

Context and environment: The city lies on a hill standing at the centre of the (relatively untouched) Liri valley, with other hills around the horizon.

Archaeological/historical/heritage research: The impressive polygonal walls of central Italy were first investigated by 19th-century ‘romantic’ archaeologists such as Ferdinand Gregorovius, later by Theodor Mommsen, and subsequently by Giuseppe Lugli. The idea that the layout of Alatri was planned on the basis of geometrical and astronomical alignments was first put forward by the local historian Giuseppe Capone in 1982. His results were confirmed and extended by subsequent investigations.

Main threats or potential threats to the site: A continual problem for the dry, polygonal masonry is the growth of tree roots inside the earthwork that stands behind the walls. Today the city authority seems to have this problem under good control, although more funding is needed. Unfortunately an attempt at restoration was made in the 1970s, in which cement was injected in some sectors; this has caused a series of problems because the masonry cannot oscillate and the area is one of high seismic activity. However, it seems to be impossible to restore the pre-restoration situation, so the monument is (for the first time in millennia) at some risk from earthquakes.

Management: The site is owned by Alatri city administration.

Additional bibliography

Aveni A. and Capone, G. (1985). “Possible astronomical reference in the urbanistic design of ancient Alatri, Lazio, Italy”, *Archaeoastronomy* 8, 12–15.

Capone, G. (1982). *La Progenie Hetea*. Alatri: Tofani.

Magli, G. (2006). “The Acropolis of Alatri: architecture and astronomy”, *Architecture and Mathematics* 8, 5–16.

Case Study 9.3: The Pantheon, Rome, Italy

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Presentation and analysis of the site

Geographical position: Piazza della Rotonda, Rome, Italy.

Location: Latitude 41° 53′ 55″ N, longitude 12° 28′ 37″ E. Elevation 15m above mean sea level.

General description: The Pantheon is the one of best-preserved buildings of the Roman period in Rome and shares with the Coliseum the title of most famous.

Inventory of the remains: The Pantheon as preserved today is composed of a rectangular *pronaos* (portico) with three lines of granite columns fronting a circular building. The latter is designed as a huge hemispherical dome (43.3m in diameter) built over a cylinder of the same diameter and as high as the radius. There is a circular opening (oculus) 8.3m wide in the top of the cupola. The wall in the interior is divided into sixteen regularly spaced sectors: the northernmost contains the entrance door while the rest contain niches and columned recesses in alternation.



Fig. 9.3.1. Sunlight entering the Pantheon through the oculus. Photograph © Giulio Magli.

The oculus provides the only source of natural light for the building, since direct sunlight can never enter through the north-facing entrance. As a consequence, the interior gives the visitor a strange impression of coldness and dark, except on sunny days when one's attention is drawn to the huge beam of sunlight entering through the oculus.

History of the site: The Pantheon was built by Agrippa around 27 BC under Augustus's rule, but its present form is due to Hadrian, c. AD 128.

Cultural and symbolic dimension: The Pantheon has exerted a tremendous influence on architecture since the Renaissance; however—apart from a brief mention by Pliny and one by Cassius Dio, writing some 70 years after Hadrian, who makes a cryptic statement about the monument being the temple of all the gods—no written source tells us why the Pantheon was built or how it was used. However, there exists convincing evidence that this monument was strongly connected with the solar cycle during the course of the year, and that at least one of its main functions (if not its main purpose) was to associate the sun with the power of Rome and to reinforce the emperor's divine right to rule.

The monument acts like a giant sundial with a dark interior, a type well known in the Roman world. During the winter months the beam illuminates only the vaulted dome. However, at noon on the equinoxes it just touches the base of the dome. After the spring equinox it starts descending and on the days around Apr 21 (as well as the symmetric ones in late August) the beam of sunlight fully illuminates the entrance at noon, creating a spectacular hierophany. Closer to the summer solstice, the beam passes across the floor during the middle of the day, although it never reaches the centre.



Fig. 9.3.2. The main hierophany occurring in the Pantheon on April 21, when the beam of sunlight illuminates the entrance fully at noon. Photograph © Giulio Magli.

The spring equinox was connected with the apotheosis of the emperor, while Apr 21 was the traditional date of the foundation of Rome as stated, for example, by Ovid. (In Hadrian's times the differences between the Julian Date in use and the 'correct' Gregorian date was still minimal.) By entering 'with the sun' during celebrations on this day, the emperor would succeed in 'placing Rome among the Gods'. In this and other ways, it is likely that the Pantheon encapsulated Hadrian's ideas about the relationship between Roman religion and power.

Authenticity and integrity: The architectural alignments giving rise to the solar phenomena in the Pantheon are unaltered since the time of Hadrian's reconstruction. The shift in the sun's position owing to the change in the obliquity of the ecliptic since that time is almost negligible.

Present site management

Present use: The site is open to the public, free of charge.

Protection: The Pantheon is on the World Heritage List as part of the "Historic Centre of Rome" World Heritage Site (no. 91).

State of conservation: Very good.

Archaeological/historical/heritage research: There is a substantial literature relating to the Pantheon. See the selective bibliography and references therein for research relating to astronomy.

Main threats or potential threats to the site: No threats known.

Management: The monument is the property of the Italian State. It is entrusted to the ‘Soprintendenza per i beni architettonici e paesaggistici’ of the Roman administration authority, which is responsible for its maintenance.

Additional bibliography

Hannah, R. and Magli, G. (2009). “The role of the sun in the Pantheon’s design and meaning”, <http://arxiv.org/abs/0910.0128>.

Oudet, J.F. (1992). “Le Panthéon de Rome à la lumière de l’equinoxe”, in *Readings in Archaeoastronomy*, edited by S. Iwaniszewski, pp. 25–52. Warsaw: State Archaeological Museum.