Chapter 3
Who Built the Pantheon?
Agrippa, Apollodorus, Hadrian and Trajan

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Despite so much that is known about Roman buildings, there is relatively little to say about the individuals involved in the ferment of their creation. We can reconstruct confidently the original appearance of many a monument, but not much about their designers. This is not for want of information; it is just not quite of the right kind. All around the Mediterranean survive ample ruins, including some strikingly well-preserved buildings, of which the Pantheon is the prime example. This physical evidence is illuminated by literary sources, inscriptions and brickstamps, and on occasion by maps and drawings inscribed in stone. Notwithstanding some long-running disputes, we can often be sure of the identity and date of individual monuments in major cities. We also possess quite a populous roster of architects' names, thanks to numbers of their tombstones, along with the occasional textual mention of a few of the men at the top of their profession. Some buildings bear discreet architects' inscriptions, yet these are nothing like as numerous and prominent as those of their patrons; it is they who take the credit. In short, it is normally impossible to join up specific surviving buildings with specific architects about whom we know any more than the name. In this the Roman period fares worse than the Greek, when architects were frequently tied to particular projects by specifications, contracts and accounts recorded on stone, while the names of famous protagonists can be found in the treatises of Roman writers, most notably Vitruvius and Pliny.[1] By such means we know of no fewer than three individuals who had responsibility for the design of the Parthenon in one role or other, Ictinus, Kallikrates and Karpion, while a fourth, Phidias, the creator of Athena Parthenos, may also have had some architectural input. By contrast it seems ironic that Vitruvius' treatise, by far the most important source on Roman architecture, comes too early in its development to provide information about practitioners of the imperial period.[2]

The Pantheon is a singular monument in so many ways, to mention just the magnificence of its interior space, its size and its state of preservation.[3] It has richer connections in terms of human agency and association than practically any other ancient building, especially from the time of the Renaissance. Suffice it to mention some of the more prominent names tied to it in one way or other: Raphael, Michelangelo, Palladio, Bernini, Piranesi (father and son), Jefferson, Boullée, Stendhal, Speer, Kahn, and the Kings Victor Emmanuel II and Umberto I, both of whom are buried, along with Raphael and other artists, within the building itself. Since the rise of modern archaeology leading scholars who have contributed to understanding the building include Heinrich Dressel, Georges Chedanne, Rodolfo Lanciani, Herbert Bloch and William (Bill) MacDonald (to mention only those who are no longer with us). It is only natural to seek to add to this human pantheon the Pantheon's original creators – be they patron, architect or both. But given the background just outlined, how close to the human story can we hope to get?

To medieval eyes the stupefying size of the Pantheon made it the work of the Devil. On a metaphorical level this notion fed the myth that its dome was formed over a huge mound of earth, which the grasping Roman poor excavated

Plate 1 Cut-away of three-dimensional virtual model of the Pantheon (conceived by the author, created by Robert Grover)

so as to get at the coins that had been mixed in for the purpose.[4] Folklore aside, any literate visitor could feel confident of the identity of the man behind the enterprise, for the name of the great Roman general and Augustus' right-hand man remains to this day boldly emblazoned over the entrance in a very direct statement of euergetism: in essence the inscription declares 'Agrippa made (this)'.[5] At the end of the 19th century, however, it became clear that Agrippa's project only survives as vestiges of foundations incorporated into the present ones, and we have become accustomed to associate the actual Pantheon with Hadrian. Archaeology made sense of written testimony that he restored the structure; evidently it was a total rebuilding from the ground up. The *Historia Augusta* states that Hadrian put the names of the original founders back on buildings he restored, so the Pantheon with its Agrippa inscription has been taken as a case in point. Furthermore, on account of Hadrian's artistic proclivities, his passion for architecture and his involvement in design (referred to by Cassius Dio in a passage that will be examined in due course), there has also been a tendency in some quarters to see him as the creative genius behind the project. Yet the latest scholarship obliges us to overturn once again conventional wisdom. Though this might seem contrary to the spirit of the present volume, we shall see that Hadrian was neither the designer of the Pantheon nor its instigator; indeed he could be portrayed as the individual responsible for the most problematic, even regrettable, aspects of the front in particular. For the conception of the project as a whole we have to bring into the picture two further figures, Trajan and his architect Apollodorus.

Past debates

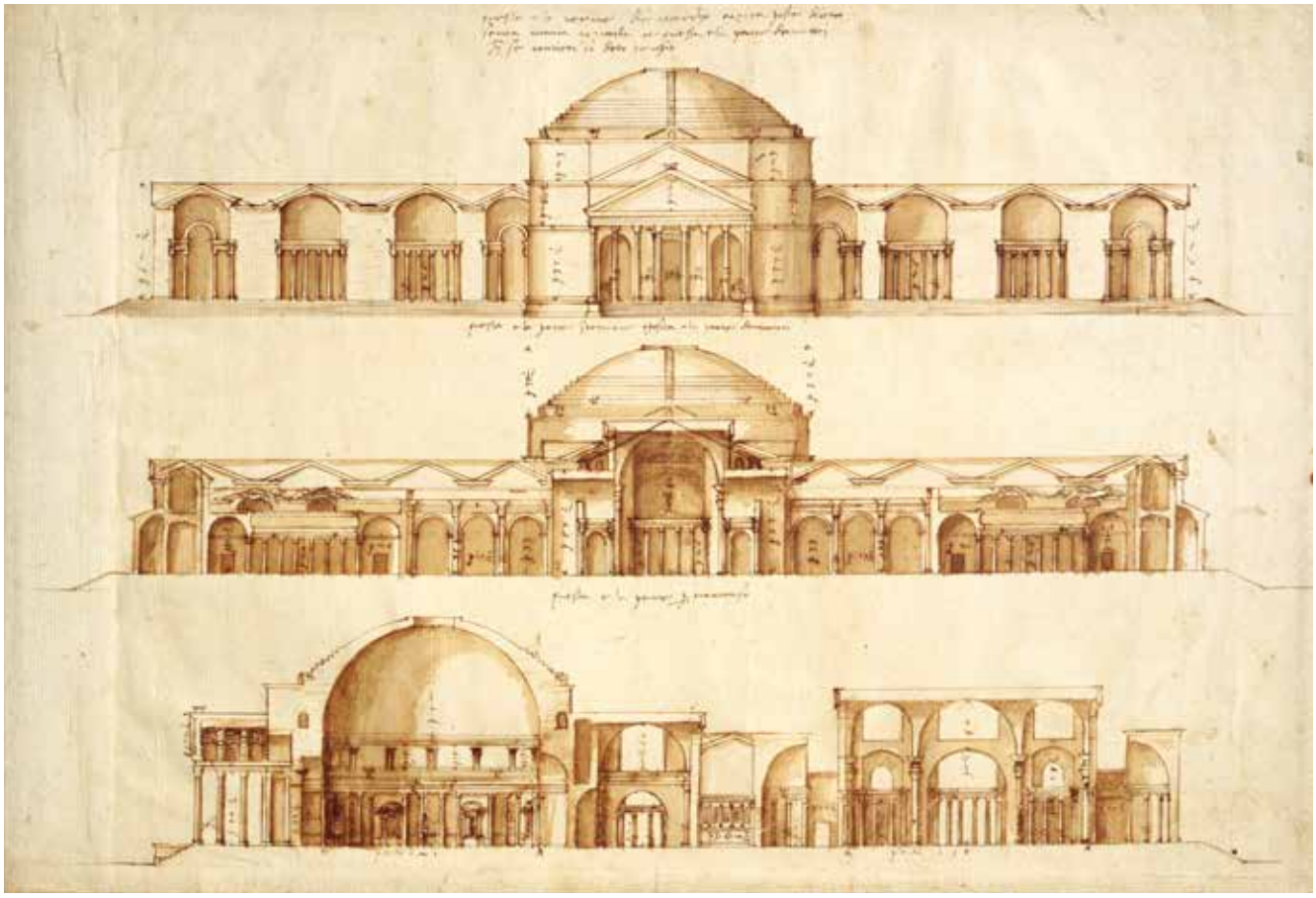
To properly gauge the chronology of the Pantheon, and implications in terms of personalities, it is necessary to understand issues of design and phasing. These topics cannot be separated from past critiques framed in aesthetic terms of the relationships between the main components of the Pantheon: rotunda, portico and the intervening 'transitional block' housing the entrance and the staircases. Paradoxically, given the hallowed status of the monument in architectural circles, there has existed since the Renaissance a sustained vein of bafflement and even outright criticism. Part of this was directed at the attic of the interior elevation, with its little pilasters that do not align with the compositional lineaments above and below.[6] But the biggest concern was the awkward resolution of the exterior and the junction of its circular and orthogonal geometries (**Pls 1**, **2**, **13**).[7] Many, to mention just Michelangelo, Antonio da Sangallo and Fontana, puzzled as to why the Pantheon exhibited architectural solecisms, that is to say offences against the classical 'language' or 'grammar' of the orders.[8] The most alarming of these is the way the entablature of the portico and transitional block crashes into the rotunda. The

Plate 2 Pantheon, junction between the rotunda and transitional block at high level (Photo author)

entablature simply stops, while notably failing to align as one might think it should with the cornice that wraps around the middle of the rotunda. The secondary applied pediment, partially cut off as it is by the roof associated with the full-blooded pediment over the portico, is only the best known of a series of other puzzles. Palladio seized upon the double pediment to help resolve how church facades might reflect different heights of naves and side aisles, but there is no obvious positive rationale for this almost unparalleled device in the Pantheon itself. For these and other problems explanation was sought in phasing. Michelangelo spoke for many Renaissance observers who believed the Pantheon to have been built in successive periods, first the rotunda up to the interior order, second the rest of the rotunda together with the dome, third the portico (along perhaps with the transitional block).[9] Others preferred to identify two phases, with arguments back and fore as to the dividing line between them.[10] By 1800 or so, in the context of increased knowledge of ancient sources and nascent archaeological principles, more attention was paid to historical background and individuals. This is evident in the title of Carlo Fea's publication of 1806, *L'Integrità del Pantheon rivendicata a Marco Agrippa*, which popularized one of the more wayward notions then going around, that the existing building represented a remodelling of the *caldarium* of Agrippa's Baths that lie on axis to the south (though in reality the complex did not extend so far north). This idea can be traced back to the Renaissance, when it was beautifully if misleadingly rendered by Palladio in one of his drawings conserved in London in the collection of the Royal Institute of British Architects (**Pl. 3**).

Disputes rumbled on down to the 1890s, when, as intimated, previous convictions had to be completely revised following detailed study of brickstamps, the identification labels which were in some periods imprinted in the still soft clay of occasional bricks prior to baking. Heinrich Dressel and Georges Chedanne interpreted brickstamps recovered from the Pantheon and its surroundings, some of them still *in situ*, to indicate that the brick and concrete structure belonged to the first half of the 2nd century AD, and not the

Plate 3 Andrea Palladio, conjectural reconstruction of the Baths of Agrippa, including the Pantheon as a *caldarium*. Royal Institute of British Architects, inv. no. SC212/VII/3 (RIBA, British Architectural Library, database entry 28210)



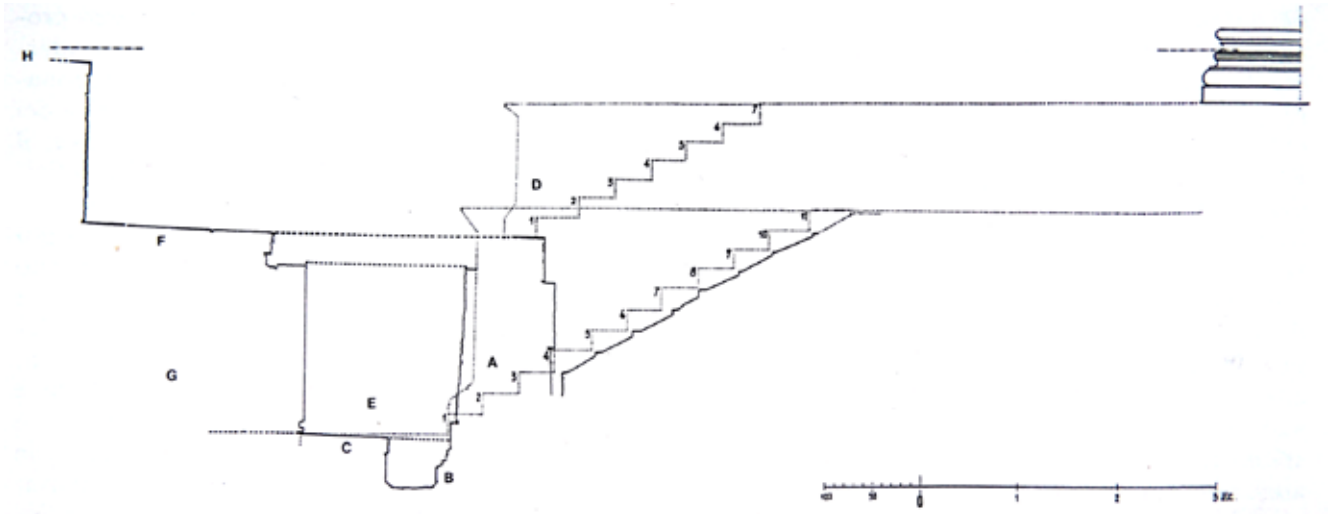


Plate 4 Pantheon, section through the front steps with the outline of steps associated with its predecessor, as revealed by excavations conducted in 1997–8. Annotations: A: earlier stair and podium; D: existing stair and podium; H: current level of the piazza (Virgili and Battistelli 1999, fig. 3, drawn by G. Ioppolo)

time of Agrippa, around 150 years earlier. The excavations prompted by the controversy, together with later observations, demonstrated that the portico was put up – or at least planned – at the same time as all the rest, while also exposing traces of its Agrippan forerunner below floor level.[11] Agrippa thus remained important as the builder of the first Pantheon completed in 27 or 25 BC. In the wake of a fire that affected many other buildings an intervention followed by Domitian, though the literary testimony to this effect has yet to find an echo in archaeological findings.[12] The building suffered a fatal conflagration in AD 110, after which the definitive Pantheon was created from the will to restore Agrippa's conception in fire-proof form. The portico became roofed not with timber but by means of trusses made of bronze, while the majestic structure of the rotunda is of course made of brick and concrete.[13]

Agrippa's Pantheon

Such a comprehensive *bouleversement* of the pre-1890s status quo was for some hard to digest; Chedanne's drawings were exhibited in Rome with infelicitous timing in 1895, that is to say just months after the Agrippa inscription was restored at the command of the new Minister of Public Instruction Guido Baccelli, who was understandably furious – the operation had consumed 800 kilograms of bronze acquired from the Ministry of War.[14] As late as the 1920s and 1930s Giuseppe Cozzo persisted in championing differential phasing and an Agrippan core for the rotunda.[15] But such theories were comprehensively dismissed by Julien Guey and Bloch, whose study of the brickstamps fine-tuned the dating of the building to the Hadrianic period.[16] The 'sphinx of the Campus Martius' nonetheless continues to provoke contrasting interpretations. In fact the authors of two recent tomes dedicated to the building sustain differential phasing to varying extents. Gene Waddell proposes that substantial portions of the portico were rebuilt in the Severan period.[17] Giovanni Belardi – the current director of the Pantheon – still believes that much of what stands today belongs to Agrippa.[18]

The nature of Agrippa's project is in fact one of the main areas in which understanding of the Pantheon has advanced significantly of late. The excavations of the 1890s directed by Luca Beltrami and ably interpreted graphically by Pier-Olinto Armanini, prior to his untimely demise, had uncovered traces of earlier substructures of contrasting character in the area of the portico on the one hand and the rotunda on the other.[19] Under the portico were found extensive masonry foundations that had been reused and consolidated in the imperial rebuilding, while the primary remains associated with the rotunda consisted of a marble floor 2.15 metres below the actual equivalent.[20] Accordingly, under the powerful influence of suggestions by Lanciani, the notion developed that Agrippa's Pantheon was a south-facing T-shaped structure, with a laterally disposed cella corresponding more or less to the outline of the present portico.[21] This theory is now a thing of the past, thanks to excavations undertaken in front of the Pantheon in 1996–7 by the archaeological service of the Comune di Roma, directed by Paola Virgili and encouraged by the then Soprintendente Eugenio La Rocca. (The Comune have responsibility for the piazza, the Ministero for the Pantheon itself.) These excavations show that the imperial Pantheon had more in common with its Agrippan predecessor than used to be thought.[22] Of the various findings probably the most decisive is the discovery of an earlier set of north-facing approach stairs directly under those of portico (**Pl. 4**).[23] In effect Agrippa's project prefigured the existing edifice in having a circular body facing north with a porticoed entrance on the same spot.[24]

These findings appear to complement earlier (and more or less simultaneous) intuitions concerning Agrippa's project from different perspectives by William Loerke and Filippo Coarelli.[25] Loerke envisaged a circular space while Coarelli set down an intriguing rationale for the choice of site on the ancient *palus caprae* (goat marsh), where according to one tradition Romulus, legendary founder of Rome, became the god Quirinus and ascended to the heavens. Agrippa would therefore have intended a programmatic connection between the founder of the city and a new Rome in the age of Augustus.[26] In addition, dynastic ambitions are suggested by virtue of the north-facing Pantheon aligning axially with the entrance to the Mausoleum of Augustus half a mile

Plate 5 Pantheon, soundings made at the junction between the rotunda and the staircase wall running longitudinally on the side of the entrance in the transitional block. Left: east stair at high level; Right: west stair at low level (second landing). The arrow on the right-hand side image points to a course of two-foot wide bricks or *bipedales*, one of which traverses the junction whole and undamaged (photo: author)

away. This programmatic connection attunes with the passage by Cassius Dio (53.27) which states that Agrippa intended to honour Augustus by dedicating the building to him, naming it after him and erecting his statue inside, though Augustus declined.[27] Agrippa therefore had statues of himself and Augustus set up in the porch (presumably in the two great niches) and placed inside a statue of Augustus' adoptive father, the deified Julius Caesar, along with Olympian gods including Venus and Mars. Thus Augustus would find his way inside only after his death, upon his presumed future divinization. All this is consistent with the adaptation to Roman sensibilities of the use of buildings and the name *pantheon* in the Hellenistic east aimed at cementing associations between rulers and divinities.[28] The circular form of the Pantheon itself is appropriate for the task; moreover, according to both La Rocca and Judith McKenzie, in separate and again simultaneous publications coming to press, it may have taken its cue from the lost Tychaion in Alexandria, a structure which brought together statues of divinities and one of a Ptolemaic monarch inside a circular space articulated it seems with axes and subsidiary accents, perhaps recesses or exedrae.[29] In the case of the Pantheon we may assume that Venus, Mars and Julius Caesar were accompanied by other statues disposed in its exedrae and aedicules. It is also likely that over time the statues of divinized members of the imperial family were added, as the initial dynastic aspect of the programme evolved into a celebration of the imperial institution and its cosmic authority. It is this inheritance which provided the thematic underpinning for the existing building when it came to be rebuilt after the fire of AD 110.

Hadrian and Apollodorus

While making allowance for later repairs, the brickstamps, the foundations, along with the stylistic similarity of the marble orders inside and out, show that the whole of the existing Pantheon was erected more or less in one go. No longer being able to fall back on differential phasing to explain what used to be viewed as solecisms, these needed to be reconsidered. In fact the attic may now be recognized not as flawed, but on the contrary a vital participant in a brilliant and coherent interior scheme that spurned a predictable radial solution in favour of a dynamically rhythmical experience.[30] As for the potentially problematic exterior junctions, it has been argued by scholars such as MacDonald and John Ward-Perkins that these would have been scarcely visible in antiquity on account of the way the building was originally framed, taking into account the levels that then pertained. Doubts were also raised as to the validity of looking at Roman design from perspectives conditioned by aesthetic and theoretical premises of Renaissance origin.[31] But for my friends Paul Davies, David Hemsoll and me, looking at the building afresh in the late 1980s, the problem could not be so easily put aside. The observations of MacDonald and Ward-Perkins seem sound, but hardly sufficient. They might help us to understand how some of the infelicities of the Pantheon were minimized and their consequences mitigated, but there is no denying their existence. It is difficult to dismiss the thrust of the criticisms directed from a design standpoint made by architects as eminent as Michelangelo and Fontana. It should be emphasized that some of the puzzling features have little to do with aesthetic considerations that are potentially susceptible to Renaissance or academic bias. That the fabric of the transitional block is bonded with the rotunda at low level (**Pl. 5**, right), but not bonded at high level (**Pl. 5**, left), is just the most striking technical oddity associated with the execution of the project.[32]

The problematic aspects of the design of the Pantheon are sufficient to raise the doubt that an architect at the apogee of the imperial period would have ever intended them, at least in the ideal world. In fact one school of thought saw ineptitude as proof of Hadrian's authorship.[33] Thus he would have been the genius behind the conceptual novelty of the project, the fusion of a (Greek) portico and a (Roman) rotunda, while his lack of professional experience meant he was unable to carry this conception through to a perfect resolution.[34] One can only admire this ingenious, if contorted, theory! Hadrian may well have been the driving creative force behind his extraordinary 'villa' at Tivoli, operating rather like the director of an orchestra in which architects and builders were the instruments. But there are good reasons to doubt that his position was compatible with designing major projects in any detail, especially those in the public realm in Rome itself.[35] As regards to the Pantheon in particular, Apollodorus has a much superior claim to its design.

The architect-engineer Apollodorus (or Apollodorus of Damascus) was Trajan's preferred designer and author of his Forum and Baths, both quite exceptional projects.[36] As we shall see, one source suggests a confidential relationship between the two men, and it is reasonable to visualize the architect filling a role broadly comparable with that of Royal Surveyor in the British context of the 17th century.[37] As befitted a profession that in antiquity spanned the modern divides of architecture and engineering, Apollodorus stood at the pinnacle of both. His technical mastery is evident from his authorship not only of the *Poliorcetica*,[38] a treatise on siege engines and the like, but also the celebrated wooden

Plate 6 Pantheon, interior elevation of the rotunda projected flat. The only instances in which there is concordance between different levels of the composition are indicated by dotted lines (author: from Wilson Jones 2000, fig. 9.25)

bridge over the Danube. An audacious wooden structure spanning between stone and concrete piers, this is represented prominently on Trajan's Column, besides being the subject of another treatise by Apollodorus, a work which, though since lost, was referred to by Procopius in such a way as to suggest that it was well known as late as the 6th century.[39] In its turn the Column, at least as regards to its architectural definition, could also be included in Apollodorus' oeuvre by virtue of being an integral part of his (i.e. Trajan's) forum. It would be reasonable to suppose that the architect was responsible for other projects besides those mentioned, though without appeal to documentary evidence it can be difficult to pin down any specific attribution, Trajan's Markets being a case in point.[40] Leaving to one side for the moment the date of the Pantheon, its attribution to Apollodorus makes sense on several levels. There are shared stylistic traits in the marble decoration of the Pantheon and his Forum of Trajan.[41] The open-air half-rotundas of Trajan's Baths offer points of similarity with the Pantheon rotunda. The latter is notable for a kind of 'syncopation' which baffled Renaissance commentators and which saw a vertical concordance between the main order, the attic and the coffering of the dome only on the main axes (**Pl. 6**). A similar syncopation occurred at the Baths, albeit in a simpler form given the absence of an attic (**Pl. 7**).[42] Moreover, the trapezoidal staircases fitted in behind these half-rotundas directly presage those of the Pantheon (**Pls 7** and **9**).[43] Finally it may be noted that Apollodorus' expertise in the erection of giant timber structures, as attested by both the *Poliorcetica* and his famous bridge, put him in a singularly good position to have masterminded the giant centring that must have been employed to build the Pantheon dome.[44] To repeat, without the kind of archival evidence that would bear on such discussions in modern times, this evidence is not sufficient for an unassailable attribution; however it is probably the closest chance we have of going beyond the generalized anonymity that is the Roman architect's fate. Yet at the same time we need to be aware of stressing the individual at the expense of team endeavour, certainly no less relevant in antiquity than it is today, despite the media focus on a few 'starchitects'.

The 'compromise hypothesis'

Were the Pantheon indeed designed by the capable Apollodorus, the shortcomings of its exterior seem all the more puzzling. How then to explain them? Together at first with Davies and Hemsoll, I have argued that the exterior of the Pantheon is not what was originally intended, but rather the outcome of compromises induced by unforeseen circumstances. The 'compromise hypothesis' proposes that the portico was initially planned with sixteen columns incorporating 50ft monolithic shafts of Egyptian granite (**Pl. 8**). These columns would have been set out on the same centres as those of the actual portico, perhaps with the same distribution of materials, i.e. eight shafts of grey granite from the quarries at Mons Claudianus in front, eight of pink granite from Aswan behind. The decision was made to employ 40ft shafts instead only after work had started on site, for some reason unknown – perhaps because of logistical difficulties with quarrying and/or transportation. Might a consignment of 50 footers have sunk en route between Alexandria and Rome?[45] Alternatively it is possible to imagine, as we shall see, that shafts originally intended for the Pantheon were diverted to the Temple of Trajan. Either way, it is significant that Roman monolithic column shafts tended to be standardized in multiples of 5ft lengths, with 30,

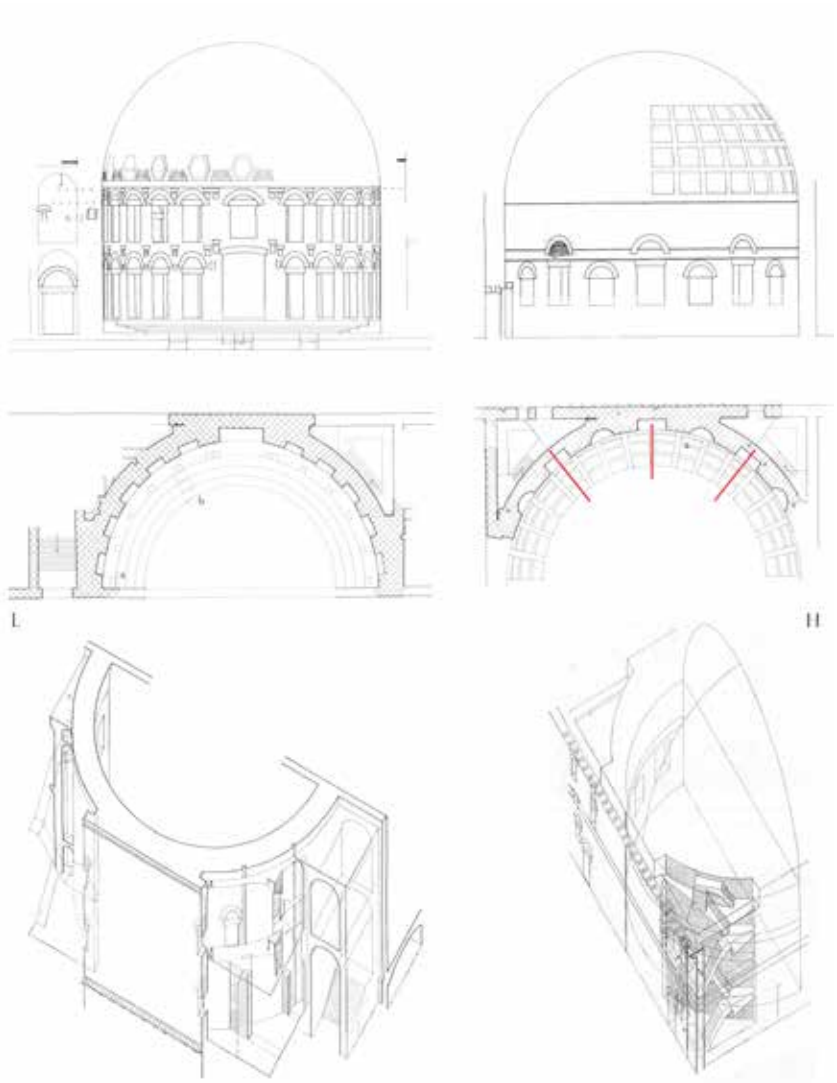


Plate 7 Baths of Trajan, hemicycles 'H' and 'L': plans, elevations and three dimensional projections. Note the alignment between niches and coffers indicated by red lines, and the triangular shaped staircases tucked in behind both of the hemicycles (after Licht 1974, Taf. 1 and. 3, Abb. 17 and 44)

40 and 50ft lengths being the dominant larger sizes. Shafts 40ft long thus represented the next major step down from 50ft, and, moreover, were much more common and therefore more likely to be available.[46]

The case for the compromise hypothesis relies primarily on deductions based on the physical examination of the building and its solecisms. Indeed, all its various solecisms and curiosities would simply not have existed in the hypothetical original project.[47] Since those mentioned so far concern the more strategic aspects of design and construction, it is well to illustrate one small-scale example so as to give an idea of the level of detail that is embraced by this theory. Where the portico meets the transitional block on the west flank the entablature 'jogs' or steps out by a small amount, one neither so small as to be insignificant, nor so big as to constitute a positive feature (**Pl. 2**). This is the product of the 'shrinking' of the columns predicted by the compromise hypothesis. The columns had become smaller, demanding that the overall width of the entablature they carry contract inwards, in theory by 5/8 of a foot on both the east and west flanks. Yet the structure of the transitional block was already in position, and could not be moved. Mitigation could be achieved by shifting the column axes with respect to the foundations (though naturally this shift could only be marginal), and perhaps also by cladding the transitional block with thinner sheets of marble than would originally have been used. But evidently not all the difference could be lost by such improvisations, hence the 'jog'.[48]

First published in 1989, fleshed out with further supporting evidence in 2000 and 2009, the 'compromise hypothesis' has had a predominantly positive reception.[49] But the reader should be aware of opposition, principally that of Lothar Haselberger, a leading scholar of ancient architecture.[50] He worries about the dangers inherent in presuming we can know what ancient architects intended, while questioning whether several of the shortcomings really amount to such.[51] For him the preoccupation with what *should* have been deflects us from a subtler understanding of what actually *is*.[52] He notes a series of lapses from precise regularity and symmetry (some of which are disconnected with the solecisms I highlight), that adds up to an inconsistency, or elasticity, that is perhaps surprising (to us). On the other hand the portico displays some features of considerable refinement, for example the slight thickening of the corner columns (by about 5–6cm, or 3 per cent, compared with the rest).[53] For Haselberger the juxtaposition of exacting details with 'misfits' could reflect a non-academic approach to design, besides divisions between different kinds of operation (or the labour involved), aspects that we have yet to fully appreciate in this as in other imperial monuments.[54] This is a valid debating position, and I am

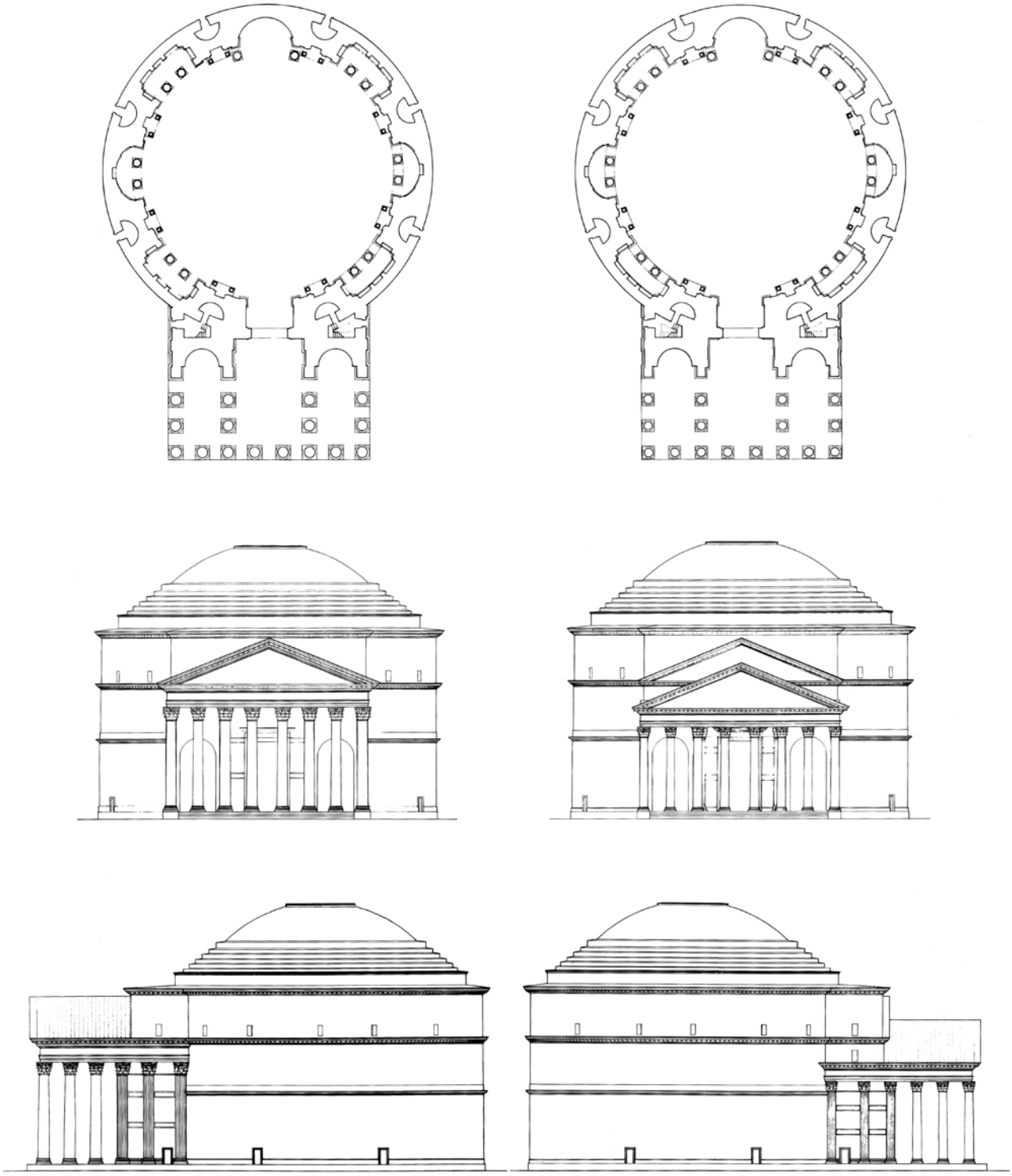


Plate 8 Pantheon, plans and elevations as intended and as executed (author: from Wilson Jones 2000, fig. 10.12)

happy to concede that one or two of the Pantheon's solecisms should be viewed less dogmatically, and perhaps discounted.[55] A couple of others are inconclusive (the second pediment is merely very unusual, it is not in fact unique in ancient architecture).[56] But several major supports of the 'compromise hypothesis' remain intact, or not even challenged. This is not the place to rehearse again all the arguments in its favour; however, given the opposition just cited, it is well to confront aspects of the problem from fresh directions, both of which have a temporal dimension. One has to do with relative chronology, the phasing of transitional block and rotunda, the other has to do with absolute chronology and the date of construction. More importantly, for the present inquiry, both have a bearing on the human side of the equation.

Phasing, chronology – and Trajan

Academic disputes have the dialectical function of sharpening a line of argumentation, and this is the case here. The juxtapositions Haselberger noted in the measurements of the Pantheon (precise-imprecise, regular-irregular and so on) seem to me not so much to detract from the compromise

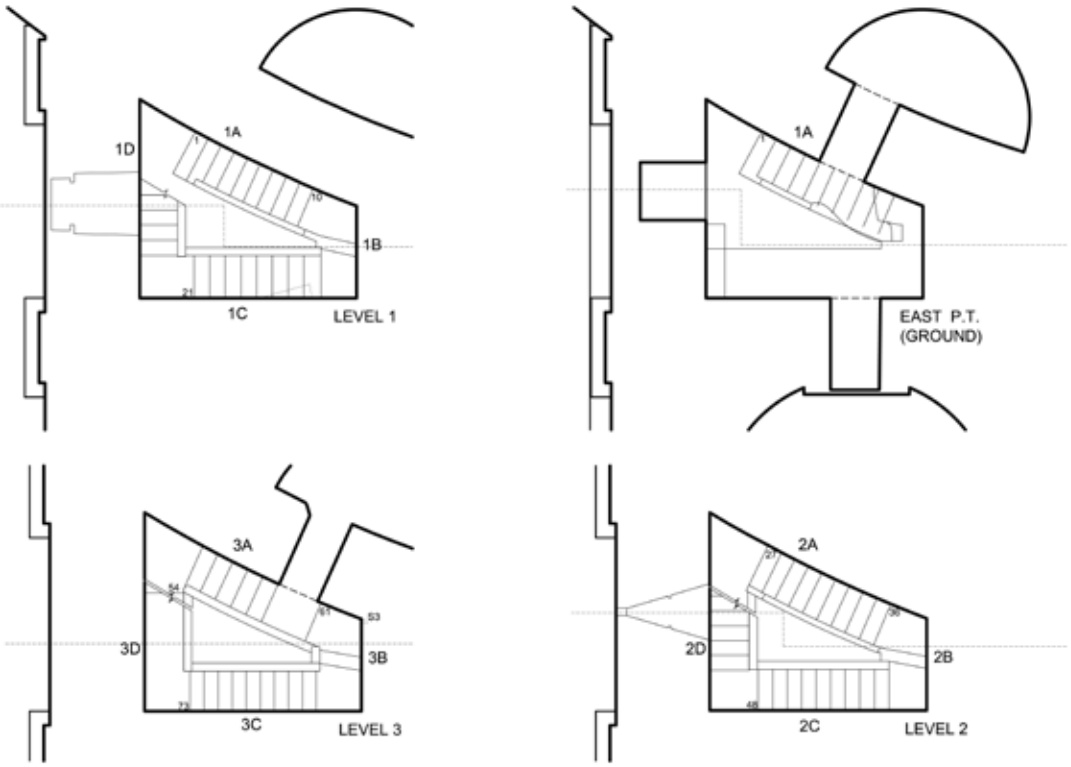


Plate 9 Pantheon, plans of the East Stair at different levels, 1:200 (author, Roberta Zaccara and Robert Grover)

hypothesis as to *add* to it, for they are easier to understand if an upset occurred that obliged an element of re-design, and hence delay, along perhaps with a rush to make up lost time.[57] Given that such questions are open to debate, as are solecisms based primarily on aesthetic considerations, it seems particularly important to focus on matters of a technical nature. During one of our conversations about our old friend the Pantheon some years ago, Haselberger pointed out that the nature of the discontinuity at the junction of the rotunda and transitional block had never been properly scrutinized (or at any rate not published), and this led me to make my own survey of the east staircase of the Pantheon in 2005 and 2006, with the help of Cinzia Conti, Giangiacomo Martines and a team of assistants.[58] Because the staircases have limited architectural pretensions, being essentially functional, they present the best opportunities to inspect the raw construction of the transitional block, and its junction with the rotunda (**Pls 1, 9**). We were able to witness the bond between these bodies of fabric at low level (**Pl. 5**, right). This proved the unity of conception that had been so much disputed in the past. On the other hand, we could also document a clearly unbonded condition in the upper half of the structure (**Pl. 5**, left). Via the study of technique (as manifest by such things as brick-to-mortar ratio, and the distribution of so-called bonding courses made with *bipedales*, the especially large, two-foot wide, bricks) it is furthermore possible to chart the close similarity in the character of the construction of the upper and lower halves of the transitional block. Although the change in the bonding condition between the rotunda and the staircases must occur somewhere around the level of the entablature, it is not possible to detect an obvious break or change in the elevation of the staircase in this area (**Pl. 10**). This suggests, even if it cannot prove, the close temporal proximity between the upper and lower halves. The evidence of the brickstamps confirms this point.[59] Therefore the work on the transitional block and the stairs merely suffered a pause; after operations were halted about half way up work then resumed quite quickly. It is not impossible that both phases were supervised by the same people.[60] Just as remarked in connection with the 'misfits', all this is perfectly compatible with a project that suffered a serious, but temporary, setback. According to my reading, the lack of bond was forced on the builders by the non-arrival of the intended columns and the ensuing hiatus, during which they could only proceed with the construction of the rotunda. When work on the transitional block resumed it was obliged to simply abut the rotunda.

The building site of the Pantheon was afflicted by other adversities too. Agrippa's building had earlier suffered significant settlement of the foundations, and some lesser but still worrying settlement made itself manifest in the building of the imperial rotunda.[61] The structure known in Italian as the *grottoni*, a two-storey infill building between the south side of the rotunda and the Basilica of Neptune, was evidently an improvised buttressing measure for the rotunda even before it was complete. This is indicated on three counts: firstly, the six longitudinal walls (running north–south) of the *grottoni* do not bond with the rotunda, but are butted up against it; secondly the brickstamps from the *grottoni* fall in roughly the same date range as those from the rest of the building.[62] The third point emerges out of my recent inspections, which have revealed a remarkable state of affairs that had hitherto escaped appreciation: despite not being bonded below, the upper parts of the *grottoni* are bonded with the rotunda. This point indicates that the whole of this structure was put up extremely fast, presumably so as to be in place by the time the dome was

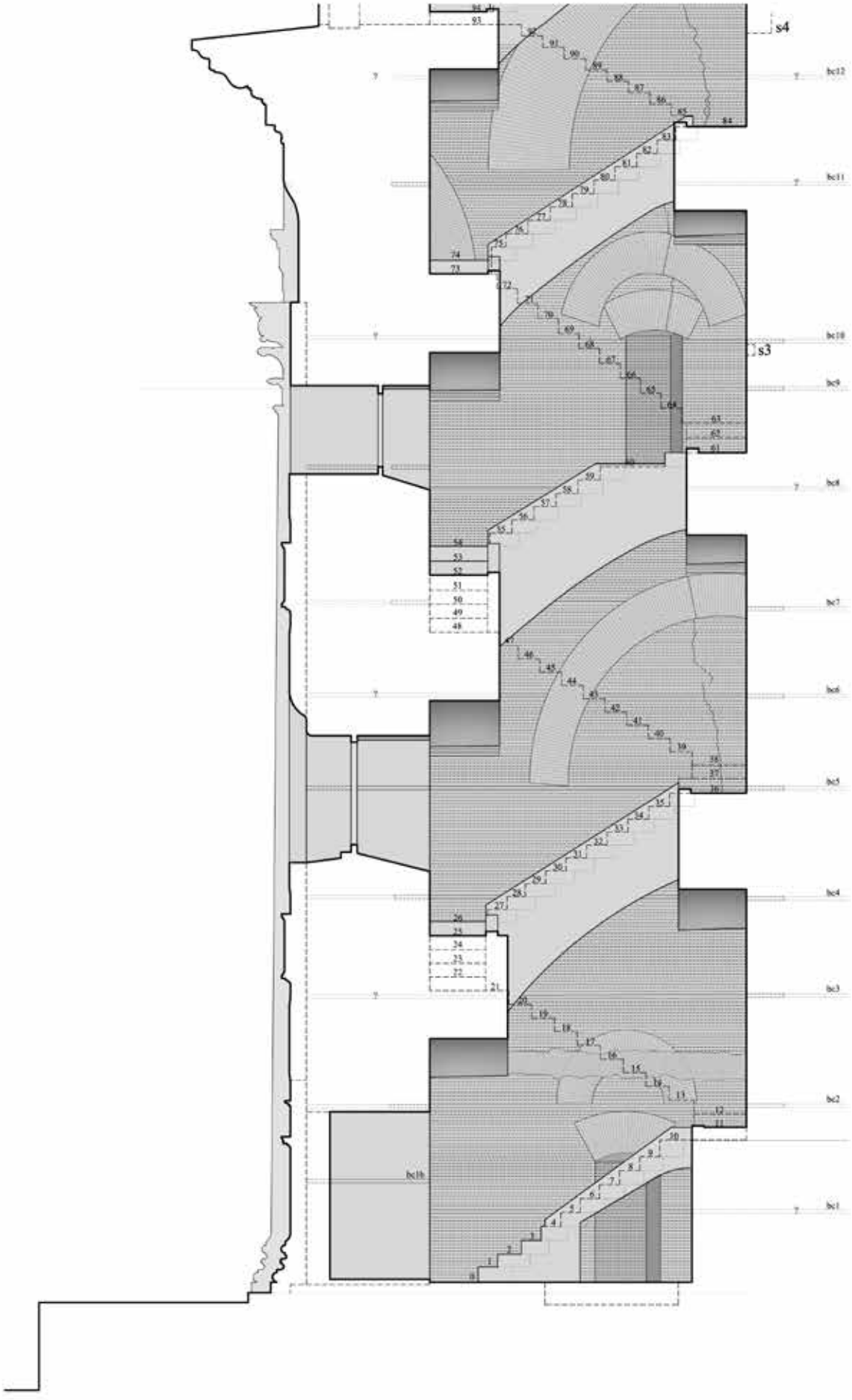


Plate 10 Pantheon, part-section of the East Stair. Bonding courses of *bipedales* are shown dotted, 1: 80 (author, Roberta Zaccara and Robert Grover)

Table 1 Key dates for the building of the Pantheon

BC 27/25	Agrippa's Pantheon dedicated	
AD 80	Pantheon damaged by fire	
post AD 80	Restoration of uncertain scope	
AD 110	Pantheon burns	Trajan's reign ongoing
AD 111–14	demolitions; conception and design	
AD 114–16	site preparation and foundations	
AD 116–19	progress on brick and concrete superstructure	117 Hadrian's accession
AD 119–21	erection of the *grottoni*;	118 Hadrian arrives in Rome
	non-arrival of 50ft shafts for the portico;	
	work on the transitional block interrupted	121 Hadrian leaves Rome
AD 122–4	completion of the dome;	
	decision to use 40ft shafts for the portico;	
	completion of the transitional block	
AD 124–5	completion of the portico	125 Hadrian arrives in Rome
AD 125–6	installation of statuary and fittings;	
	finishing and dedication	
		128 Hadrian leaves Rome

constructed. Here, then, is a yet another sign of improvisation and haste.[63]

A further twist in scholarship over the Pantheon has emerged with Lise Hetland's recent research. In line with Wolf-Dieter Heilmeyer's earlier arguments based primarily on the style of capitals and other marble elements, this pulls back the date of the commencement of the project to a few years earlier than the prevailing consensus of *c.* AD 117–18.[64] Only a few years, it is true, but enough to force a change in any assumptions about Hadrian's involvement. Credit for the project should now go to his predecessor Trajan.

This proposal relies on a reappraisal of the same body of brickstamps that had already been studied by Guey and Bloch. A minority of brickstamps are of critical interest, for these are dated to a specific year by virtue of the abbreviations included of the names of the consuls then in power. A larger group of stamps can be dated within rough limits by tracing other names that appear, and by cross-referring to the same names on dated examples. It is striking that all the *in situ* brickstamps preserved in the Pantheon which can be dated with reasonable confidence are late Trajanic, save for one Hadrianic example. Bloch, the doyen of brickstamp studies in the middle of the last century, had realized this.[65] However, a fondness for a more general theory of his concerning brick production in this period led him to argue that the Trajanic shipments were stockpiled, not to be taken up until Hadrian instigated the project after coming to power in mid AD 117. Exposing circularity in Bloch's position, Hetland guides us towards the more logical conclusion that the project was Trajan's. Is it not more likely, she asks, that Trajan commissioned a replacement Pantheon sooner rather than later after the fire of 110 that destroyed its previous incarnation?[66] In short, allowing for demolition and planning, a start date between AD 113 and 115 is substantially more probable than one around AD 118.

As for the end date, this can also be established within a fairly close range. The key consideration here is that in AD 123 – presumably in response to an edict of Hadrian – an unusually high proportion of Roman brick production was stamped (i.e. with the abbreviated names of the then reigning consuls, Apronianus and Paetinus).[67] The absence of such stamps in the Pantheon shows that the bricks used in its construction must have been made prior to AD 123. The superstructure must therefore have been completed by this time, if not soon after. (The exact time lag twixt production and use is impossible to know.[68])

The single *in situ* brickstamp datable to the Hadrianic period and specifically the key year AD 123 allows additional precision. The piece of brick in question was found where the columnar system of the portico meets the transitional block, in the fill material that accompanied the positioning of the marble pilasters.[69] Given that the portico could have been put up relatively rapidly, this suits dedication of the new Pantheon in or after AD 125. Since Hadrian returned to Rome in the summer of AD 125 after his first tour of the empire,[70] it is tempting to imagine that he would have presided over the ceremonies in person. Was he keen for this event to take place soon after his return, forcing the rush to which several details attest?

The likely duration of the project from conception to completion was thus around a dozen years (*c.* AD 113/14 to *c.* AD 125/6). In the normal course of events, a construction period of around eight years for the Pantheon would be feasible, given the legendary logistical capabilities of the Roman building machine.[71] But in this case events were far from normal. Delays would have been incurred firstly by the improvised erection of the *grottoni*, and secondly by the interruption and reconfiguration of the transitional block and portico. (It remains difficult to say whether these delays ran separately or concurrently.) In any event, the evidence from brickstamps and phases combined with worksite logistics leads to the above sketch chronology for the Pantheon and its main component parts (see **Table 1**).

The revised dating of the Pantheon reminds us that we should be wary of assigning building projects according to artificially clean break-lines relating to individual emperors. It is convenient to be able to call a building Domitianic, Trajanic, Hadrianic and so on. But to do so distorts the realities of the imperial administrative system; policies and attitudes could certainly change on the diktat of a new emperor, but the machinery of state ensured relative continuity across a spectrum of activities. Hadrian only

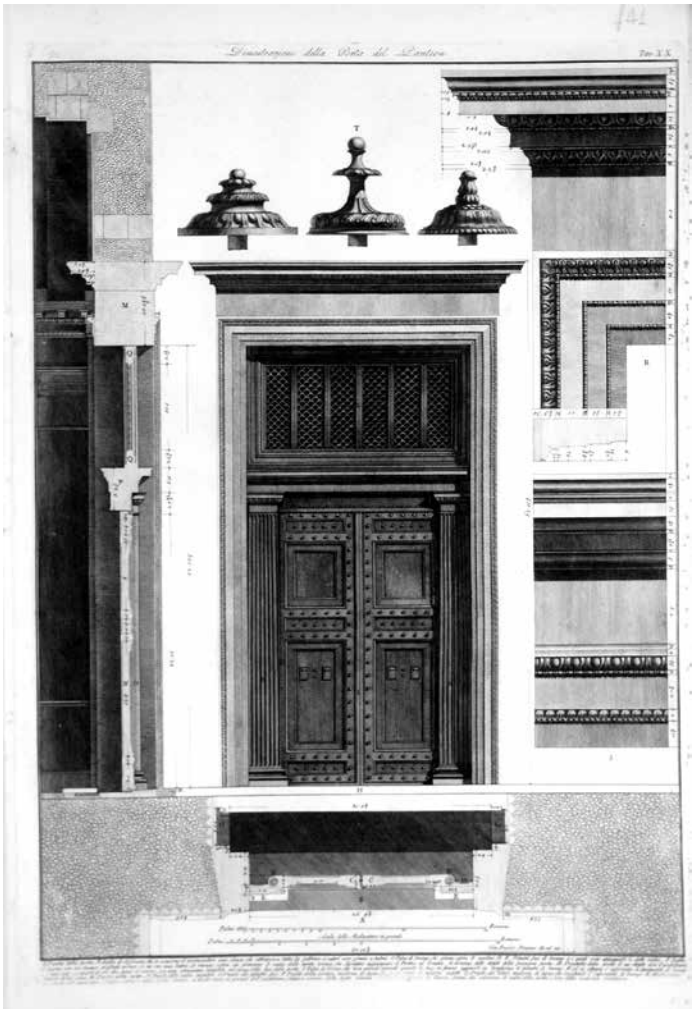


Plate 11a–b Pantheon, entrance and door. Note the pilasters and grille that fill the gap between the double doors and the masonry opening (a: photo: Maxim Atayants; b: Francesco Piranesi, *Raccolta de' tempi antichi*, II (1790), Tav. 20)

came onto the scene after the unexpected death of Trajan, and in general terms it is inevitable that some projects begun in one emperor's reign were finished in another; death hardly works to a schedule. When we speak of Trajan's Forum, we should keep in mind that Hadrian may have completed it.[72] Likewise there would be nothing so exceptional about a Pantheon begun in Trajan's time and completed in Hadrian's.

Along with practically everyone else I used to accept the conventional Hadrianic date, albeit reluctantly, conscious that it did not suit the attribution to Apollodorus on account of Hadrian's antagonism. So it is a pleasure to be freed from this error. With the dating of the Pantheon revised and its inception under Trajan clarified, the case for the involvement of his favourite architect Apollodorus is significantly strengthened. Indeed, who more likely to have been given charge of the new project than Apollodorus, covered in glory as he was concerning the bridge over the Danube, Trajan's Baths and Trajan's Forum?

The last significant intervention in the Pantheon of pagan antiquity consisted of restoration works by the emperors Septimius Severus and Caracalla, as attested by the inscription that runs below Agrippa's in much smaller letters on the architrave.[73] The scope of works is however uncertain. A pair of brickstamps has been found associated with the vaulted fabric over the entrance portal. Here the bronze doors do not fit the marble aperture, which is in part filled by the associated pilasters at the sides, and the grille overhead making it legitimate to wonder whether they were retrofitted (**Pl. 11a–b**). Having been originally produced in the Augustan period according to one interpretation, the doors themselves may have been recycled, perhaps in the Severan period if not in the Hadrianic phase.[74] Other Severan interventions are difficult to identify. It is possible that settlement, even if not so pronounced as that which bedevilled Agrippa's Pantheon, continued to cause problems. Its severity should not be overstated – the Pantheon stands, after all, and the radial cracking of the rotunda is probably generated by stresses affecting most unreinforced hemispherical domes – but settlement possibly contributed to the collapse of the north-eastern corner of portico in the 17th century. It has also been wondered if the bronze trusses and ceiling were created or restored in the Severan period.[75] However it may be noted that the Trajanic fabric of the transitional block seems to anticipate vaults of some kind over the side aisles.[76] Perhaps movements in the fabric over the course of the 2nd century caused portions of its marble revetment to detach, giving rise to a programme of repairs attested by the Severan inscription, a document that, despite the rather grandiose claim to have restored 'all the decoration', can be assumed to have inflated reality, as was common practice at the time.[77] There then followed centuries

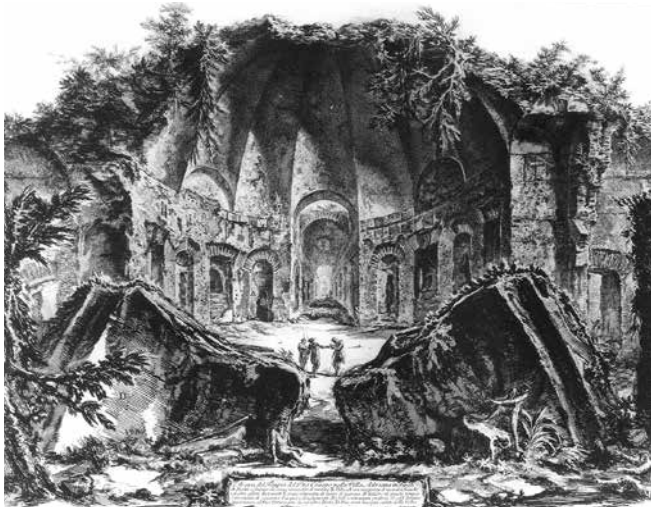


Plate 12 Hadrian's Villa, the so-called Serapeum, also known as the 'Temple of Canopus' or less problematically the Scenic Triclinium (Giovanbattista Piranesi)

of decay, robbery, repair and conservation, which, albeit fascinating, cannot detain us here.

Three texts

In summary, then, a range of evidence makes it clear that Agrippa built the first Pantheon, that the actual building was begun by Trajan and finished by Hadrian, while Apollodorus has the best claim to having been its designer. Now for a change of gear, as we turn to three texts that may provide further depth to the scenarios discussed, and their human dimension. This is no longer the realm of proof and logical argumentation, but that of conjecture. Nonetheless my inferences help create a narrative that has the potential to tie up loose ends and make sense of them, while not actually violating any of the facts at issue.

The first document to which I appeal is a letter on papyrus concerning a 50ft shaft in transit from the quarries of Mons Claudianus across the eastern Egyptian desert. The letter bears a date in the third year of Hadrian's reign, that is to say the winter months of AD 119/120.[78] Written to secure fodder for the draught animals involved, which by implication of the urgency of the request must have been running worryingly short, the papyrus illustrates the kind of problems that might bedevil the transport of such monstrous – 100 tonne – stones. This event is too early for the destination to have been a Hadrianic Pantheon, but the winter of AD 119/120 fits well with the Pantheon as we now know it to have been begun under Trajan, and which, according to the compromise hypothesis, should have had 50ft shafts. If the shaft in question was not part of a consignment that was lost at sea and successfully arrived in Rome, where might it have ended up? Fifty-foot monoliths, it must be emphasized, were very rare indeed. Though the letter is too early for the shaft to originally have been intended for the Temple of Trajan – a project that was probably only begun after Trajan's death – it most likely found use there. The exact date and location of this building eludes scholarly consensus, but pieces of several shafts of this very size lie underneath the modern Palazzo Valentini not far from Trajan's Column, in addition to the large chunk that can easily be seen at the foot of the Column itself.[79] Thus 50ft shafts were envisaged for both the Pantheon and Trajan's temple, and indeed Amanda Claridge has directly connected the fortunes of these two projects. Delays in supply are easy to envisage, whether due to transportation or shipwreck, or simply the time needed to produce such a large number of huge columns that the combined projects demanded. It should be borne in mind that at the time the Pantheon was commissioned Trajan's death could not have been anticipated, while building the temple to the god that he thus became was a political imperative for Hadrian, a way of consolidating his accession. By Claridge's intriguing reasoning the prospect of unacceptably long delays for this project could have triggered an instruction to divert to it shafts originally intended for the Pantheon.[80] This or shipwreck are thus the two chief likely causes of the problem. Naturally, we will never know the exact dynamics, but the papyrus gives us a remarkable glimpse of the possibilities.

Trajan, Apollodorus and Hadrian

The next text of potential relevance is perhaps the most famous passage concerning an ancient architect that comes to us from a source other than Vitruvius. Written by Cassius Dio, it happens to brings together, in the context of major imperial projects, all three of the key names involved in this phase of the Pantheon: Trajan, Apollodorus and Hadrian:

> [Hadrian] first banished and later put to death Apollodorus, the architect who had built the various creations of Trajan in Rome – the forum, the odeon and the baths. The reason assigned was that he had been guilty of some misdemeanour, but the true reason was that once when Trajan was consulting him on some point he had said to Hadrian, who had interrupted him with some remark: 'Be off and draw your pumpkins. You don't understand any of these matters' – it chanced that Hadrian at the time was pluming himself upon some such drawing. When he became emperor, therefore, he remembered this slight and would not endure the man's freedom of speech. He sent him the design of the Temple of Venus and Rome by way of showing him that a great work could be accomplished without his aid, and asked Apollodorus whether the proposed design was satisfactory. The architect in his reply stated first, in regard to the temple, that it ought to have been built on high ground ... so that it might have stood out more conspicuously on the Sacred Way ... Secondly, in regard to the statues, he said that they had been made too tall for the height of the cella. 'For now', he said, 'if the goddesses wish to get up and go out, they will be unable to do so.' When he wrote this so bluntly to Hadrian, the emperor ... restrained neither his anger nor his grief, but slew the man. Indeed, his nature was such that he was jealous not only of the living, but also of the dead.[81]

As Frank Brown surmised, the disparaging reference to pumpkins or gourds was most likely an allusion to the scalloped vaults that Hadrian and his architects used to such effect in his villa at Tivoli (**Pl. 12**).[82] The text conveys an antipathy between Hadrian and Apollodorus that was provoked or augmented by the 'slight', and which may perhaps have been rooted in differences of opinion and/or approach on the subject of architecture. This would not be the first nor the last time that the professional and the dilettante rouse mutual irritation. A further cause for resentment on the part of Apollodorus can be ascribed to the

Plate 13 Pantheon, view of the front and its inscription (photo: author)

destruction of his great bridge on Hadrian's orders, out of fears that barbarian forces would use it to cross to the Romans' side.[83] Yet the most striking event, Apollodorus' execution at Hadrian's behest, would seem to be embroidery aimed at tarnishing the emperor, in keeping with Dio's efforts to portray him in a bad light. (The *Historia Augusta* has the architect collaborating on one of the emperor's later unrealized projects, which was to create a statue of Luna to accompany the Colossus.[84]) As for the passage about the Temple of Venus and Rome and its goddesses, this is but an adaptation of the well-known anecdote about the classical Greek sculptor Phidias' statue of Zeus in his temple at Olympia.[85] Yet Dio's rendition may still contain genuine elements, and it is tempting to suppose that the Pantheon was the real focus of the dispute. Perhaps he had heard about the controversy over the height of its portico, pinning a jumbled version on the Temple of Venus and Rome instead. After all, in Dio's mind the Pantheon was built by Agrippa, since another passage of his shows that he took the inscription under the pediment at face value.[86]

According to this intuition, the clash would have arisen not primarily over the Temple of Venus and Rome, but over the problems that afflicted the portico of the Pantheon. Apollodorus would be the designer and Hadrian the emperor/patron, the death of Trajan having propelled him into a commanding position over Apollodorus, along with so much else. We may envisage the two men on opposite sides of a dispute over how to resolve the project, which stood preposterously incomplete in the middle of the Campus Martius just as so much other building work all around was finished, or soon so to be. On the one side was the architect: bent no doubt on keeping to the more impressive original, ideal, design, in spite of protracted further delays associated with a new order and delivery of the requisite giant shafts from Egypt. On the other side was the emperor: concerned above all with limiting the duration of the embarrassment, and getting the project finished as quickly as possible. Was it Hadrian who insisted on the compromise solution, authorizing the diversion from another project of a set of 40ft columns that was already in Rome, or on its way? In one sense or another then it is correct to call the portico Hadrianic, in contradistinction to the rest of the building.

The construction of the Pantheon may already have run into problems at its southern end, where the *grottoni* would rise as a precautionary measure, and then there arose the portico fiasco at the northern end. Though the cause may well have been what we would call an act of god – Poseidon/Neptune? – and not of Apollodorus' making, there may yet have been a perceived element of fault on his part. (Was he over optimistic about the number of shafts that could be quarried? Did he order shafts to be shipped from Alexandria too late in the season, thus endangering them in storms? Did he instruct them to be sent in one flotilla, as opposed to the more prudent option of separate batches?) Hadrian and Apollodorus, I imagine, locked horns over their divergent preferences for resolving the catastrophe – albeit at a distance or via delegates, for the emperor was away from Rome for most of the period during which this drama unfolded. (A parallel of sorts exists in surviving correspondence between Trajan and Pliny the Younger, when as governor of Bithynia he needed instruction as how best to manage problems with public buildings in

Claudiopolis.[87]) One can almost feel the tension between a principled Apollodorus, holding out for the ideal taller portico, and an impatient Hadrian, imposing his will for the sake of minimizing embarrassment and for the speediest possible opening of the grandest hall the world had yet seen. So as to justify his instruction to make do with a set of 40ft shafts, who knows if Hadrian used similar arguments to those advanced by MacDonald and Ward Perkins, to the effect that the resultant offending junctions were of limited visibility? Knowledgeable as he was of Athens, did Hadrian point to the stacked roofs-cum-pediments of the Propylaea on the Acropolis as a precedent of sorts that sanctioned his chosen solution?[88] All this may be speculation, but as the compromise hypothesis is refined in the light of the revised dating, the plausibility of the Pantheon as the focus of the quarrel between Apollodorus and Hadrian grows. In any event, it is Trajan who should take the credit as the patron of the project; Hadrian only finished it off.

Hadrian and Agrippa

The third and final text returns to where we began – the laconic Agrippa inscription dominating the frontal frieze of the portico: *M. Agrippa L. f. cos. tertium fecit* (**Pl. 13**). Of course, no one today takes this at face value, as Dio did. Nor is it to be interpreted as a faithful replication of any original inscription belonging to Agrippa's Pantheon. The formulation seems rather to be inconsistent with his own lifetime.[89] Most probably the inscription was a Hadrianic creation, purpose-made for the Pantheon that was completed in AD 125 or soon after.

What would be the motivation behind such a device? As already remarked, the *Historia Augusta* cites Hadrian setting up building inscriptions which accredit his forerunners, out of a show of modesty and respect.[90] This was a literary topos; Augustus is recorded as having made similar gestures in his *Res Gestae*.[91] However, as Mary Boatwright explores in this same volume, no comparable examples from the time of Hadrian have survived. Indeed the literary and epigraphical evidence do not march in tandem, and where inscriptions on restored buildings are known (including ones involving Hadrian), she shows that they typically 'highlight, not cover up, the actions of the re-builder'. Rather than manifesting a more general habit of Hadrian, did the Pantheon inscription alone, reinforced by the longstanding literary topos and associated propaganda, prompt the passage in the *Historia Augusta*? This prompts in turn a more radical question: was the official presentation of Hadrian's modesty a device to avoid taking ownership for the compromised portico?

It would be flippant to present this as a simplistic one-liner. As Boatwright shows, there are likely to be multiple subtle messages encapsulated in both the inscription as a whole, with its unusual size and form, and even its minor details (for example, the exact rendering of *tertium*). The thinking that went into such a prominent inscription was no doubt considered and nuanced. It is worth reflecting on the possibility that it was intended to complement or reflect the character of the front end of the Pantheon, and specifically overtones that took the visitor back to the time of Agrippa and Augustus. We have already seen that the basic conception of the imperial Pantheon was substantially determined by its Agrippan predecessor. Agrippa's portico must have been a no less monumental affair than the present one; in fact the columns along the front were set out on the same spacing. In praising the pedimental statues of Agrippa's Pantheon, Pliny the Elder gives the impression that their lofty position made them relatively unfamiliar or difficult to see.[92] The columns, then, were tall; might both porticoes have had the same height as well as the same rhythm? In other words the Hadrianic portico may well have replicated the general scale of Agrippa's if not also some of its key dimensions.[93] Yet since the time of Agrippa Roman audiences would have become used to displays of taller columns with tighter spacing in proportional terms (i.e. the ratio of the intercolumnation, or interval between columns, to their diameter). Both the temple of Mars Ultor and of Concordia had similar column spacings but 60ft tall columns with 50ft shafts, rather like the Pantheon should ideally have had. One of the consequences of the revised, lowered portico (as built) would arguably have been a faintly old-style or archaizing air conveyed by the relatively squat proportions. If Doris and Gottfried Gruben are right, the great bronze doors date originally from the Augustan period, later being adapted for the Pantheon (**Pl. 12**). This is an intriguing hypothesis, for it could explain why they do not fit the opening in the normal way, and the recourse to pilasters at the sides, and the fish-scale grille at the top.[94] As already mentioned, the installation could be attributed to a Severan intervention, but in the absence of firm evidence to this effect a Hadrianic date seems more likely. (One can only wonder further whether the lost bronze trusses and vaults harked back to the use of bronze in Agrippa's Pantheon; it is, after all, known to have had bronze capitals.[95]) The frieze reliefs with incense burners and swags that divide up the elevation of the transitional block also appear to be inspired by precedents of Augustan date.[96]

There are, then, indications to suggest that the Hadrianic portico had a character congenial to the statues of Agrippa and Augustus that Dio says stood in the entrance of the Pantheon he described, that is to say the actual Trajanic-Hadrianic one. The almost eclectic, revivalist, approach implicit in the retrofitting of the doors and in the Augustan-style reliefs does not obviously find a place within the formal and stylistic consistency of Apollodorus as discernible in the remains of Trajan's Forum and Baths (not to mention the Pantheon interior). The revivalist composition of the portico seems to reflect a predominant interest in programme and politics and a willingness to compromise for this sake, making it legitimate to wonder whether key decisions originated with Hadrian (perhaps via a delegate), then to be imposed on a reluctant Apollodorus.

Hadrian is an important figure in the history of architecture; the extraordinary architectural laboratory that is his villa at Tivoli is enough to ensure that.[97] But it happens that the most emblematic monument at the apogee of Roman achievements was not his. The character of the Pantheon was determined by Agrippa in the first instance and subsequently by Trajan and Apollodorus. The one part that might bear the imprint of Hadrian's thinking, the portico and transitional block, is the most problematic. Indeed, the 'sphinx of the Campus Martius' is far too

slippery a subject to be pinned down to a single explanation. The very function of the building, along with its status as a temple (or not), is notoriously ambiguous.[98] As for the portico, multiple overlapping intentions must have gone into a struggle to resolve a veritable crisis, and then the delicate dilemma presented by the need for an inscription. Perhaps Hadrian did not feel justified to claim a project he only completed – though such sentiment hardly stopped others and indeed himself elsewhere. Perhaps he felt disinclined to do so given the negative connotations that come with compromise. Perhaps it was politically expedient to affect a grand gesture of pious modesty in giving up his claim. All these considerations may have acted in concert. In any event, claim the Pantheon he did not.

Notes

1 On Roman architects see Donderer 1996; Anderson 1997; Wilson Jones 2000, ch.1, with bibliography on 246–7. On Greek architects, see Svenson-Evers 1996.

2 On the architects of the Parthenon see Barletta 2005, esp. 88–95. For introductions to Vitruvius and associated scholarship see Howe and Rowland 1996; Corso and Romano 1997; Wilson Jones 2000a, ch. 2; Gros 2006; Schofield and Tavernor 2009.

3 Key monographs on the Pantheon remain those of MacDonald (1976) and Licht (1968). For recent scholarship on the building see Lucchini 1996; Thomas 1997; La Rocca 1999; Virgili 1999; Ziolkowski 1999; Waddell 2008; Graßhoff *et al.* 2009; Marder and Wilson Jones forthcoming (with coverage of its post-antique history).

4 This inscription appears in the 15th-century writings of John Capgrave, see his *Ÿ Solace of* Pilgrimes; Fiore and Nesselrath 2005, 191.

5 This and other ancient sources relevant to the Pantheon are conveniently compiled, with translations, in Licht 1968, 180–4.

6 Buddensieg 1971; Marder 1989; Pasquali 1996, ch. 5 and 6; Wilson Jones 2000, 189–91.

7 Buddensieg 1971; Davies *et al.* 1987; Wilson Jones 2000, 199–202.

8 On the Renaissance interpretation of architecture using linguistic analogies, see Payne 2000, esp. 150. The metaphor was extended in the 18th century by figures such as Germain Boffrand and Quatremère de Quincy, going on to become widely accepted in 20th-century architectural history and criticism. See, for example, Summerson1963 and Jencks 1977.

9 Vasari, *The Lives of the Painters, Sculptors and Architects*, as translated by Hinds 1963, 275–6; Buddensieg 1971, 265.

10 For example, Palladio believed that Agrippa added the portico to a Republican rotunda, while Carlo Fontana imagined a simple masonry first phase, with both the portico and the columnar scheme of the interior being attributed to a later remodelling. See Palladio 1570, IV, 73; Fontana 1694, Book VII, 453 ff., esp. plates on p. 457 (interior) and 467 (exterior). Fontana was anticipated in some respects by Demontiosus, see Pasquali 1996, 12–14, fig. 6.

11 Beltrami 1898; Colini and Gismondi 1926.

12 Dio, 66.24.2; *Chronogr.* a. 354, 146 (Licht 1968, 182 for translations); Hieronymous a. Abr. 2105; cf. Suetonius, *Dom.* 5.1 and Boatwright's chapter here. For argumentation to the effect that the Domitianic works did not amount to a rebuilding, and were limited in scope, see La Rocca forthcoming. For arguments in favour of a Domitianic Pantheon see Ziolkowski 2009, esp. 34; cf. Broucke 2009.

13 Rice 2008a; 2008b.

14 Letter from Baccelli to the Ministro della Guerra, Mocenni, 7 September, 1897; Loerke 1982, 44; Williams forthcoming.

15 Cozzo 1928.

16 Guey 1936; Bloch 1947, esp. 14–26. For the rebuttal of Cozzo see also Beltrami 1929. For the consensus view in place until recently see Licht 1968, 185–90.

17 Waddell (2008) advances the following interpretive positions: a. that the Pantheon, aside from its rebuilt portico, dates after AD 118 (pp. 17–21); b. that Hadrian was possibly both patron and designer (pp. 23–5); c. that the portico was built at a later phase; d. that the whole edifice was transformed from a basilica to a temple in the Severan period, to when is assigned the portico rebuilt in its current form with a pediment as opposed to the attic or parapet hypothesized for the Hadrianic portico (pp. 124–38, esp. 136, point 5; 149–50).

18 With the institutional authority behind him of the Soprintendenza per i Beni Architettonici e per il Paesaggio di Roma, and so ultimately the Ministero per i Beni e le Attività Culturali, Belardi champions a variant on Palladio's, Fea's and Cozzo's ideas. According to Belardi (2006) the core of the existing rotunda dates to the time of Agrippa.

19 Beltrami 1898; 1929; La Rocca forthcoming.

20 Virgili and Battistelli 1999; Virgili 2009.

21 Lanciani 1892; see La Rocca forthcoming. For a graphic summary see Kähler 1970, Abb. 9.

22 Virgili and Battistelli 1999; Virgili 2009.

23 For simultaneous argumentation in favour of a northern orientation based on other grounds see Simpson 1997.

24 For further recent assessments (not all in unison) see Grüner 2004; the texts by Broucke, Grüner and Ziolkowski in Graßhoff *et al.* 2009; La Rocca forthcoming.

25 Loerke 1982; Coarelli 1983. See also Tortorici 1990.

26 Coarelli 1983.

27 Dio 53.27. For translation and commentary see Licht 1968, 180; Ziolkowski 2007, 468–70; 2009, 36; La Rocca forthcoming.

28 Will 1951; Coarelli 1983; Godfrey and Hemsoll 1986.

29 La Rocca forthcoming; McKenzie and Reyes 2013. For the anonymous text, which has been associated with Libanius, see [Libanius] *Ecphr.* 25; R. Foerster (ed.), *Libanii opera* VIII (Leipzig 1915) 529-31 = Ps. Nicolaus *Ecphr.* 8 (ed. Walz I 408.11-409.29). Edmund Thomas earlier made the connection between this *ekphrasis* and the Pantheon, but interpreted the location of the Tychaion to be in Antiochus on the Orontes, see Thomas 2004.

30 Kähler 1967, esp. 45; Marder 1989; Loerke 1990, esp. 30 ff.; Wilson Jones 2000, 191–6.

31 MacDonald 1976, 62–70; 1982, 113; Ward Perkins 1981, 111–12; Wilson Jones 2000, 202.

32 Davies *et al.* 1987; Wilson Jones 2000, ch. 10; forthcoming.

33 For the possibility that the emperor Hadrian was involved, or even responsible for the design of the Pantheon, see Brown 1964; MacDonald 1976, 11–12; Stierlin 1984; Boatwright 1987, 30–1; Gros 2002, 48–57; Martini 2009.

34 Rivoira 1921, 149–50; Vighi 1957, 11–12.

35 The idea has long been popular that Hadrian performed as an architect (see for example Rivoira 1909), with some recent affirmation: Ricotti 2000; 2001; Waddell 2008, 19, 23–5 (summarized in an earlier note here). For collected opinion and a more critical stance see Wilson Jones 2000, 24; Hetland forthcoming.

36 On Trajan's Baths see Licht 1974; Anderson 1985; Caruso and Volpe 1999;. On Trajan's Forum Packer 1997, 2001, 2003; Meneghini 2001; Claridge 2007.

37 Dio 69.4. On Apollodorus see Leon 1961; MacDonald 1965 (1982), 129–34; Heilmeyer 1975; Scagliarini Corlàita 1993; Anderson 1997, 59–64; La Regina 1999; Wilson Jones 2000, 21–4; Festa Farina *et al.* 2001.

38 La Regina 1999.

39 By referring his readers to Apollodorus' treatise Procopius kept his own mention brief (*De Aedificiis*, 4.6.11–16). For a fuller account see Dio, 68.13.1–6. Piers from the bridge still survive at Turnu-Severin in Romania (out of a probable total of twenty mentioned by Dio, as opposed to five shown on Trajan's Column for the sake of artistic efficacy). See Barcacila 1966; O'Connor 1993, 142–5; Coulston 2001, esp. 124–5.

40 Wilson Jones 2000, 22–3.

41 Following a hint by Bloch (1947, 116) the attribution of the Pantheon to Apollodorus was argued in depth by Heilmeyer (1975). See also Wilson Jones 2000, 192–3; Viscogliosi 2001, 158–9; Heene 2004. The focus of the forum, Trajan's Column, also bears comparison with the Pantheon as regards to some formal aspects of radial planning, see Martines 1989; forthcoming.

42 Wilson Jones 2000, 192–5.

43 Wilson Jones 2009, 75–81; forthcoming.
44 Martines forthcoming; Wilson Jones forthcoming.
45 Davies *et al.* 1987; Wilson Jones 2000, ch. 10. For shipwrecked cargoes of ancient marbles see Pensabene 2002, esp. 34–6. See also Amanda Claridge's chapter in the present volume.
46 On column proportions and standardized sizes see Wilson Jones 1989; 2000, 148, 155, 208, Appendix B; Barresi 2002; Pensabene 2002, 24–5.
47 The list of nine solecisms (Wilson Jones 2000, 203) has now been expanded to twelve, see Wilson Jones 2009; forthcoming.
48 Wilson Jones 2000, 203–6 (point viii); forthcoming.
49 Peña 1989, 131; Thomas 1997, 179–80; Ziolkowski 1999, 58; Taylor 2003, 129–32; 2004, esp. 244–54 (with a different proposal for the cause); Waddell 2008, esp. 135 (who accepts the change of column size, but thinks settlement lay at the root of further problems and his own proposal of a Severan rebuilding of the portico). For further references see Haselberger 2009 and Wilson Jones forthcoming.
50 For negative reception see Gruben and Gruben 1997, 72, n. 217; Tiberi 1998, esp. 14. For Tiberi the Propylaea to the Athenian acropolis constituted a precedent for the double pediment, a point taken up by Haselberger (2009, 182–3).
51 In November 2006 Haselberger presented his objections at the conference at the Karman Centre in Bern (see Haselberger 2009, esp. 181–4). For discussion and counter arguments see Wilson Jones forthcoming.
52 Haselberger 2009, 182.
53 Haselberger 2009, 172–3. Only the western corner represents the original condition (the eastern corner having been rebuilt in the 17th century).
54 Haselberger 2009, 174–8.
55 In response to the critique developed from observation of the lack of alignment between the fluting and capitals of the antae (Wilson Jones 2000, 203, point vi), Haselberger (2009, 174–8, fig. 3) notes comparable misalignment in the rotunda. However this is neither so acute nor so systematic as it is for the antae in the portico, i.e. for all of them. Haselberger's point about variable modillion spacing (pp. 176–7) is pertinent, but it does not vitiate my point about differential sizes (point iv).
56 Haselberger (2009, 181–3), is right to point out that there did exist ancient buildings with secondary or staggered pediments, as occurred at Mnesikles' Propylaia to the Athenian Acropolis and at the temple of Zeus Asklepios at Pergamon, built soon after the Pantheon. However see Wilson Jones 2009, 86, for a counter observation. It is also possible that the unusually steep rake and heavy proportions of the main pediment of the Pantheon could have been deliberately intended, though in my view they are best explained in terms of the hypothetical intended design.
57 Apart from the possible effect on some of the misfits Haselberger assembles, a rush to finish may be deduced from the absence of a remedy for the awkward lop-sided antae and capitals with extra portions of rough marble where the portico columnar system meets the transitional block (Wilson Jones 2000, 203–4 (point vi). A possible theoretical remedy would be to have added a requisite thickness of marble revetment to the faces of the transitional block between the antae. One reason for this not being carried out could be that the architrave built into the transitional block lacked the necessary projection to master any such revetment. Presumably forethought in this regard was lacking in the haste to proceed with the revised design.
58 Wilson Jones 2009, 75–81.
59 Hetland 2007, 101.
60 In this regard I am most grateful for the detailed observations of Cinzia Conti.
61 For evidence of settlement affecting the Pantheon, see Beltrami 1898; Virgili and Battistelli 1999; La Rocca forthcoming; Wilson Jones forthcoming.
62 Licht 1968, 157–71; Wilson Jones 2009, 72–5.
63 Wilson Jones 2009, 74, fig. 5. For a different interpretation, see Waddell 2008, ch. 13.
64 Heilmeyer 1975; Hetland 2007; forthcoming.
65 There are only five consular dated *in situ* stamps, of which four are Trajanic, one Hadrianic. Nineteen others can be defined within a relatively tight time frame by comparative analysis, all of them being Trajanic–late Trajanic (AD 100–17). As Hetland observes, the emergent pattern is a great preponderance of Trajanic examples (4 + 19, equalling 23), as against the one Hadrianic example dated to AD 123 that will be discussed further here.
66 Hetland 2007, by coincidence on pages 110–11.
67 Waddell (2008, 19) interprets the ubiquity of brickstamps dated to AD 123 thus: 'Considering that Hadrian was an architect, it is likely that an unusually large quantity of brick had been manufactured on his orders in anticipation of his return from his initial period of travel.' However this ubiquity more likely indicates simply that a higher proportion of bricks than usual were stamped in that year, and/or stamped with consular abbreviations.
68 A lag of a few months if not a year would have probably have been the norm, yet on occasions bricks may have been rushed to market, or conversely set aside for future usage. Note divergent views relating to Trajan's Markets, where Domitianic brickstamps have been interpreted to favour a Domitianic inception (Bianchi 2003, 349–52), or as stockpiled supplies consistent with a Trajanic date (Anderson 1985, 508; Lancaster 1995).
69 Lanciani 1892, 153; Bloch 1947, 107, 114.
70 Bloch 1947, 117. Cf. Licht 1968, 186; MacDonald and Pinto 1995, 17–19; Birley 1997, 189–91; Wilson Jones 2000, 177, 210–11.
71 DeLaine forthcoming.
72 Bianchi 2001, esp. Appendix II, 117–19; Hetland forthcoming.
73 The inscription (CIL VI 896 [2]) reads: *Imp. Caes. L. Septimius Sev[e]rus Pius Per[t]inax [Aug. Ar]abicus A[dia]b[e]nicus Parth[icu]s Ma[xim]us, pontif(ex) max(imus), [t]rib(unicia) pot[est](ate) X, imp(erator) XI, [c]o(n)s(ul) III, p(ater) p(atriae), [p]roco(n)s(ul) et / imp. Caes. M. Aurelius Anton[inus Pius Fe]lix Aug., [tri]b(unicia) potest(ate) V, co(n)s(ul), proco(n)s(ul), Pant[heu]m vetusta[te] corruptum cum omni cultu restituerunt.* For translation see Mary Boatwright's chapter in the present volume.
74 Gruben and Gruben 1997.
75 Waddell 2008, 136; DeLaine forthcoming.
76 The features in question are semi-circular projections of *c.* 30cm formed by the two relieving arches integral to the transitional block over the great niches. See Waddell 2008, fig. 15a for a photograph of one of these arches, though the projection is not visible; this is however indicated by shadowing in Leclère's survey (Waddell 2008, fig. 107), and in Wilson Jones forthcoming, fig. 17. See also Colini and Gismondi 1926.
77 Thomas and Witschel 1992, 136; see also Boatwright here, p. ••. Waddell's contention (see here n. 17) that the portico was rebuilt and modified in the Severan period as a response to settlement can be challenged on a number of grounds. One difficulty is accounting for the stepping forward of the entablature on the west flank [Pl. 2]. The blocks that incorporate this 'jog' span from the transitional block to the adjacent column of the portico, and so are integral to both structures; they cannot therefore be different in date unless one were to envisage an anastylosis of improbable fidelity. It is also inconsistent with differential settlement between the transitional block and the portico as a cause (Waddell 2008, esp. 126–7), for this implies that blocks like these, straddling as they do the junction, would have cracked. Alternatively such solecisms could have been created during the Severan rebuilding, which in that case must have contributed large portions of the portico (the antae and associated pilasters, the entablature blocks just mentioned). This implies a certain ineptitude, which seems at odds with the skill necessary to obtain a close match, in terms of both style and metrical coordination, with those Hadrianic members that were reused. Independently of these problems, Waddell's idea that the pediment we see today was created for the Severan project is problematic on three counts: firstly with Pliny's report that Agrippa's building had a pediment (*HN* 36, 38); secondly with the pediment featured in the working drawings inscribed in the pavement near the entrance of the Mausoleum of Augustus which Haselberger (1994) has connected to the 2nd-century Pantheon; thirdly with the presence of the secondary upper pediment on the transitional block. Why would this exist if the portico of the Trajanic/Hadrianic project only had an attic or parapet?
78 Peña 1989; cf. Ward Perkins 1992; Claridge 2007.
79 For contrasting opinion see Meneghini 2001; La Rocca 1999; Packer 2003; Claridge 2007 and her chapter in the present volume

(with further bibliography).
80 Claridge 2007, 94. See also Taylor 2003, 129–32; 2004, for another scenario involving diverted shafts.
81 Dio 69.4. Cf. MacDonald 1982, 131–2; Wilson Jones 2000, 23–4.
82 Brown 1964, 57; MacDonald 1982, 135.
83 Once again Dio (68.13.5–6) is the source.
84 *HA Hadrian* 19.12–13.
85 Strabo, 8.3.30.
86 Dio 53.27; cf. Wilson Jones 2000, 192–3, 212–13. Ziolkowski (2007, 473–4) objects to what amounts to a portrayal of Dio as a man easily taken in, with a poor grasp of historical context. Certainly there would be dangers in exaggerating this point, but it is not just a question of being misled by the inscription, which may or may not have been the case. Dio also appropriates the criticism of Phidias' statue, decontextualizing that too in the process.
87 Pliny, *Ep.*, 10.39–40 (for other instances see 10.37 and 10.51–2).
88 Wilson Jones 2009, 86.
89 Ziolkowski 2007, 466–8; 2009, 38–9; Simpson 2009. See now Boatwright's chapter here, and for background Thomas and Witschel 1992; Fagan 1996.
90 *HA Hadrian* 19.10.
91 See here Boatwright's chapter.
92 Pliny, *HN* 36, 38.
93 The material of the shafts of the original building is unfortunately unknown; presumably white marble was used, since this period seems too early for monoliths of Aswan granite, though the possibility cannot be ruled out categorically.
94 Gruben and Gruben 1997.
95 Pliny, *HN* 34, 13.
96 Broucke 2009, 28.
97 MacDonald 1993; Jacobson and Wilson Jones 1999.
98 Godfrey and Hemsoll 1986; Wilson Jones 2000, 179–80.

Bibliography

Anderson, J.C. 1985, 'The date of the *Thermae Traiani* and the topography of the *Oppius Mons*', *AJA* 89, 499–509.
Anderson, J.C. 1997, *Roman Architecture and Society*, Baltimore.
Barcacila, A. 1966, 'Les piliers du pont Trajan sur la rive gauche du Danube et la scène CI de Colonne Trajan', *Studi si Cercetari de Istorie Veche* 17, 645–63.
Barletta, B.A. 2005, 'The architecture and the architects of the classical Parthenon', in *The Parthenon from Antiquity to the Present*, ed. Jenifer Neils, Cambridge and New York, 67–99.
Barresi, P. 2002, 'Il ruolo delle colonne nel costo degli edifici pubblici', in *I marmi colorati della Roma imperiale*, eds Marilda De Nuccio and Lucrezia Ungaro, Rome, 69–81.
Belardi, G. (ed.) 2006, *Il Pantheon: storia, tecnica, e restauro*, Viterbo.
Beltrami, L. 1898, *Il Pantheon: La struttura organica della cupola e del sottostante tamburo*, Milan.
Beltrami, L. 1929, *Il Pantheon rivendicato ad Adriano 117–138 d.C.*, Milan.
Bianchi, E. 2001, 'I bolli laterizi del Foro di Traiano: il catalogo del Bloch e i rinvenimenti delle campagne di scavo 1991–1997 e 1998–2000', *BullComm* 102, 82–120.
Bianchi, E. 2003, 'I bolli laterizi dei Mercati Traiani', *Bullettino di archeologia cristiana* 104, 329–52.
Birley, A.R. 1997, *Hadrian: The Restless Emperor*, London and New York.
Bloch, H. 1947, *I bolli laterizi e la storia edilizia romana. Contributi all'archeologia e alla storia romana (1936–1938)*, Rome.
Boatwright, M.T. 1987, *Hadrian and the City of Rome*, Princeton.
Broucke, P. 2009, 'The first Pantheon: architecture and meaning (Abstract)', in Graßhoff *et al.* 2009, 27–8.
Brown, F.E. 1964, 'Hadrianic architecture', in *Essays in Memory of Karl Lehmann*, ed. L.F. Sandler, New York, 55–8.
Buddensieg, T. 1971, 'Criticism and praise of the Pantheon in the Middle Ages and the Renaissance', in *Classical Influences on European Culture A.D. 500–1500: Proceedings of an International Conference held at Kings College, Cambridge, April 1969*, ed. R.R. Bolgar, Cambridge, 259–67.
Capgrave, John, *Y Solace of Pilgrimes*, ed. D. Giosuè, Rome (1995).
Caruso, G. and Volpe, R. 1999, 'Thermae Traiani' in *LTUR* V, 67–9.
Claridge, A. 2007, 'Hadrian's lost Temple of Traian', *JRA* 20, 54–94.
Coarelli, F. 1983, 'Il Pantheon, l'apoteosi di Augusto e l'apoteosi di Romolo', *Cittá e architettura nella Roma imperiale, Analecta Romana Instituti Danici* 10, 41–6.
Coarelli, F. 1993, 'Caprae palus', in *LTUR*, I, 234.
Coarelli, F. 1997, *Il Campo Marzio: dalle origini alla fine della reppublica*, Rome.
Colini, A.M. and Gismondi, I. 1926, 'Contributo allo studio del Pantheon: La parte frontale dell'avancorpo e la data del portico', *BullComm* 44, 67–92.
Corso, A. and Romano, E. 1997, *Vitruvio. De Architectura* [trans. with commentary], 2 vols, Turin.
Cozzo, G. 1928, *Ingegneria Romana: maestranze romane; strutture preromane, strutture romane, le costruzioni dell' anfiteatro flavio, del Pantheon, dell' emissario del Fucino*, Rome.
Coulston, J. 2001, 'Transport and travel on the Column of Trajan', in *Travel and Geography in the Roman Empire*, eds C. Adams and R. Laurence, London, 106–37.
Davies, P., Hemsoll, D. and Wilson Jones, M. 1987, 'The Pantheon: triumph of Rome or triumph of compromise?', *Art History* 10, 133–53.
Delaine, J. forthcoming, 'The Pantheon builders: estimating manpower for construction', in Marder and Wilson Jones forthcoming.
Donderer, M. 1996, *Die Architekten der späten römischen Republik und der Kaiserzeit: epigraphische Zeugnisse*, Erlangen.
Fagan, G. 1996, 'Reliability of Roman rebuilding inscriptions', *Papers of the British School at Rome* 64, 81–93.
Fea, C. 1806, *L'Integrità del Pantheon rivendicata a Marco Agrippa*, Rome.
Festa Farina, F., Calcani, G. Meucci, C. and Conforto M. (eds), 2001. *Tra Damasco e Roma: l'architettura di Apollodoro nella cultura classica* (exh. cat.), Rome.
Paolo Fiore, F.P. and Nesselrath, A. 2005, *La Roma di Leon Battista Alberti: umanisti, architetti e artisti alla scoperta dell'antico nella città del Quattrocento*, Milan.
Fontana, C. 1694, *Templum Vaticanum et ipsius origo. Cum aedificiis maxime cospiquis antiquitus & recens ibidem constitutis…*, Rome.
Godfrey, P. and Hemsoll, D. 1986, 'The Pantheon: temple or rotunda?', *Pagan Gods and Shrines of the Roman Empire*, eds M. Henig and A. King, Oxford, 195–209 .
Graßhoff, G., Heinzelmann, M. and Wäfler, M. 2009, *The Pantheon in Rome. Contributions to the Conference*, Bern, November 9–12, Bern.
Gros, P. 2002, 'Hadrien architecte. Bilan des recherches récentes', *Hadrien empereur et architecte*, eds M. Mosser and H. Lavagne, Paris, 33–53.
Gros, P. 2006, *Vitruve et la tradition des traités d'Architecture. Fabrica et Ratiocinatio. Receuil d'études*, Rome.
Gruben, D. and Gruben, G. 1997, 'Die Türe des Pantheon', *Mitteilungen des Deutschen Archäologischen Instituts, Römische Abteilung* 104, 3–74.
Grüner, A. 2004, 'Das Pantheon und seine Vorbilder', *Mitteilungen des Deutschen Archäologischen Instituts, Römische Abteilung* 111, 495–512.
Guey, J. 1936, 'Devrai-on dire: Le Panthéon de Septime Sévère? A propos des estampilles sur briques recueillies dans ce monument, notamment en 1930 ou en 1931 et depuis', *Mélanges d'Archéologie et d'Histoire* 53, 198–249.
Haselberger, L. 1994, 'Ein Giebelriss der Vorhalle des Pantheon. Die Werkrisse vor dem Augustusmausoleum', *Römische Mitteilungen des Deutschen Archäologischen Instituts* 101, 279–308.
Haselberger, L. 2009, 'The Pantheon: nagging questions to no end', in Graßhoff *et al.* 2009, 171–86.
Heene, G. 2004, *Baustelle Pantheon: Plannung, Konstruktion, Logistik*, Düsseldorf.
Heilmeyer, W.-D. 1975, 'Apollodorus von Damaskus – der Architekt des Pantheon', *Jahrbuch des Deutschen Archäologischen Instituts, Römische Abetilung* 90, 316–47.
Hetland, L. 2007, 'Dating the Pantheon', *JRA* 20, 95–112.
Hetland, L. forthcoming, 'The date of the Pantheon', in Marder and Wilson Jones forthcoming.
Howe, T.N. and Rowland, I.D. 1999, *Vitruvius. Ten Books on Architecture* (Cambridge and New York).
Jacobson, D.M. and Wilson Jones, M. 1999, 'The annexe of the Temple of Venus at Baiae: an exercise in Roman geometrical planning', *JRA* 12, 57–71.
Jencks, C. 1977, *Language of Post-Modern Architecture*, London and New York.
Kähler, H. 1967, 'The Pantheon as sacral art', *Bucknell Review* 15, 41–8.
Kähler, H. 1970, *Der römische Tempel*, Berlin.
Lancaster, L. 1995, 'The date of Trajan's Markets: an assessment on

the light of some unpublished brick stamps', *Papers of the British School at Rome* 63, 25–44.
Lanciani, R. 1892, 'La controversia sul Pantheon', *BullComm* 20, 150–9.
La Regina, A. (ed.) 1999, *L'arte dell'assedio di Apollodoro di Damasco*, Rome.
La Rocca, E. 1999, 'Pantheon (fase pre-Adriana)', *LTUR* V, 280–3.
La Rocca, E. forthcoming, 'Agrippa's Pantheon and its origin', in Marder and Wilson Jones forthcoming.
Leon, C. 1961, *Apollodorus von Damaskus und die trajanische Architecktur*, Innsbruck.
Licht, K. de Fine 1968, *The Rotunda in Rome. A Study of Hadrian's Pantheon*, Copenhagen.
Licht, K. de Fine 1974, *Untersuchungen an den Trajansthermen zu Rom*, Copenhagen
Loerke, W.C. 1982, 'Georges Chedanne and the Pantheon: a Beaux Arts contribution to the history of Roman architecture', *Modulus* 4, 40–55.
Loerke, W.C. 1990, 'A rereading of the interior elevation of Hadrian's rotunda', *Journal of the Society of Architectural Historians* 49, 22–43.
LTUR = Lexicon Topographicum Urbis Romae, ed. E.M.Steinby, 6 vols, 1993–2000, Rome.
Lucchini, F. 1996, *Pantheon*, Rome.
MacDonald, W.L. 1965, *The Architecture of the Roman Empire*, New Haven (2nd rev. edn, New Haven, 1982).
MacDonald, W.L. 1976, *The Pantheon. Design, Meaning, and Progeny*, London 1976 (repr. 19821, 2002).
MacDonald, W.L. 1993, 'Hadrianic circles', *Journal of the Society of Architectural Historians* 43, 394–408.
MacDonald, W.L. and Pinto, J. 1995, *Hadrian's Villa and Its Legacy*, New Haven.
McKenzie, J. S. and A.T. Reyes 2013 'The Alexandrian Tychaion, a Pantheon?', *JRA* 26, 2013 (in press).
Marder, T.A. 1989, 'Bernini and Alexander VII: criticism and praise of the Pantheon in the seventeenth century', *Art Bulletin* 71, 628–45.
Marder, T.A. and Wilson Jones, M. (eds) forthcoming, *The Pantheon from Antiquity to the Present*, Cambridge and New York.
Martines, G. 1989, 'Argomenti di geometria antica a proposito della cupola del Pantheon', *Quaderni dell'Istituto di Storia dell'Architettura* 13, 3–10.
Martines, G. forthcoming, 'The conception and construction of drum and dome', in Marder and Wilson Jones forthcoming.
Martini, W. 2009, 'Das Pantheon Hadrians?', in Graßhoff *et al.* 2009, 139–43.
Meneghini, R. 2001, 'Il foro Traiano. Ricostruzione architettonica e analisti strutturale', *Römische Mitteilungen des Deutschen Archäologischen Instituts* 108, 245–68.
O'Connor, C. 1993, *Roman Bridges*, Cambridge.
Packer, J. 1997, *The Forum of Trajan in Rome: A Study of the Monuments*, Berkeley.
Packer, J. 2001, *Il Foro di Traiano a Roma: breve studio dei monumenti*, Rome.
Packer, J. 2003, 'Templum Divi Traiani Partici et Plotinae: a debate with R. Meneghini', *JRA* 16, 109–36.
Palladio, A. 1570, *I quattro libri dell'architettura*, Venice.
Pasquali, S. 1996, *Il Pantheon: architettura e antiquaria nel Settecento a Roma*, Modena.
Payne, A. 2000, '*Ut poesis architectura*: tectonics and poetics in architectural criticism circa 1570', in *Antiquity and its Interpreters*, eds Alina Payne, Ann Kuttner and Rebekah Smick, New York, 145–58.
Peña, T. 1989, '*P. Giss. 69*: evidence for the supplying of stone transport operations in Roman Egypt and the production of fifty-foot monolithic column shafts', *JRA* 2, 126–32.
Pensabene, P. 2002, 'Il fenomeno del marmo nel mondo romano', *I marmi colorati della Roma imperial* (exh. cat.) eds M. De Nuccio and L. Ungaro, Rome, 3–67.
Piranesi, F. 1790, *Seconda parte de'templij antichi che contiene il celebre Pantheon*, Rome.
Rice, L. 2008a, 'Urbano VIII e il dilemma del portico del Pantheon', *Bollettino d'arte* 143, 93–110.
Rice, L. 2008b, 'Bernini and the Pantheon bronze', in *Sankt Peter in Rom 1506–2006*, eds G. Satzinger and S. Schütze, Munich, 337–52.
Ricotti, E. Salza Prina 2000, 'Adriano – architetto, ingegnere e urbanista', *Adriano architettura e progetto*, Milan, 41–4.
Ricotti, E. Salza Prina 2001, *Villa Adriana: il sogno di un imperatore*, Rome.
Rivoira, G.T. 1909, 'Di Adriano architetto e dei monumenti Adrianei', *Rendiconti della Accademia dei Lincei* 18, fasc. 3, 171–7.
Rivoira, G.T. 1921, *Architettura romana*, Milan.
Scagliarini Corlàita, D. 1993, 'Per un catalogo delle opere di Apollodoro di Damasco, architetto di Traiano', *Ocnus – Quaderni della Scuola di Specializzazione in Archeologia* 1, 185–93.
Schofield, R. and Tavernor, R. 2009, *Vitruvius. On Architecture*, trans., with introduction, London.
Simpson, C.J. 1997, 'The northern orientation of Agrippa's Pantheon: additional considerations', *L'antiquité classique* 66, 169–76.
Simpson, C. 2009 'The Pantheon's inscription, CIL VI 896. Its date of composition, cultural context, and "message"', *Athenaeum* 97, 149–57.
Stierlin, H. 1984, *Hadrien et l'architecture romaine*, Fribourg.
Summerson, J. 1963, *Classical Language of Architecture*, London.
Svenson-Evers, H. 1996, *Die griechischen Architekten archaischer und klassicher Zeit*, Frankfurt.
Taylor, R. 2003, *Roman Builders*, Cambridge.
Taylor, R. 2004, 'Hadrian's Serapeum in Rome', *AJA* 108, 2, 223–66.
Thomas, E. and Witschel, E. 1992, 'Claim and reality of Roman rebuilding inscriptions from the Latin West', *Papers of the British School at Rome* 60, 135–77.
Thomas, E. 1997, 'The architectural history of the Pantheon in Rome from Agrippa to Septimus Severus via Hadrian', *Hephaistos* 15, 163–86.
Thomas, E. 2004, 'From the Pantheon of the Gods to the Pantheon of Rome', *Pantheons: Transformations of a Monumental Idea*, ed. Richard Wrigley, Aldershot, 11–34.
Tiberi, C. 1998, 'Saggio introduttivo', in G. Ortolani, *Il padiglione di Afrodite Cnidia a Villa Adriana: Progetto e significato*, Rome, 9–16.
Tortorici, E. 1990, 'L'attività edilizia di Agrippa a Roma', *Il bimillenario di Agrippa*, eds A. Ceresa-Gastaldo and M. Grant, Genoa, 19–55.
Vasari, G., *The Lives of the Painters, Sculptors and Architects* (trans. A.B. Hinds, ed. W. Gaunt, 1963), London and New York.
Vighi, R. 1957, *The Pantheon* (trans. J.B. Ward-Perkins), Rome.
Virgili, P. 1999, 'Pantheon: età adrianea', *LTUR* V, 284–5.
Virgili, P. 2009, 'Scavi in piazza della Rotonda e sulla fronte del Pantheon', in Graßhoff *et al.* 2009, 201–14.
Virgili, P. and Battistelli, P. 1999, 'Indagini in piazza della Rotonda e sulla fronte del Pantheon', *BullComm* 100, 377–94.
Viscogliosi, A. 2001, 'Il Pantheon e Apollodoro di Damasco', in Festa Farina *et al.* 2001, 156–61.
Waddell, G. 2008, *Creating the Pantheon: Design, Materials, and Construction*, Rome.
Ward-Perkins, J. 1981, *Roman Imperial Architecture*, London.
Ward Perkins, J. 1992, *Marble in Antiquity: Collected Papers of J.B. Ward Perkins*, eds H. Dodge and B. Ward Perkins, Rome.
Will, E. 1951, 'Dodekathéon et Panthéon', *Bulletin de Correspondance Hellénique* 75, 233–46.
Williams, R.B. forthcoming, 'A nineteenth-century monument for the state', in Marder and Wilson Jones forthcoming.
Wilson Jones 1989, 'Designing the Roman Corinthian Order', *JRA* 2, 35–69.
Wilson Jones, M. 2000, *Principles of Roman Architecture*, New Haven and London.
Wilson Jones, M. 2009, 'The Pantheon and the phasing of its construction', in Graßhoff *et al.* 2009, 69–87.
Wilson Jones, M. forthcoming, 'Building on adversity: the Pantheon and problems with its construction', in Marder and Wilson Jones forthcoming.
Ziolkowski, A. 1999, 'Pantheon', *LTUR* IV, 54–61.
Ziolkowski, A. 2007, 'Prolegomena to any future methaphysics on Agrippa's Pantheon', in *'Res bene gestae': Ricerche di storia urbana su Roma antica in onore di Eva Margareta Steinby*, eds A. Leone, D. Palombi and S. Walker, Rome, 465–75.
Ziolkowski, A. 2009, 'What did Agrippa's Pantheon look like? New answers to an old question', in Graßhoff *et al.* 2009, 29–39.