain occasions in the year, so that it has something of the same quality and facility as the Early Modern *meridiane* in Italian churches. They too rely on the midday sun entering the building, this time through a small hole in a vertical wall, so that the sunbeam falls on a line, carefully laid out in the floor so as to follow the local meridian. In these cases, the light and line combined to permit the measurement of the solar year.[3] No such line exists in the Pantheon to direct our attention to specific moments in the solar year.



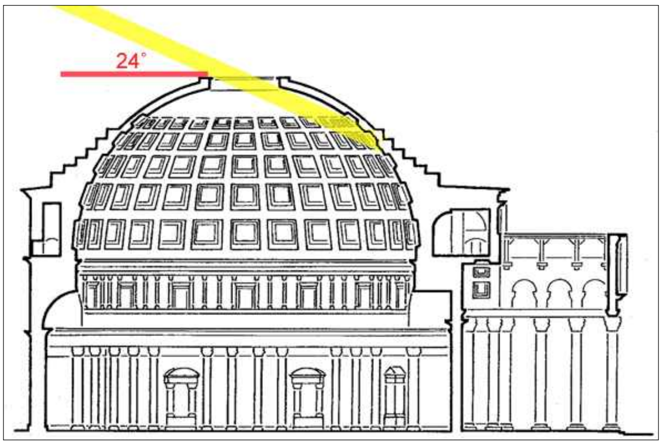




*Fig. 4 (top left). Section through the Pantheon, showing the fall of the noon sunlight at the summer solstice, when the sun is at altitude 72°.*

*Fig. 5.(bottom left).Section through the Pantheon, showing the fall of the noon sunlight at the winter solstice, when the sun is at altitude 24°.*

*Fig. 6 (above). Section through the Pantheon at the equinoxes, showing the fall of the noon sunlight, when the sun is at altitude 48°.*


*Fig. 8 (above). North-south section through the Octagonal Room of the Golden House of Nero in Rome (north is to the right), showing the fall of the noon sunlight on 13 October, when the sun is at altitude 41°.*

*Fig. 7 (left). Sunlight falling above the north entrance of the Pantheon at local noon at the autumn equinox (23 September 2005).*

At best it may be argued that the coffers of the ceiling directly above the doorway and the square-and-circle decoration of the interior marble floor in front of the doorway might serve a similar purpose. Rosenbusch and Sperling have illustrated this idea, which seems to show a tendency for the sun to fall on some of these decorative elements at the moment when it enters a new zodiacal sign.[4] If that is the case, then the sun in the Pantheon would provide a sort of calendar through the year. But to what end?

One particular day in this zodiacal cycle does seem to warrant further attention. Dr Giulio Magli (Milan Polytechnic) has pointed out to me that on 21 April the midday sun shines directly on to visitors to the Pantheon when they are standing in the open doorway, dramatically highlighting them. This day is of particular significance, not just because this was when the sun entered Taurus, but more because it is the traditional Birthday of Rome, a festival preserved from antiquity right through to the present day. Therefore it may also be the case that the apparition of the sunbeam through the grille above the doorway a month earlier at the spring equinox (when the sun entered Aries) would forewarn visitors to the Pantheon, or more particularly its priestly officials, that a month hence the sunbeam would shine directly on the visitor standing in the doorway. And it may be that when the building was officially commissioned in AD 128, the person expected to be standing in the open doorway was the emperor Hadrian himself. But once again, this is speculation. And whether other times of the year – most likely significant dates in the religious calendar – were highlighted in some fashion remains to be discovered. Dr Magli and I are currently collaborating on this problem.

All the same, there is some support for this line of argument in an earlier Imperial building in Rome. This is the palace known as the *Domus Aurea* or Golden House, which was built by the emperor Nero to replace the one that had been destroyed in the fire of AD 64. The new palace was oriented directly along the north-south meridian, so it has none of the slight deviation from this direction that the Pantheon has. At the centre of the complex lies the so-called Octagonal Room, a large, dome-ceilinged room that served perhaps as a banqueting hall but also as a vestibule through its eight doorways to other areas of the palace. From within this room, it turns out that a person standing at the threshold of any of the doorways of the Octagonal Room can see above the rim of the *oculus* in the dome only that part of the sky with an altitude of about 42° and above. Since the latitude of Rome is 41° 54′ this means – as Voisin first pointed out – that from the vantage point of the southern doorway the observer could just see the area of the sky occupied by the north celestial pole.[5] In effect, therefore, the position of the celestial pole defines the perimeter of the *oculus*, and we start to realise that this room's dimensions are governed by astronomy. Voisin has demonstrated other facets of the room are similarly a function of astronomical considerations.

In addition, and perhaps just as significantly, the sun is at about the same altitude above the horizon at noon on 13 October as the celestial pole. 13 October was the anniversary of Nero's accession as emperor in AD 54. At noon on that day the sun was just still visible to an observer standing on the threshold of the northern doorway of the room for the last time until it returned to sight in the first week of March (Fig. 8). In between times, the sunlight would fall above eye-level. So from this date of Nero's accession the sun would ascend up the ceiling and then return down again by March. That this is more than coincidence is suggested by the fact that Nero's personal association with the sun is well-attested elsewhere: in the Golden House complex there was a colossal statue of the Sun, which stood not far from the Octagonal Room (it gave its name eventually to the Colosseum, which was built on Nero's palace grounds later); and in Nero's later portraits on coins and in sculptures he wears the radiate crown usually associated with the Sun god. The emperor got as close to identification with the gods as was possible without being deified while he was still alive.

There are other potential astronomical features in this Octagonal Room. For the moment, though, there is, I hope, enough to indicate that the ideas about the Pantheon outlined here can be replicated and substantiated through careful analysis of other Roman structures. To call the Pantheon a sundial would be inaccurate in the present state of our knowledge, since it appears that no hours other than noon could be marked out in the building (although whether they needed to be is moot for the viewer in antiquity). It is better to regard the building as a timekeeper for certain periods of the year, which remain to be fully identified.

**REFERENCES**


1. P. Pattenden: 'Sundials in Cetius Faventinus', *Classical Quarterly,* 29, 203-12, (1979); S. L. Gibbs: *Greek and Roman Sundials*, Yale University Press, New Haven and London, (1976), 23-27, 194-218.
2. J-F. Oudet: 'Le Panthéon de Rome à la lumière de l'equinoxe', *Readings in Archaeoastronomy: papers presented at the international conference: Current Problems and Future of Archaeoastronomy held at the State Archaeological Museum in Warsaw, 15–16 November 1990*, State Archaeological Museum, Warsaw, (1992), 25–52; R. Hannah: *Time in Antiquity*, London, Routledge, (2009).
3. J. L. Heilbron: *The Sun in the Church: Cathedrals as Solar Observatories*, Cambridge, Mass. and London, Harvard University Press, (1999).
4. G. Sperling: *Das Pantheon in Rom: Abbild und Mass des Kosmos*, Neuried, Ars Una (1999), esp. 113.
5. J-L. Voisin: '*Exoriente Sole* (Suétone, *Ner*. 6). D'Alexandrie à la Domus Aurea', in *L'Urbs: Espace urbain et Histoire (1er siècle av. J.-C. – IIIe siècle ap. J.-C.),* École française de Rome, Rome, (1987), 509–41.



*Author's address:*
*Department of Classics, University of Otago*
*P.O. Box 56, Dunedin 9054*
*New Zealand*