The Pantheon in Rome

Contributions

Pantheon 1

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Contributions to the Conference Bern, November 9–12, 2006

Pantheon I

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Preface

Gerd Graßhoff, Michael Heinzelmann, Markus Wäfler

The Bern Digital Pantheon Project was born out of an initiative of the Institutes of Archaeology and Philosophy and the Faculty of Humanities of the University of Bern. On the eve of a major reorganisation of the universities in Switzerland that goes beyond the Bologna Reform and before the University's two archaeological departments were merged into one institute, the research priorities for each of the University's faculties were re-evaluated. Many humanities subject areas have experienced changes in their research activities, particularly in the style of collaboration within their field and with external research groups. After the Faculty of Humanities had successfully invested in new data acquisition techniques for scanning large buildings (for example, the Hagia Sophia project undertaken by Volker Hoffmann of the Institute of Art History), it was decided that an additional pilot study should prepare the ground for directions in research and thereby help to integrate modern scientific methods into research work in the fields of the history of art, archaeology, the history of science and other humanities disciplines in collaboration with the natural sciences.

A group of internationally renowned academics who participated in the conference, «History of the Epistemology of Architecture», which was hosted by the Max Planck Institute for the History of Science in Berlin in May 2005, encouraged us to extend the Bern approach – and directed our attention to the Pantheon as a promising subject. Besides its important position in many disciplines in the humanities, a modern building survey of the Pantheon was lacking.

A number of areas would be studied in what would be new ground for the humanities: how to include complex digital data in research publications, making the data accessible with the policy of open access as well as keeping the data available and accessible for a long period. Such goals can only be pursued within a framework of close, interdisciplinary collaboration.

These aims were supported by favourable circumstances. In autumn 2005, the University of Bern opened the Karman Center for Advanced Studies in the Humanities in order to promote interdisciplinary research projects, including graduate studies. At the same time the directors of the Institute of Archaeology and the Institute of Philosophy, Markus Wäfler and Gerd Graßhoff, were joined by Michael Heinzelmann of the Department of Mediterranean Archaeology to embark on a common project at the Center. Teams from the two institutes were formed, and a first digitising campaign of the Pantheon successfully took place during the final weeks of that year.

The Bern Digital Pantheon Project was officially launched at an international conference that was held in November 2006 on the first anniversary of the new Institute of Archaeology and the inauguration of the Karman Center. Forty leading Pantheon experts accepted the

invitation to come together in the Swiss capital. Archaeologists, architectural historians, art historians, historians and engineers were thus able to present and discuss new observations in an exceptionally open and stimulating atmosphere. The conference resulted in an exciting reappraisal of hitherto accepted information, presented new approaches and laid new foundations on which further Pantheon research will be built. This volume documents, therefore, the current state of research on the Pantheon.

No project of this scale could have materialised without the help of a large number of people and institutions. The University gave generously to the founding of the institutions and the pilot project, and was strongly supported by the Faculty of Humanities. Oskar Kaelin, Ralph Rosenbauer and Nikolaos Theocharis joined the digitising team, with Nikolaos Theocharis in charge of extracting the data from the Bern Digital Pantheon Model. Katharina Schaffer and Werner Wirz were indispensable as they set up the infrastructure of the Karman Center. Bernd Kulawik, a new staff member of the Center, quickly became the key organiser of the conference. Jon Albers enlarged the scope of the project with his dissertation on an urbanistic analysis of the Campus Martius; his scrupulous assistance in preparing the editions was invaluable throughout the last hectic months of the project. Christian Berndt joined the team at a late stage to study the methodological issues of new complex forms of evidence in the humanities. Finally, Margareta Simons polished the English of a number of contributions and Thomas Hofmeier took up the difficult task of preparing the layout.

Contributions

Abb. 1: Pantheon. Ansicht von Norden (Foto M. Heinzelmann).

Das Pantheon in Rom und die Sprache seiner Architektur

Heiner Knell

Bekanntlich gehört das Pantheon in Rom (Abb. 1) zu den berühmtesten, am besten erhaltenen und am meisten besuchten, aber zugleich auch rätselhaftesten Bauten antiker Architektur. Berühmt wurde es vor allem wegen seiner einzigartigen Rotunde (Abb. 2), deren spektakuläre Kuppel mit einem, von keiner zweiten Kuppel der Weltgeschichte übertroffenen oder wenigstens erreichten Durchmesser von 43,40m den kreisrunden Saal der Rotunde überspannt. Da Kaiser Phokas im Jahr 609 n. Chr. dieses Gebäude dem Papst Bonifaz III. übereignet hatte und das Pantheon anschliessend in eine christliche Kirche umgewidmet wurde,[1] blieb es vor mutwilliger Zerstörung verschont und gehört deshalb bis zum heutigen Tag zu den am besten erhaltenen Bauten antiker Architektur überhaupt. Allerdings sind sein Sinn oder seine Bedeutung und deshalb auch seine Form nach wie vor etwas rätselhaft, zumal nur unzureichend bekannt ist, was ein Pantheon als solches und insbesondere in Rom bedeuten sollte oder konnte. Dies ist nicht zuletzt deshalb problematisch, weil im reichhaltigen Festkalender Roms kein Feiertag für ein Pantheon genannt und hierfür auch kein Kult bekannt ist. Ausserdem wurde bisher im baulichen Zusammenhang dieses Pantheons kein archäologischer Hinweis auf einen Altar oder dessen möglichen Standort gefunden. Zum anderen ist noch zu wenig von diesem *Bauwerk* bekannt, weil — unbeschadet zahlreicher, um nicht zu sagen zahlloser Einzelbetrachtungen[2] — eine vollständige, wissenschaftliche Bauuntersuchung seines Gesamtbestands nach wie vor zu den Desideraten der Forschung gehört. Deshalb ist z. B. auch die Datierung des Bauwerks noch nicht abschliessend geklärt, obwohl Stempel der bei seinem Bau verwendeten Ziegel Daten vom zweiten Jahrzehnt bis in die erste Hälfte des dritten Jahrzehnts des zweiten nachchristlichen Jahrhunderts und deshalb von spättrajanischer bis in hadrianische Zeit überliefern.[3] Zwar steht jetzt ein mit modernster Messtechnik erstellter, vollständiger und über das Internet abrufbarer Datensatz sämtlicher Masse des Pantheon zur Verfügung, doch ersetzt dies weder eine sorgfältige Bauuntersuchung,[4] noch hebt dies die Defizite unserer Kenntnis über die dem Gebäude selbst eigene Geschichte auf,[5] wie auch nach wie vor Fragen zu einer religionsgeschichtlichen oder politisch-historischen und ideologischen Bedeutung dieses Bauwerks nicht ausreichend beantwortet sind.[6]

1 Blaauw 1994.

2 Zusammengestellt von Adam Ziolkowski, in: Ziolkowski 1999.

3 Fine Licht 1968 und Boatwright 1987, S. 33 ff.

4 Deshalb ist die Publikation von Luca Beltrami, Il Pantheon = Beltrami 1898 nach wie vor unverzichtbar.

5 Hierzu zuletzt Thomas 1997, S. 54 ff.

6 Kienast 1980 geht solchen Fragen zwar nach, streift hierbei jedoch S. 398f. das Pantheon nur mit wenigen Worten.

Abb. 2: Pantheon. Innenansicht der Rotunde (Coarelli 2000, 285).

Trotzdem sind einige Fakten bekannt, die eingangs genannt sein sollen: Zu ihnen gehört, dass die Gesamtanlage dieses Pantheon — wie in einer isometrischen Rekonstruktion (Abb. 3) gut zu erkennen ist — aus einer mehrgliedrigen Anlage mit einem etwa 60m x 120m grossen Säulenhof, einer 35m langen sowie 16m breiten, quergerichteten Halle und einem eigentümlich sperrig eingefügten Zwischenelement besteht, an das sich schliesslich die in ihrem Aussendurchmesser 56m und in ihrem inneren Saaldurchmesser 43,40m grosse Rotunde anschliesst. Bekannt ist auch, dass dies nicht der erste Bau für ein Pantheon in Rom gewesen ist, weil bereits Agrippa, an den noch die Inschrift[7] im Frontgebälk der Vorhalle (Abb. 1) erinnert, in den Jahren zwischen 27 und 25 v. Chr. einen Bau für das Pantheon errichten liess. Wahrscheinlich durch Blitzeinschlag wurde dieser Bau im Jahr 110 n. Chr. so schwer beschädigt, dass anscheinend bereits Trajan nach 115 n. Chr. dessen Renovierung veranlasste und Hadrian jenen Neubau vollendete,[8] der allgemein als das Pantheon Roms berühmt wurde.

Damit dürfte klar sein, dass eigentlich viel zu wenig von diesem Pantheon und von seiner Architektur — von seiner Funktion und Bedeutung ganz zu schweigen — bekannt ist. Will man sich trotzdem mit diesem Gebäude beschäftigen, dann ist man wahrscheinlich gut beraten, wenn man es dabei belässt, das Gebäude in der Sprache seiner Architektur selbst sprechen zu lassen oder durch aufmerksames und geduldiges Betrachten zum Sprechen zu bringen, in dem alles, was mit blossem Auge zu sehen ist, ganz wörtlich ernst genommen wird.

Kommt man heute zu diesem Pantheon (Abb. 1), dann sieht man zuerst eigentlich nur die grosse tempelartige Fassade, deren mächtige Giebelfront den spontanen Eindruck so stark dominiert, dass man meinen könnte, man stehe hier vor dem Zitat der Stirnseite eines zwar monumentalen, aber trotzdem ziemlich normalen Tempels. Dabei ist ausser der in ihrer Sprachgewalt imponierenden Giebelfront von der großen Rotunde, die doch erst den Ruhm dieses Pantheon begründet, kaum etwas zu sehen und auf jeden Fall so gut wie nichts zu verstehen. Auch der Versuch, das ganze Gebäude zu umschreiten, um auf diese Weise den großen Baukörper besser wahrzunehmen, hilft hier nicht entscheidend weiter. Dies behindern heute vor allem — wie in einer Luftaufnahme gut zu erkennen ist (Abb. 4) — nachantike Bauten der direkten Umgebung. Offensichtlich sind sie dem Körper der Rotunde so dicht auf den Leib gerückt, dass keine Chance besteht, einen etwas grösseren Betrachterabstand zu erreichen, wie er für ein genaueres Studium der Bauformen zwingend notwendig wäre. Freilich ist diese Baudichte nicht erst das Ergebnis eines rücksichtslosen Umgangs späterer Zeiten mit Hinterlassenschaften einer älteren und vergangenen Zeit, weil die örtliche Situation ursprünglich auch nicht besser, sondern eher sogar noch bedrängender gewesen ist. Hierzu gehört, dass — wie ein Grundriss zeigt

7 CIL VI 896, 1.

8 SHA Hadrian 19. 10.

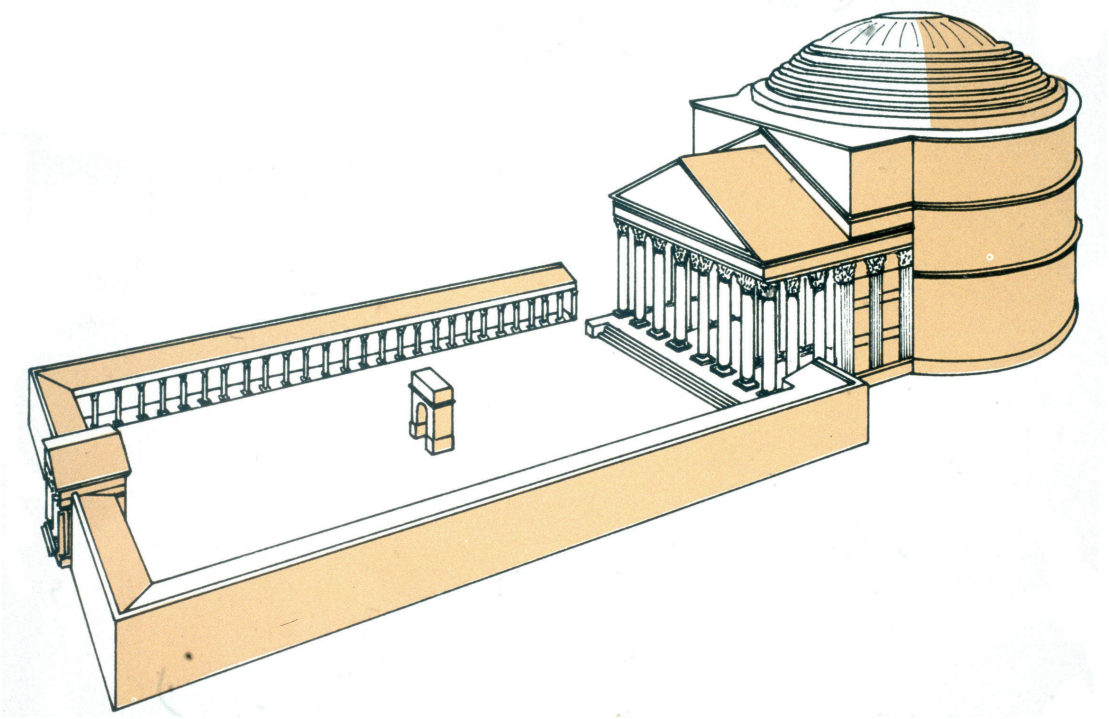

Abb. 3: Pantheon. Isometrische Darstellung der Gesamtanlage mit Vorplatz (Coarelli 2000, 283).

(Abb. 5) — der Bauplatz der Rotunde zumindest an drei Seiten so dicht von älteren Bauten eingefasst war, dass zwischen der Rotunde und diesen Bauten nicht einmal der Platz für einen engen Durchgang übrig blieb. Noch heute ist dies bei einem Blick entlang der Ostflanke des Pantheon gut zu erkennen (Abb. 6).

Da es somit beim Pantheon nahezu demonstrativ unterblieb, seinen Baukörper durch eine entsprechende Inszenierung wirkungsvoll in Szene zu setzen und offensichtlich — aus welchem Anlass auch immer — nichts dafür getan wurde, diesen in seiner Art einzigartigen Bau besser zur Wirkung kommen zu lassen, scheint auch dies als ein bewusst in Kauf genommenes, wenn nicht sogar erwünschtes Ergebnis des Bauvorgangs gewesen zu sein, das auf jeden Fall ernst genommen werden sollte. Diese Zurückhaltung gilt selbst für die Kuppel, deren äussere Gestalt lediglich als flache Kalotte und dabei ziemlich unzureichend wahrnehmbar ist (Abb. 1). Offensichtlich war sie mit ihrem Fuss und unteren Ansatz so tief in die Ringmauer der Rotunde eingedrungen, dass sie eher in ihr zu versinken scheint, als sie — wie etwa Michelangelos Kuppel von St. Peter — triumphal zu bekrönen. Statt dessen konzentriert sich der Blick des Besuchers ganz auf die mächtige Giebelfront der Vorhallenfassade. Mit seinen acht Säulen entspricht dieser Prospekt Tempelfronten, wie sie von hellenistischen Tempeln im Typus eines Dipteros mit doppelter Ringhalle zwar landläufig, aber bis zu dem gleichfalls unter Hadrian und etwas später als dieses Pantheon errichteten Tempel für Roma und Venus mit seiner nochmals gesteigerten dipteralen Anlage in Rom[9] nicht bekannt war. Dabei sind bereits die Säulen dieser Halle besonders bemerkenswert: Mit einem Durchmesser von 1,50m und einer Höhe von fast 15m beeindrukken sie zwar durch ihre Monumentalität, doch wird die Bedeutung ihres Formats von der Eigenart ihres Materials noch übertroffen. Dies betrifft vor allem die 12m hohen und pro Exemplar mehr als 60 Tonnen schweren, monolithischen Säulenschäfte aus dunklem Assuan-

9 Cassatella 1999.

Abb. 4: Luftaufnahme des Pantheon mit heutiger Umgebung (Postkarte).

granit. Wirkungsvoll kontrastieren sie mit den weißen Säulenbasen, Kapitellen und Gebälken aus wahrscheinlich in Luni gebrochenem Marmor. Offensichtlich waren den Initiatoren dieses Gebäudes keine Mühen zu gross, um es mit 16 Säulen auszustatten, deren Material aus den Steinbrüchen im fernen Assuan Ägyptens stammte und von dort über das Meer bis nach Rom transportiert werden musste. Dies signalisiert zumindest, dass es sich beim Bau dieser im Inneren eher dunklen Halle um ein in den Augen ihrer Auftraggeber besonders wichtiges und prestigeträchtiges Projekt gehandelt haben dürfte. Dem entspricht auch die besondere Aufmerksamkeit, die für den Entwurf der Vorhallenfassade nachgewiesen werden konnte.[10] Trotzdem bleiben Funktion und Bedeutung dieser Halle unbekannt. Dies gilt gleichfalls für Sinn oder Nutzen des eigentümlich sperrigen, fast schrankartigen Gebäudetrakts, der direkt an diese Halle anschliesst (Abb. 7) und zugleich zur Rotunde überleitet. Zwar ist er nach Aussage von datierenden Ziegeln gleichzeitig mit der Rotunde errichtet worden, wird damit jedoch einschliesslich der wie eine Applikation seiner Stirnseite vorgeblendeten Form eines Giebeldreiecks noch längst nicht besser verständlich.

Umso überraschender ist es, wenn nach dieser ziemlich dunklen Vorhalle wie von einem Schritt auf den anderen der weit gedehnte und von der einzigartigen Kuppel überwölbte Raum der Rotunde (Abb. 2) erreicht wird. Dabei ist es nicht etwa ein besonders helles Licht, das unvorbereitet blendet, sondern die unmittelbar wirksame Realität dieser Architektur, die selbst verwöhnten Besuchern noch den Atem nehmen kann.

Natürlich ist es die in ihrer Art und Grösse weltweit einmalige Kuppel mit ihrer, im oberen Zenit knapp 9m weiten und zugleich einzigen Lichtquelle dieses Raums,[11] die den Blick zuerst an sich zieht. Im Inneren entspricht die Form ihrer Kalotte einer nach unten offenen

10 Haselberger 1995b.

11 Heilmeyer 1990.

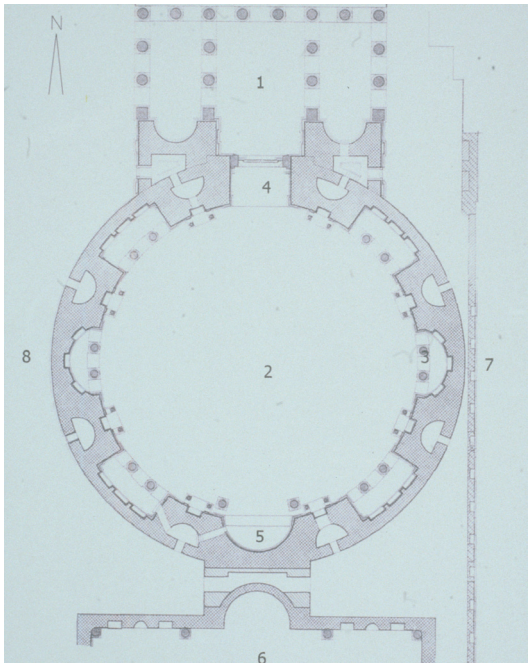

Abb. 5: Pantheon. Grundriss mit Resten der Nachbarbebauung.

Halbkugel. Dabei zitiert ihre Höhe den Radius ihres Grundkreises (Abb. 5), der seinerseits und wie in einer von dem festlich geschmückten Fussboden nach oben projizierten Antwort den Radius der Saalrotunde wiederholt. Ein solcher Bodenbelag könnte mit seinen unterschiedlichen Marmorsorten aus verschiedenen Gegenden des Imperiums wie in einer imperialen Geste nach damaligem Verständnis[12] auch auf die Grösse des römischen Reichs verweisen. Unbeschadet einer solchen Metapher schmückt das Innere der Kuppel ein streng geordneter Kassettendekor (Abb. 8), dessen einzelne Glieder entsprechend der Geometrie dieser Kuppelschale nach oben zunehmend kleiner werden.[13] Zugleich sind die inneren Leisten der einzelnen Kassetten schräg so angeschnitten, dass der Eindruck von einer vermeintlichen Perspektive oder optischen Verkürzung entstehen konnte, der die Kuppel noch höher erscheinen liess als sie tatsächlich schon war. Dabei lagert die Kuppel mit ihrem

Abb. 6: Lücke zwischen der Rotunde des Pantheon und der Westflanke der Saepta Iulia (Foto J. Zbinden).

Fuss anscheinend auf dem oberen Abschluss der umlaufenden Saalwand, deren Höhe mit 21,72m das Radiusmass des Fussbodenkreises wiederholt. Aus diesen im Prinzip sehr einfachen Verhältnissen folgt, dass dem Innenraum der Rotunde sowohl im Grundriss (Abb. 5) als auch im Höhenschnitt (Abb. 9) ein jeweils gleich grosser Kreis und deshalb dem Raum insgesamt eine Kugel — die für die Geometrie der Alten Welt seit Platon vollkommenste Figur überhaupt — einbeschrieben ist. Zwar folgt der heutige Zustand nicht lückenlos diesem Ideal, weil ein vertikal einbeschriebener Kreis den Fussboden nicht lediglich tangiert, sondern knapp durchschneidet, da der Fussboden aus unbekannten Gründen leicht aufgewölbt ist,[14] doch ist kaum zu bezweifeln, dass für den Entwurf dieses Rundsaals eine diesem Innenraum einbeschriebene Kugel massgeblich war. Deshalb geht dieser besondere Raum auf keine hintergründige Idee oder ein unbekannt gebliebenes Geheimnis zurück, sondern ist in der sehr rationalen Sprache dieser Architektur und zu Gunsten eines idealen Zentralraums das Ergebnis einer leicht verständlichen und unmittelbar nachvollziehbaren Entwurfsentscheidung.

Darüber hinaus ist die Konstruktion der überaus grossen Kuppel das zu recht nach wie vor am meisten bewunderte und diskutierte Thema dieses Bauwerks.[15] Hierzu gehört zuerst das tragende System der Rotunde. Es zeichnet sich

12 Statius, Silvae 4. 2.
13 Martines 1991.
14 Pelletti 1989.
15 Mack 1989.

Abb. 7: Pantheon. Blick von Nordwest auf den oberen Abschluss der angeschnittenen Nordwestecke des Zwischentrakts (Foto M. Heinzelmann).

im Grundriss (Abb. 5) als ein Achteck aus massiv aufgemauerten, ca. 6m starken Pfeilern ab, die aussen von einer kreisförmigen Ringmauer eingefasst werden, während ihre Abstände als Exedren genutzt worden sind, denen innen in der Regel anspruchsvolle Architekturprospekte vorgeblendet wurden. Über diesem konstruktiven Traggerüst entwickelt sich der weitere Aufbau, der zur Rotunde überleitet. Allerdings ist diese Kuppel keineswegs nur das Ergebnis eines den Rundsaal vollständig und frei überspannenden Gewölbes, weil die beiden unteren Kassettenreihen der Kuppel (Abb. 10) nicht zur Innenhaut der Gewölbeschale, sondern noch zur Innenwand der Ringmauer gehören, die das wirkliche Gewölbe trägt.[16]
Hierzu ist in einem Schnitt durch die Ringmauer der Rotunde gut zu erkennen (Abb. 11), dass diese Ringmauer, auf der das Gewölbe lagert, fast 9m höher ist als die Innenwand des Rundsaals. Deshalb entspricht der obere Abschluss dieser Wand zwar dem Anfang des Kuppelanstiegs, jedoch nicht zugleich dem Beginn des Gewölbes. Offensichtlich bedienten sich die Bauleute hierbei einer Methode, die angesichts dieser Kuppel den Eindruck von einem grösseren Gewölbe evozierte, als dies seiner baulichen und konstruktiven Realität tatsächlich entsprach. Dass die Kuppel trotzdem schon immer faszinierte und sogar zu einem Vergleich mit dem Himmlesgewölbe Anlass war,[17] hat zu mancherlei Interpretationen geführt, ohne dass deren Schlussfolgerungen immer nachvollziehbar sind.[18]
Zusätzlich zur Kuppel definiert vor allem die umlaufende Saalwand mit den architektonisch ausgestatteten Fassaden ihrer Exedren den Raumeindruck dieser Rotunde (Abb. 2). Dabei fassen Eckpilaster jeden Nischeneingang ein. Zwischen diesen Pilastern stehen jeweils zwei korinthische Säulen, die gemeinsam mit den Pilastern ein vollständiges Gebälk üblicher Art tragen. Architekturprospekte dieser Art (Abb. 12) sind hauptsächlich von äusseren Frontfassaden kleinerer Bauten im Typus eines Antentempels bekannt, gehörten jedoch eigentlich nicht zum üblichen Repertoire einer dekorativen Raumausstattung. Im Pantheonsaal wurde lediglich bei der Nische, die in der Mitte der Südseite und damit genau gegenüber des Eingangs in die Rotunde liegt (Abb. 13), auf einen solchen Architekturprospekt verzichtet. Statt dessen öffnet sich diese Nische einschliesslich ihres Deckengewölbes in ganzer Breite zum Saal. Anscheinend kennzeichnet diese Sonderform, welche zugleich das Ziel einer Fluchtachse bildet, die den ganzen Saal vom Eingang bis zum Zenit dieses Apsisbogens durchschneidet, damit die offene Südnische als einen besonderen Raum. Fragt man nach einer Begründung für diese exklusive Ausnahme, dann kann nur auf jene Schriftquelle hingewiesen werden,[19] nach der sich Hadrian in diesem Pantheon mit dem Senat beraten oder dort auch Gericht gehalten hat. Vielleicht kann man seinen bei solchen Gelegen-

16 Hierzu siehe Gerkan 1929, S. 277.

17 Cassius Dio 53. 27, 2.

18 Dies gilt vor allem für Deutungsversuche, wie sie zuletzt von Gert Sperling (Sperling 1999) oder auch von Lambert Rosenbusch (Rosenbusch 2002) veröffentlicht worden sind.

19 Cassius Dio 69. 7, 1.

Abb. 8: Pantheon. Blick in die mit Kassetten ausgestattete Kuppel (Foto J. Zbinden).

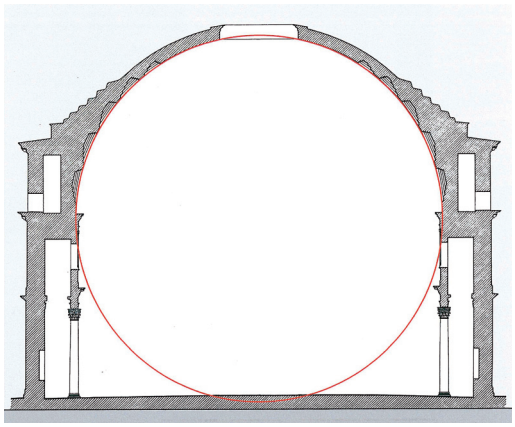

Abb. 9: Pantheon. Schnitt durch die Rotunde mit Innenkreis, der den Boden schneidet (N. Pelletti).

heiten eingenommenen Platz in dieser Apsis vermuten, zumal es im gesamten Pantheon keinen prominenteren Platz für den Kaiser gegeben hätte.

Zu den besonderen Eigenarten dieser Rotunde gehört schliesslich auch die Attikazone der Innenwand (Abb. 2), die den Saalraum im Inneren wie eine breite Binde umgürtet. Zwar stammt ihr heutiger Wanddekor nahezu vollständig von einer im 18. Jahrhundert ausgeführten Neuausstattung, doch blieb von ihrer ursprünglichen Form immerhin noch so viel erkennbar, dass wenigstens eine Sequenz wieder in ihren ursprünglichen Zustand zurückversetzt werden konnte (Abb. 14). An ihr erkennt man, dass sie anscheinend aus richtigen Fenstern besteht, mit denen der Eindruck entsteht, man könne durch sie wie von aussen in das Innere eines anderen Gebäudes blicken. Zugleich fällt auf, dass zu diesen Fenstern oben nach aussen vorspringende Rahmenleisten gehören, wie sie an der Aussenseite von Fenstern als Witterungsschutz gegen Regen ebenso üblich, wie an ihren Innenseiten unnötig waren und deshalb dort auch nicht verwendet worden sind. Angesichts dieser Fenster in der Attika der Saalwand könnte sich bei Betrachtern die irritierende Frage gestellt haben, ob man hier mitten im Pantheon nicht zugleich auch ausserhalb und vor einem anderen Gebäude steht, auf dessen Fenster man blickt. Zu ähnlichen Effekten trug in bestimmten Situationen auch das Sonnenlicht bei. Dies vor allem dann, wenn die Sonne (Abb. 15) von oben durch das Opaion wie von aussen direkt auf eines dieser Fenster traf und von dort in den dahinter liegenden Raum mit der darunter liegenden Nische geführt wurde. Auch dadurch konnte für den Besucher der Eindruck entstehen, man stehe hier vor einem anderen Gebäude, in dessen Inneres man, vom Sonnenlicht begleitet, hineinblickt.

Für die durch die Exedraprospekte und die in die Attika eingefügten Fenster thematisierte Frage nach dem mit architektonischen Formen zum Ausdruck gebrachten Verhältnis zwischen innen und aussen ist nicht zuletzt auch die grosse Portaltür von Interesse (Abb. 16). Steht man in der Vorhalle und blickt auf die Tür, dann wird deutlich, dass ihr Rahmen oben wie üblich in einem aufwendig ausgestatteten und kräftig ausladenden Türsturz, dem sogenannten Hyperthyron endet. Allerdings ist in diesem Fall auch die Innenseite der Tür mit einem solchen Hyperthyron ausgestattet (Abb. 17).[20] Da — ähnlich wie bei den Fenstern — eine solche Massnahme als Wetterschutz nur an der Aussenseite einer Tür sinnvoll ist, gehört sie bei antiken Bauten auch stets zur Aussenseite einer Tür, aber — ausser beim Pantheon — niemals zur Ausstattung ihrer Innenseite. Nimmt man auch die-

20 Gruben 1997, S. 3 ff., S. 54 f.

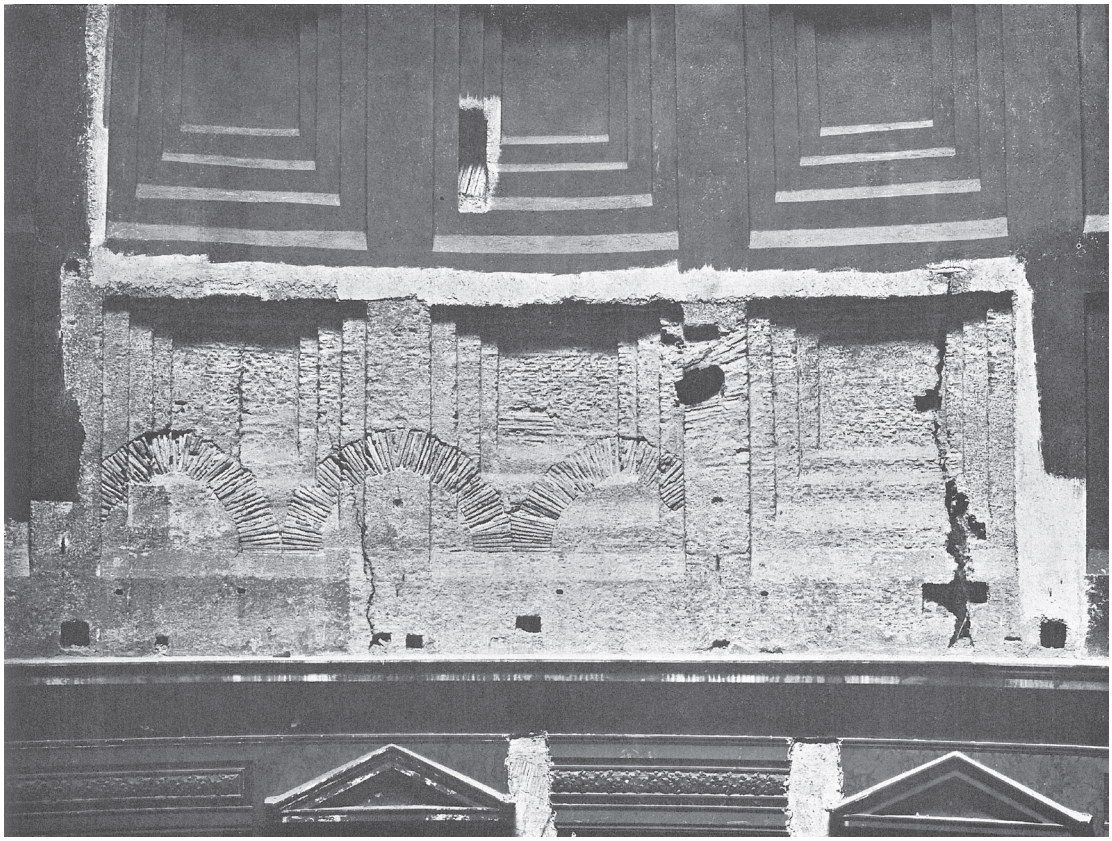

Abb. 10: Pantheon. Freigelegte, mit Ziegeln gemauerte Kassetten des unteren Kassettenrings der Kuppel (Foto Sopr. Lazio 9804).

sen Befund ganz wörtlich zur Kenntnis und versteht ihn als Teil einer Architektursprache, in der einzelne Bauglieder die Vokabeln sind und ihr Zusammenhang einer Syntax entspricht, dann besitzt die Pantheontür eigentlich zwei Aussenseiten, aber keine wirkliche Innenseite.

Sollte dies nicht nur als ein unverständliches Unikat der antiken Architekturgeschichte unkommentiert hingenommen werden, ergeben sich Fragen, die das Pantheon in seiner heutigen Gestalt nicht ohne weiteres klären lässt. Dies betrifft zuerst den Zustand des Bauplatzes bevor dieser spektakuläre Neubau errichtet worden ist. Hierzu ist bekannt, dass an dieser Stelle eine hofartige, ca. 60m x 60m große Fläche vorhanden war (Abb. 18), die von drei, im rechten Winkel zu einander stehenden Bauten eingefasst wurde. Im Südosten dieser Fläche wurde bei archäologischen Untersuchungen[21] u.a. ein gebogen verlaufender, etwa 15m langer Mauerrest gefunden (4 in Abb. 18). Dabei fällt auf, dass sich dieses Fragment angesichts seiner Krümmung zu einem Kreis ergänzen lässt, dessen Grösse fast genau dem Aussendurchmesser der Pantheonrotunde entspricht. Da der obere Abschluss dieser Mauer zeigt, dass sie keinen weiteren Aufbau getragen haben kann, müsste sie zu einer runden Hofeinfassung gehört haben.

Im Süden stand direkt hinter dieser Hoffläche ein von Ost nach West verlaufender Hallenbau (2 in Abb. 18). Wahrscheinlich handelte sich hierbei um jene Basilica, die Agrippa nach der berühmten Schlacht bei Actium dem Meeresgott Neptun als Dankgeschenk für dessen Unterstützung gewidmet hatte.[22] Demnach

21 Gruben 1997, S. 57.
22 Cassius Dio 53. 27, 1.

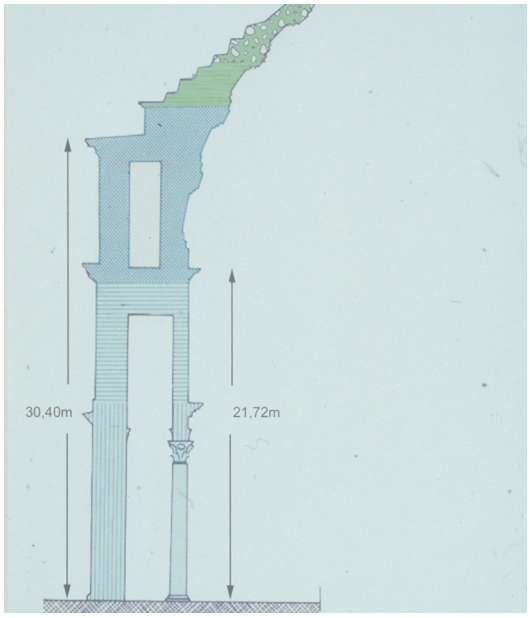

Abb. 11: Pantheon. Schnitt durch die Ostmauer der Rotunde mit innerem und äusserem Höhenmass (D. Boussios).

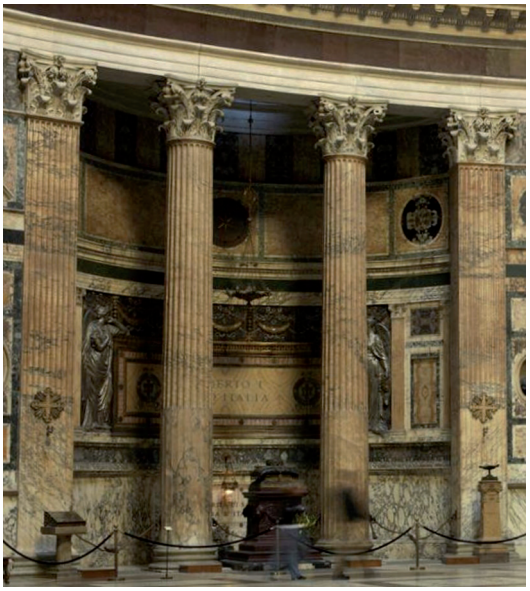

Abb. 12: Pantheon. Ansicht eine Exedraprospekts (Foto J. Zbinden).

war dies ein dem Gott übereignetes Bauwerk, das nicht zuletzt und aus der Sicht römischer Kaiser zugleich an jenes epochale Ereignis erinnerte, durch das die Herrschaft des Augustus und damit der Beginn der römischen Kaiserzeit besiegelt war, und ist es gut verständlich, dass Hadrian auch dieses Gebäude gründlich renovierte.[23] Östlich schloss sich hieran im rechten Winkel die einst ca. 120m x 400m grosse Anlage der bereits von Caesar gegründeten und anschliessend von Agrippa im Auftrag des Augustus vollendeten Saepta Iulia an,[24] von der noch Teile ihrer Westflanke sichtbar sind (3 in Abb. 18).[25] Da sich hier die wehrfähigen Männer Roms versammelten, um bestimmte Wahlen durchzuführen, war dies ein für das Marsfeld passendes und äusserst wichtiges Staatsgebäude von hohem Rang, das gleichfalls von Hadrian erneuert worden ist,[26] nachdem seine Anlage in flavischer Zeit zweckentfremdet auch als Warenhaus genutzt worden war.

23 SHA Hadrian 19.10.
24 Cassius Dio 53. 23.
25 Gatti 1937.
26 SHA Hadrian 19, 9 ff.

Schliesslich stand an der Nordseite dieses Hofquartiers und damit in direktem Gegenüber zur Basilica Neptuns jener Hallenbau (1 in Abb. 18), der zu dem bereits gleichfalls von Agrippa in Rom gegründeten Pantheon gehörte. Von diesem Hallenbau ist zwar lediglich sein 21m x 43,70m grosses Fundament gefunden worden, das direkt unter der heutigen Vorhalle der Pantheonrotunde liegt, doch ist damit zumindest der Standort des ursprünglichen Pantheons bekannt und zugleich geklärt, dass mit dem von Trajan begonnenen und von Hadrian vollendeten Pantheon eine für Rom traditionsreiche Stätte wieder in Stand gesetzt und reaktiviert worden ist. Zugleich reichten die Funde aus, um zumindest typologisch ein grundsätzlich zutreffendes Bild von diesem Hallenbau Agrippas zu gewinnen.[27] Hiernach ist klar, dass er sich wie sein Nachfolger in einer Säulenfront nach Norden öffnete und an der Rückfront eine grosse Tür besass, die von dieser Halle in den rückwärtigen Bereich und Hof zwischen den anderen Bauten führte. Dabei ist die Tür selbst (Abb. 16) ein eigenes

27 La Rocca 1999.

Abb. 13: Pantheon. Ansicht der offenen Südapsis (Foto J. Albers).

und sehr erstaunliches Thema,[28] weil sie beim Neubau einschliesslich ihrer schweren Schwelle wie eine architektonische Reliquie wiederverwendet und hierbei fast an derselben Stelle, wenngleich in einem neuen und prunkvolleren Portalrahmen, wieder aufgebaut wurde. Ausserdem erklärt dieser Befund, dass auch schon der Bau Agrippas eine sehr repräsentative Tür besass, die gleichfalls an der südlichen Rückseite aus dem Bau herausführte. Deshalb kann die Situation, zu der diese Tür führte, nicht völlig belanglos gewesen sein, und es liegt nahe, dass die Stelle, an der später die Rotunde mit ihrer grossen Kuppel errichtet wurde, bereits zuvor im Zusammenhang mit dem Pantheon Agrippas ein wichtiger Ort gewesen ist. Dabei muss das eigentümliche Beieinander der runden oder kreisförmgen Anlage mit einem rechtwinkelig angelegen Gebäude nicht erstaunen, nachdem neuerdings gezeigt werden konnte, dass eine solche Kombination im zeitlichen und geographischen Kontext Italiens durchaus bekannt gewesen ist.[29] Zwar ist nicht mehr eindeutig festzustellen, welche Funktion hiermit ursprünglich verbunden war, doch steht fest, dass der heutige Standort der Rotunde bereits zuvor und von Anfang an zur Stätte der Verehrung eines Pantheon gehörte. Jedoch bleibt trotzdem ungewiss, wo in diesem ersten Pantheon Roms die Götterbilder aufgestellt waren, von denen eine Schriftquelle berichtet,[30] dass zu ihnen Statuen des Mars, der Venus und des Divus Iulius[31] gehörten. Dabei muss es kein Zufall sein, dass diese Göttergruppe wie in einem Vorgriff auf ein später realisiertes Bildprogramm jener Trias entspricht, die als Kultbildgruppe im Tempel des 2 v. Chr. eingeweihten Augustusforums als Bestandteil der Prinzipatsideologie auf die göttliche Herkunft Roms und des iulischen Hauses verweist.[32]

Allerdings blieb es beim trajanisch-hadrianischen Wiederaufbau — wie ein Blick in die Rotunde belegt (Abb. 2) — nicht nur bei einer fällig gewordenen Reparaturmassnahme. Vielmehr wurde durch die Rotunde ein Saalbau mit dem Pantheon verbunden, der in seiner besonderen Eigenart ebenso einmalig wie ungewöhnlich war. Daraus folgt, dass sich die Interessen der Initiatoren dieses Neubaus zwar auf eine notwendig gewordene Erneuerung konzentrierten, dies aber zugleich zum Anlass nahmen, sie durch den Kuppelbau mit einer wahrhaft kaiserlichen Architektur zu verbinden, wie sie die Welt noch nie zuvor gesehen hatte. Umso mehr fällt die Zurückhaltung auf, mit der der Baukörper der Rotunde eher versteckt als stolz präsentiert worden ist. Offensichtlich ist die neue Rotunde nahezu passgenau in die Fläche zwischen den älteren Bauten eingefügt, um nicht zu sagen, eingezwängt worden (Abb. 19). Deshalb hatte der monumentale Baukörper bereits von Anfang an und zu keiner Zeit eine echte Chance, mit seinem gewaltigen Volumen tatsächlich zur

28 Gruben 1997.

29 Grüner 2004.
30 Cassius Dio 53. 27, 2–3.
31 Fishwick 1992.
32 Zanker 1970, S. 20 f.

Wirkung zu kommen. Statt dessen wurde das neue Pantheon an dieser Stelle zum Bestandteil eines grösseren Zusammenhangs, in den die mächtige Rotunde fast bis zur eigenen Unkenntlichkeit integriert worden ist. Nimmt man auch dies im Sinne einer Sprache dieser Architektur ganz wörtlich zur Kenntnis, dann war es anscheinend selbst für diese spektakuläre und einzigartige Rotunde wichtiger, wie ein Implantat zu einem älteren baulichen und inhaltlichen Kontext zu gehören, als sich nur selbst zur Schau zu stellen.

Auch bei der Innenausstattung der Rotunde (Abb. 2) könnten Erinnerungen an ältere Situationen ein wichtiges Thema gewesen sein, wenngleich dies die eindrucksvolle Gestalt des Neubaus auf einen ersten Blick kaum verrät. Dem entspricht, dass im Saal der Rotunde sowohl vor den Exedren als auch mit Blick auf die in die Attika eingefügten Fenster und ebenso angesichts der mit einem Hyperthyron ausgestatteten Innenseite der Portaltür, vor allem aber unter dem weit gegen den offenen Himmel weisenden Opaion der Eindruck entstehen könnte, man befände sich hier immer noch in einem von anderen Bauten umgebenen Hofbereich. Einer Erinnerung an ältere Situationen und einer damit verbundenen Tradition entspricht vor allem die grosse Architravinschrift (Abb. 1), mit der in einem Text, der etwa 150 Jahre älter ist als seine Schriftform, deutlich betont wird, dies sei nach wie vor das von Agrippa errichtete Pantheon. Deshalb war auch der Neubau rein rechtlich gesehen eigentlich nicht mehr als der nach einer Naturkatastrophe notwendig gewordene Wiederaufbau[33] des ramponierten Pantheon augusteischer Zeit.

Trotzdem war der Neubau mit seinem ganz besonderen Innenraum (Abb. 2) ein unvergleichliches Exempel. Allerdings könnte gerade mit einer ihm beigegebenen Anspielung auf den einstigen Platz hinter dem ursprünglichen Hallenbau und einer dabei zugleich inszenierten Überspielung des in dieser Art neuen

Abb. 14: Pantheon. «Fenstersequenz» aus der Attika der Rotunde (Foto J. Zbinden).

und für manchen Betrachter vielleicht auch befremdlichen Kuppelsaals durch eine Verbindung von Tradition und neuer Realität ein Schlüssel zu einem Verständnis der nach wie vor einzigartigen Raumschöpfung dieser wahrhaft kaiserlichen Architektur liegen. Dass dies zugleich die Frage nach dem hierfür verantwortlichen Architekten aufwirft, ist zwar verständlich, aber kaum schlüssig zu beantworten. Dabei wird der genialische Entwurf vor allem mit Apollodor von Damaskus, dem Staatsarchitekten Trajans in Verbindung gebracht.[34] für dessen Autorenschaft auch bestimmte Stilmerkmale sprechen könnten,[35] doch steht dem das schwere Zerwürfnis zwischen diesem Architekten und Hadrian[36] entgegen.

Unbeantwortet ist darüber hinaus auch die Frage nach Funktion und Bedeutung eines der griechischen Sprache entlehnten Begriffs ‚Pantheon', der in Rom keineswegs heimisch, aber durch den Bau Agrippas und nochmals durch den von Hadrian vollendeten Neubau etabliert wurde. Wie fremd ein Pantheon für Rom gewesen zu sein scheint, könnte auch der Umstand zeigen, dass die frühesten Quellen, die für Rom ein Pan-

33 SHA Hadrian 19. 10.

34 Viscogliosi 2001.
35 Heilmeyer 1975.
36 Cassius Dio 69. 4, 1 ff.

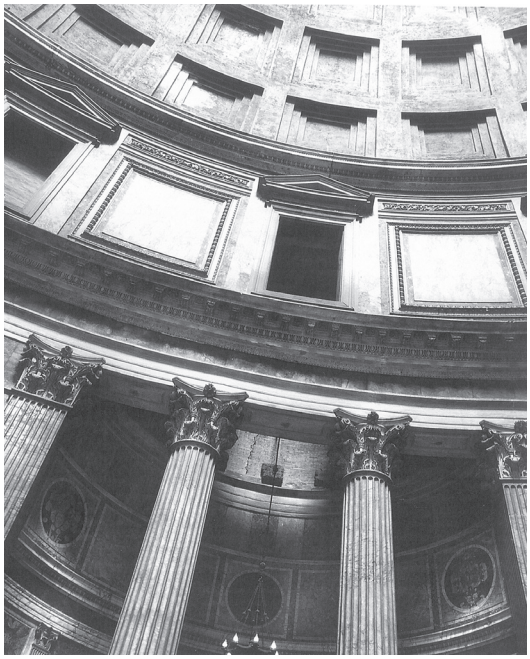

Abb. 15: Pantheon. Einfall des Sonnenlichts in eine der Exedren.

Abb. 16: Pantheon. Aussenansicht der Tür zur Rotunde (Foto Istituto centrale per il catalogo e la documentazione, Rom).

theon nennen, eine Notiz in den Arvalakten des Jahres 59 n. Chr.[37] und ein Hinweis bei Plinius[38] sind. Dagegen wurde — soweit man bisher zu wissen meint[39] — die Vorstellung von einem Pantheon spätestens seit hellenistischer Zeit in den Gebieten des Ostens vor allem in Kleinasien und im Ptolemäerreich Ägyptens mit ihren von Königen beherrschten Ländern gepflegt und konnte dort mit bestimmten Eigenschaften ihrer zugleich als Götter verehrten Herrscher verbunden sein. Dabei gehörte die Göttlichkeit des Königs nicht zuletzt zu dessen Reputation sowie Legitimität, und war ein König zugleich einer der Götter und nur als solcher auch ein König. Deshalb konnte ein Pantheon auch wie ein Attribut verstanden worden sein, das einem Herrscher die ihm eigene Göttlichkeit und damit Legitimität zur Herrschaft attestierte.[40]

Dass solche Vorstellungen und Ansprüche in und für Rom auf keinen Fall akzeptabel sein konnten, versteht sich angesichts der Geschichte des römischen Staates von selbst. Schliesslich hatte Rom seine nach wie vor als Republik verstandene Staatsform erst durch die Vertreibung der Könige erreicht und dies auch in seiner Verfassung fixiert. Umso mehr könnte es erstaunen, dass ausgerechnet Agrippa als der nächste Vertraute des Augustus, der bekanntlich stets peinlich genau auf sein republikanisches Image achtete, den Plan verfolgte,[41] in Rom für den Princeps ein Pantheon einzurichten. Natürlich lehnte Augustus dieses Vorhaben ab, liess es aber doch zu, dass eine entsprechende Verehrungsstätte für alle Götter — wenngleich ohne Bezug zu seiner eigenen Person — angelegt wurde. Anscheinend war nichts gegen eine gemeinsame Verehrung aller Götter einzuwenden, doch war zugleich grösste Vorsicht geboten oder klingelten sogar die Alarmglocken, wenn der Verdacht aufkommen konnte, mit dieser Götterverehrung — also einem Pantheon — sollte zugleich eine Reverenz an den Regenten verbunden sein. Anscheinend

37 CIL vi 2041.
38 nat. hist. 34,13 ; 36,38.
39 Nilsson 1974, 574 ff.
40 Habicht 1970.
41 Cassius Dio 53. 27, 2.

Abb. 17: Pantheon. Hyperthyron von der Innenseite der Tür zur Rotunde (Foto J. Albers).

wäre mit einer solchen Überhöhung des Herrschers das Mass dessen überschritten gewesen, was in Rom an Machtvollkommenheit eines Kaisers gerade noch hinnehmbar war.

Auch wenn seit der Zeit des Augustus in Rom die Ausübung der Macht schon längst und unrevidierbar in die Hände der Kaiser übergegangen war, ist jede übertriebene Selbstdarstellung von Kaisern noch immer ein heikles Thema gewesen. Deshalb dürfte angesichts dieser spektakulären Neuformulierung des Pantheon eine Zurückhaltung, die offen lässt, was wirklich mit diesem einzigartigen Bauwerk und seiner Rotunde gemeint sei, nicht ganz unbegründet gewesen sein. Schliesslich wusste auch Hadrian, dass es in Rom noch keinem Herrscher gut bekommen ist, wenn er die durch die Empfindlichkeiten der römischen Eliten gesetzten Grenzen überschritten hatte. Hadrian trug dem auch dadurch Rechnung, dass er es vermied, diesen Neubau mit seinem eigenen Namen in Verbindung zu bringen, und er es statt dessen dabei beliess, durch die Bauinschrift auf Agrippa und damit implizit zugleich auch auf Augustus zu verweisen. Dem entspricht, dass es Hadrian grundsätzlich vermieden hatte, sich bei Renovierungen selbst als Bauherrn zu nennen.[42] Er konnte sich dabei in bester Tradition wissen, da auch Augustus in gleicher Weise vorgegangen war.[43] Wahrscheinlich konnte er auch deshalb getrost auf die Nennung seines eigenen Namens verzichten, weil die Architektur den grossen Kuppelsaal mit der in ihm angespielten Erinnerung an den einst hier gelegenen, offenen Hof in einer Sprache beschreibt, die in ihrer wahrhaft kaiserlichen Diktion ohnehin niemand anderen als nur den Kaiser selbst meinen konnte.

Zugleich stellte hierzu das Pantheon mit den gleichzeitig erneuerten Stätten der direkten Umgebung, in welche die neue Rotunde konsequent eingebunden war, klar — wenn dieser Kontext so ernst genommen wird, wie ihn die

42 SHA Hadrian 19, 9 ff.

43 Res gestae divi Augusti 19 f.

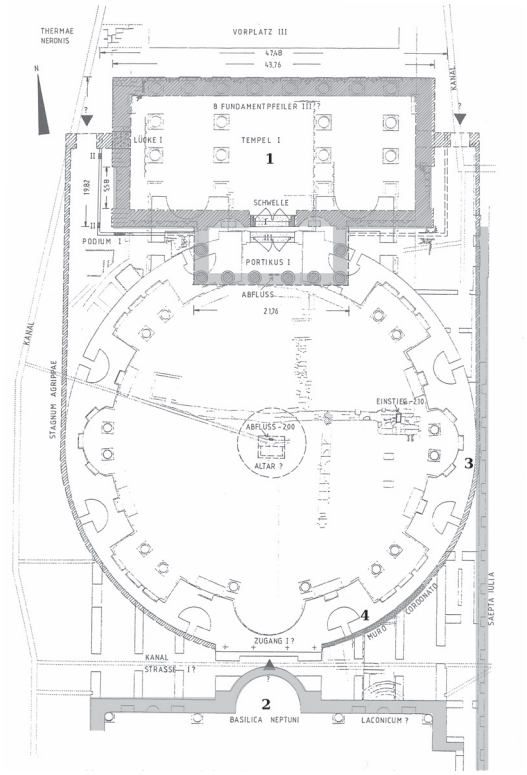

Abb. 18: Pantheon. Plan mit Resten der Vorgängerbauten (Gruben/Gruben 1997).

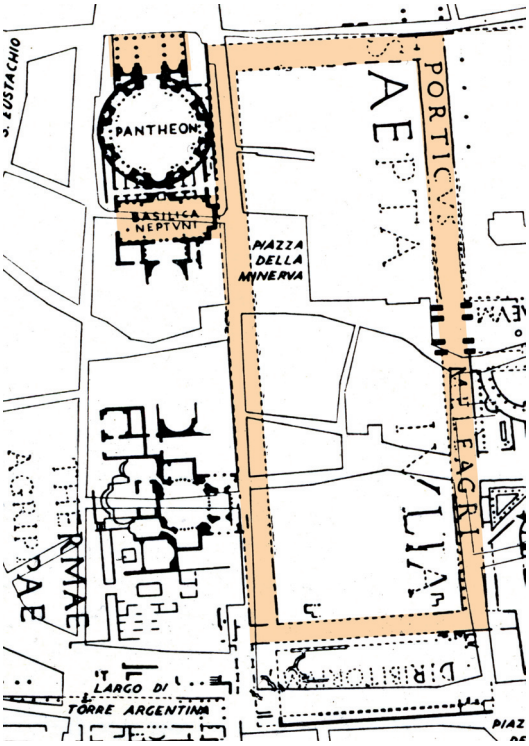

Abb. 19: Pantheon und ältere Nachbarbauten. Schema eines Gesamtplans.

damalige Wirklichkeit beschreibt (Abb. 19) —, dass der Kaiser und die durch ihn vertretene Herrschaft nach der in diese Architektur übertragenen Aussage aus dem hervorgegangen sind, was zum einen bereits zuvor vorhanden war und was ihn zum anderen mit und in diesem Pantheon ständig umgibt. Deshalb unterstreicht dieser Neubau des Pantheon die herausragende Position des Kaisers ebenso wie dessen bewusst inszenierte Integration in ältere und ehrwürdigste Tradionen, die einer an die Adresse Roms gerichteten Legitimation der kaiserlichen Herrschaftsideologie nur dienlich sein konnte.

Zu Hadrian dürfte in Rom ohnehin allgemein bekannt gewesen sein, dass dieser Kaiser sich selbst Qualitäten zugeschrieben hatte, die ihn in besonderer Weise überhöhten und dabei zugleich in die Nähe von Göttern rückten. Hierzu zeigt das Bild einer bereits um 120 n. Chr. geprägten Münze (Abb. 20),[44] dass Hadrian das Szepter als Zeichen der Macht von einem Adler, der auf ihn zufliegt, und damit von dem attributiven Boten Jupiters übergeben wurde. Wie die Beischrift betont, entsprach dies einer *providentia deorum*, d.h. der Vorhersehung und dem Willen der im Plural genannten Götter und damit dem Plan eines Pantheon. Angesichts des offiziösen Charakters einer Münzprägung und einer durch sie in Umlauf gesetzten oder auch im wahrsten Sinne des Wortes von Hand zu Hand gereichten Botschaft muss es ernst genommen werden, dass bei der hier geschilderten Szene mit der Übergabe der Macht an Hadrian von Rom und seinem Senat nicht mehr die Rede ist.[45] Dabei unterstreichen sowohl das Münzbild als auch der Pantheonbau ein kaiserliches Selbstbewusstsein, das keine Architektur hätte deutlicher und besser spiegeln können als gerade der prächtige Rundsaal dieses Pantheon.

44 RIC Hadrian Nr. 589.

45 Kienast 1980, S. 395.

Bleibt schliesslich auch am Ende dieser Betrachtung des Pantheon das methodische Vorhaben gültig, nach dem alles als Teil einer Sprache dieser Architektur so ernst und wörtlich zu nehmen ist, wie es sich darstellt, dann spricht angesichts der Gesamtanlage von Pantheon und Vorplatz[46] (Abb. 3) nichts dagegen, in ihr das zu sehen, was jedem auch nur halbwegs mit der Geschichte seiner Stadt und deren Monumenten vertrauten Römer wie Schuppen von den Augen gefallen sein müsste: Dass hier eine Anlage im Entstehen war, die nicht nur dem Pantheon einen ihm angemessenen Raum und Rahmen gibt, sondern zugleich und darüber hinaus einem Kaiserforum entspricht,[47] wie es vor allem im Augustusforum, für dessen Renovierung sich Hadrian gleichfalls tatkräftig einsetzte,[48] sein nicht zu übertreffendes Vorbild hatte. Wollte man dies bei einer derart prominenten Anlage nicht für puren Zufall halten, müsste gelten, dass diese Anlage nicht ohne hintersinnige Absicht eine für jedermann verständliche Gestalt erhalten hatte, die einen ebenso gut verständlichen Inhalt transportiert haben dürfte.

Auch deshalb gehörte und gehört das Pantheon in Rom — so seine Form und die Sprache seiner Architektur — zu den anspruchsvollsten Staatsmonumenten dieser Zeit, das die unübertroffene Grösse Roms und den besonderen Rang seines Kaisers ins rechte Licht rückt.

Abb. 20: Um 120 n. Chr. geprägtes Münzbild mit der Übergabe des Szepters an Hadrian durch den Adler Jupiters (Foto London, Brit. Mus. 1236).

46 Battistelli/Virgili 1999.
47 Martini 2006, S. 24 ff.
48 SHA Hadrian 19.10.

The First Pantheon: Architecture and Meaning (abstract)

Pieter Broucke

Until the late nineteenth century, it was believed that Agrippa, Augustus' general and factotum, had built the Pantheon in 27 BC. A study of its brick stamps, however, revealed it was constructed after AD 118, under Hadrian. Where, then, was the Pantheon of Agrippa, and what had it looked like? Studies by the architect Georges Chédanne led to excavations by Luca Beltrami and Pier Armanini in 1892 and 1893. Some 3 m below grade they encountered various remains that became associated with the Agrippan building. Over time, a confusing reconstruction took hold in the scholarship. Today, the Pantheon of Agrippa, though recognized as important, remains an inadequately understood building.

Modeled after Hellenistic precedents in form and meaning, Agrippa's Pantheon should be seen as Augustus' dynastic sanctuary. The fascination with Greek civilization represents a propagandistic leitmotiv of Augustan culture because, together with the explicit introduction of artistic typologies, the notion of the divinely sanctioned ruler is implied. The exploration of six research areas provides evidence for the architectural articulation of Agrippa's Pantheon, leading to a fuller understanding of the building.

1. The Pantheon of Agrippa: Physical Evidence. Chédanne's drawings and Beltrami's publication constitute the main sources of information. First-hand analysis of these materials revealed that the large foundations under the porch (since their discovery thought to be associated with the Pantheon of Agrippa) should be reattributed to an initial, abandoned phase of the Hadrianic Pantheon. Only a short stretch of curved wall at the north-west of the Hadrianic rotunda and various floor levels within and outside it can be securely assigned to the Agrippan building. The results are unequivocal: the Agrippan Pantheon consisted of a circular precinct (a *templum*), accessed via a portico facing north.

2. Agrippa's Pantheon and the Early Imperial Campus Martius. Exactly half a Roman mile north of the Pantheon stands the Mausoleum of Augustus, a circular monument designed to hold the remains of the first emperor and his dynasty. Constructed only one year apart (28 v. 27 BC), the Mausoleum and the Agrippan Pantheon are both circular buildings, their entrances facing each other. By comparing them, an architectural arrangement for the Agrippan enclosure can be hypothesized: an annular vault, carried by a colonnade on the inside and a circular wall on the outside, surrounded the round *templum*. The two circular buildings together formed an urbanistic complex in the Campus Martius, brimming with dynastic and religious connotations.

3. The Tivoli Caryatids and the Pantheon of Agrippa. Pliny states that the Pantheon of

Agrippa incorporated caryatids made by Diogenes of Athens. The four caryatids — copies of those at the Erechtheion in Athens — overlooked, as free-standing sculptures, the Canopus at Hadrian's Villa in Tivoli. Yet they originally had belonged to an architectural context, and divide into two datable types that correspond to the two documented phases of construction and restoration at the Pantheon of Agrippa. Hadrian apparently recycled them as free-standing statues for his gardens. Restored to Agrippa's Pantheon, they provide physical evidence for the building's elevations, and should be reassigned to their positions in the attic façade of the annular vault that encircled the open-air enclosure, similar to their sisters at the more-or-less contemporary Forum of Augustus.

4. The San Lorenzo Reliefs as Remains ex situ. Six fragments of a frieze were used as *spolia* at San Lorenzo fuori le Mura. They depict two types of designs: priestly instruments and naval motifs. In 1937 a seventh fragment was found a few hundred meters from the Pantheon. Stylistically and iconographically close to a frieze of Augustus's Memneion at Nikopolis from c. 27 BC, they are securely dated to the Augustan period. Agrippa erected one religious building in the Campus Martius: the first Pantheon. The reliefs' attribution to that building is corroborated by the incorporation on Hadrian's Pantheon of friezes with closely related motifs. Restored to Agrippa's Pantheon, the San Lorenzo reliefs provide evidence for the appearance and organization of the north-facing portico.

5. The Pantheon of Agrippa and a Building on the Haterii Reliefs. The Tomb of the Haterii, of Domitianic date, contained reliefs representing building projects in which a contractor buried in the tomb participated. Several are unlabeled, suggesting that for the ancient viewer they were easily identifiable. One depicts a rounded structure fronted by a portico with a frieze that contains several motifs from the San Lorenzo reliefs. In addition, the pediment displays a *corona civica*, the civic crown associated with the house of Augustus, a motif that was also repeated on the Hadrianic Pantheon. On the basis of these (and other) parallels, I interpret this depiction as representing Agrippa's Pantheon. Its depiction in the Haterii Tomb suggests that the contractor buried in it took part in the documented restorations of the Pantheon during Domitian's reign. The relief provides evidence for the overall appearance of the Pantheon of Agrippa.

6. The Two Pantheons. Literary sources state that Hadrian «restored» the Pantheon, even though a new construction replaced the Agrippan ruins. The statement only holds if formal similarities existed between the Hadrianic replacement and the Agrippan original. Several elements of the Hadrianic building can be seen as carry-overs from the Agrippan model: the circular nature of the structure, many of its dimensions, the northern orientation, the *corona civica* in the pediment, and the motifs from the San Lorenzo reliefs. Other aspects of the Hadrianic building are revolutionary when compared to what had come before, especially the spectacular dome, to be read as an annular vault from which the inside has been raised skyward to form a large dome with an *oculus* at its apex. This arrangement required neither a colonnade nor an attic façade with caryatids. The new building was no longer a dynastic sanctuary associated with the first dynasty, but became instead associated with all the gods and, through the powerful image of the dome, with the entire universe.

A reconstruction Agrippa's Pantheon that is fairly clear regarding its architectural organization emerges, although it remains schematic in many minor aspects. The newly reconstructed Agrippan Pantheon should be considered in context: its relationship with the Mausoleum invites the reading of the building as part of a dynastic and religious complex, a crucial feature of the Campus Martius' development under Augustus.

What did Agrippa's Pantheon look like? New Answers to an Old Question

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The debate on the form of the original Pantheon, apparently solved, in spite of occasional sceptical voices, by the soundings of Armanini and Beltrami in 1892–1893,[2] was re-opened by the excavations of 1996–1997 in the Piazza della Rotonda.[3] In my paper I shall try to assess the opinion of the excavators that the new evidence proves (against the traditional view, based on Armanini's excavations of 1892–1893, according to which the original Pantheon faced south and that the site of the rotunda was a piazza in front of it) that the basic layout and orientation of the building remained the same throughout all its phases.

Armanini's excavations under the existing *pronaos* and the intermediate block revealed the remains of a rectangular structure of concrete with c. 3 m thick outer walls of travertine blocks on a bed of concrete, 43.76 m wide and 19.82 m deep, with a projection on its south side, 21.56 m wide and of undetermined depth. The structure's main north-south axis coincided exactly with that of the present building, its width was identical with the inner diameter of the rotunda, and its south side was practically tangent with the rotunda's outer curve. Under the floor of the rotunda two layers of concrete were identified. One, reached only in a small area close to the east end of the transverse axis of the rotunda where the first dig was made, laid on virgin soil and 120 cm thick, revealed no traces that might determine its purpose. The other, c. 2.25 m below the floor of the rotunda and 30 cm thick, was undoubtedly a bedding for a marble pavement of pavonazzetto and (probably) giallo antico slabs oriented east-west but varying in size, which continued into or outside the foundation of the rotunda and northwards to the *pronaos*, where a corresponding layer was found c. 1.50 m below the *pronaos*' floor. The marked southward sloping of this pavement had a counterpart in an even more pronounced sloping of travertine wall of the rectangular structure (in its west section, the base of the lowest course of blocks leads downwards north-south from 335 cm to 390 cm below the level of the present floor). Finally, along the curve of the outer face of the south-east foundation of the rotunda, a wall was identified, 60 cm thick and faced with *opus reticulatum*, apparently a section

1 The content of this paper by necessity differs from what I read out at the conference. After having listened to Lise Hetland's paper, I can no longer refer to a ‹Hadrianic Pantheon'; most importantly, from my point of view, Pieter Broucke's revolutionary interpretation of older structures on the Pantheon's site challenges everything that has been written on its earlier phases. A full digestion of his proposition will require much time and discussion (and, as a preliminary, its availability in printed form), but it would be foolish not to take into account in this paper at least some of his observations.

2 Beltrami 1898.

3 Battistelli/Virgili 1999 and Virgili 1999. See also La Rocca 1999.

of a circular enclosure running round the perimeter of the rotunda.[4]

Rodolfo Lanciani interpreted the rectangular structure under the *pronaos* and the intermediate block as the foundations of a south-facing building with a transverse *cella* and *pronaos*, protruding on to an open circular forecourt corresponding to the rotunda, delimited by the wall of *opus reticulatum*.[5] His interpretation became something of an orthodoxy, with the exception of the form of the forecourt, the anteriority of the wall of *opus reticulatum* to the rotunda being less evident for many scholars. In spite of the total lack of absolute chronological indicators, the rectangular structure was attributed almost unanimously to Agrippa. Of the two layers of concrete under the rotunda's floor, the lower was identified, not unexpectedly, as Agrippan and the upper as Domitianic. A fragment of a brick with the stamp dated approximately to the beginning of the first century AD, found between the two layers, apparently supports this attribution.[6]

The excavations of 1996–1997 made it possible to establish the form of the forepart of the present *pronaos* and the piazza in front of it. They showed that the stairs from the piazza to the floor of the *pronaos* did not make a continuous flight of steps as wide as the width of the structure but consisted of two lateral flights c. 7.50 m wide, separated by a central podium. More important for the subject at hand was the finding of an earlier phase of the same arrangement (a central podium and two lateral stairs leading down to a travertine-covered piazza) pertaining to the rectangular structure, with the correspondingly wider podium. The director of the excavation, Paola Virgili, harbours no doubts: «Il Pantheon di Agrippa era orientato verso nord, come dimostra inconfutabilmente il ritrovamento della scalinata di accesso al pronao, esattamente al di sotto dell'avancorpo frontale adrianeo.»[7]

This conclusion is a little hasty, considering that neither her excavations nor Armanini's/Beltrami's yielded securely datable material. The only finds from the Pantheon which provide useful chronological indications are the brickstamps collected by Louis Chedanne and others, which proved that the present structure belongs in its entirety to the Trajanic-Hadrianic phase,[8] the *terminus post quem* of which was the fire of AD 110. But the Pantheon had two earlier phases: Agrippan (dedicated in 25 BC) and Domitianic (after its destruction by fire in AD 80). A statement like Virgili's requires at the very least a demonstration that the stairs her team discovered were in fact Agrippa's. This, in turn, considering the aforementioned lack of dated finds, can only be made by reconsidering the evidence and putting forward a reconstruction of the early stages of the Pantheon and its immediate environs into which this attribution would fit.

An attempt at such a reconstruction was made by Virgili's collaborator, Paola Battistelli.[9] Right at the outset I wish to point out what, in my opinion, is a weak spot of her painstaking study: she consistently operates with only two notions of the Pantheon, *adrianeo* and *pre-adrianeo*. With the first there is no quarrel; but the second means that all the finds predating the present structure are in fact attributed to a unitary design arbitrarily rated as Agrippan.[10] Disregard-

4 A useful presentation of the results of Armanini's excavations and their very cautious interpretation can be found in Fine Licht 1968, passim, esp. 172–179.

5 Lanciani 1897, 479–483.

6 Bloch 1937, 108 83–187.

7 Battistelli/Virgili 1999, 138.

8 See Lise Hetland's contribution in this publication.

9 Battistelli/Virgili 1999, 141–153. The first to challenge Lanciani's orthodoxy was W. C. Loerke in Loerke 1982. See also Loerke 1990, followed by Tortorici 1990, Thomas 1997, Wilson Jones 2003, 182. Battistelli's reconstruction owes much to those studies, but since her study was the first to incorporate the results of the new excavations, I shall only discuss her arguments.

10 Battistelli briefly mentions (without discussing) the eventuality that certain elements of the ‹pre-Hadrianic› Pantheon might in fact be considered as belonging to the Domitianic phase in notes 34, 39 and 50 (in note 50 she mentions traces of travertine paving and marble decoration on the west side of the rectangular structure c. 250 cm below the level of the present floor, tentatively attributing them either to this phase or to Nero's activity occasioned by the building of the neighbouring Thermae Neronianae); see Migliorati/Sommella 1998, 100–102.

ing the fundamental fact that below the present Pantheon there are two others to be taken into account is bad enough; but the effective cancelling out of the Domitianic phase is even more risky, considering the emperor's impressive record as a builder in general and his decisive contribution to the layout and architecture of the Campus Martius in particular.

Battistelli's analysis of the traces of marble paving in the rotunda and the *pronaos* is of crucial importance in her reconstruction. She points out that, though found at different depths, they were, on account of the southward sloping of the entire complex, parts of one and the same pavement, which thus extended north-south from the northern side of the *pronaos* to at least three-quarters of the rotunda, and east-west into the latter's foundation ring. A common pavement implies a single building; ergo, the ‹pre-Hadrianic› Pantheon covered basically the same area as the present one and consisted of the same main parts: rectangular to the north and circular to the south, joined by the southward projection of the rectangular structure, interpreted as a functional equivalent of the intermediate block of the present Pantheon. The northward orientation of the whole complex is determined unequivocally by the recently found podium-with-stairs abutting on the north wall of the rectangular structure. Throughout its history, the Pantheon thus retained the same basic layout and orientation.[11]

Individually, the respective parts of the two Pantheons would have presented a varying mixture of continuity and diversity. In the author's view, continuity in the *pronaos* can best be appreciated in the same arrangement of the stairs in the two phases and by the fact that, in the north wall of the rectangular structure, travertine blocks were arranged like piers placed exactly beneath the columns of the present *pronaos*, alternating with the filling of concrete, which indicates that the columns of both were identically spaced. These features show that the overall design of this part of the original Pantheon closely resembled the Trajanic-Hadrianic one. The difference lay in the considerably larger dimensions of the *fase pre-adrianea*: the *pronaos* stood on a higher podium (245 cm above the level of the piazza against the present structure's 130 cm, with a correspondingly larger number of steps: eleven instead of seven); it was also wider (43.76 m against 34.20 m), which means that (the intercolumnia being of the same width) the older *pronaos* was a decastyle, not an octostyle.[12]

The *cella* would have been a counterpart of its successor in plane and overall dimensions. Battistelli is rightly sceptical about the wall in *opus reticulatum* being indicative of the circular form of the postulated *cella*.[13] Her argument is based on the very existence of the southward projection of the rectangular structure, in her view a link between two main, obviously incongruent parts of the building: the rectangular *pronaos* and the *cella*, by necessity circular. Another clue to this effect, and an indicator of the dimensions of the *cella*, is the total lack of vestiges of walls of this hypothetical original *cella*, which must therefore have corresponded with, and been obliterated by, the massive foundations of the present rotunda. Architecturally, the two *cellae* would have had little in common. The author agrees that with flimsier foundations a cupola like the present one would be an impossibility and hesitates between a tambour with complete roofing of the traditional kind (which would necessitate internal supports, traces of which have not been found) and a largely uncovered structure similar to a circular portico around a central court.[14]

The two phases would have differed most conspicuously in the junction between the *cella* and the *pronaos*. The intermediate block of the present Pantheon can be described as a projection of the *cella*, as wide as the *pronaos* but considerably narrower than the rotunda. This

11 Battistelli/Virgili 1999, 145–146.

12 Battistelli/Virgili 1999, 142–143, 145, 149–150.

13 Battistelli/Virgili 1999, note 42.

14 Battistelli/Virgili 1999, 147–148.

elegant solution would, however, be impossible with the width of the *pronaos* equal to the *cella*'s diameter. In Battistelli's reconstruction the intermediate section took the form of an inconspicuous ‹neck›, relatively narrow (half of the *pronaos*' width) and very short (no more than a couple of metres), just sticking out enough to avoid the clumsy meeting of a straight line with a curve.[15]

In keeping with the foregoing unexpressed premise of the unicity of the *fase pre-adrianea*, the thus reconstructed structure is attributed more or less arbitrarily to Agrippa. The discussion of the relative chronology of its parts is limited to the two layers of concrete under the rotunda. The author observes that there is no reason to date them to different phases, Agrippan and Domitianic. The lower layer has no traces of having been used as a foundation or a bedding for pavement, which shows that its function was to stabilize the soil and provide insulation from groundwater; and the post-Agrippan (= Domitianic) dating of the upper layer on the basis of the palaeography of a single unidentified fragmentary brickstamp is anything but secure. It is better to treat them as two elements of a unitary project (stabilizing/insulating stratum, plus pavement bedding), corresponding stratigraphically with the rectangular structure and so Agrippan as well.[16]

Before discussing Battistelli's reconstruction, I wish to emphasize yet again that in the dossier on the early phases of the Pantheon the only new element added by the excavations of 1996–1997 is the northern approach to the rectangular structure, similar to that adopted by the builders of the present *pronaos*. All the rest is a rereading of the evidence collected by Armanini and Beltrami. Now, there is a certain discrepancy between that evidence and its presentation by Battistelli concerning the north wall of the rectangular structure. The report of the excavations states that originally the north wall was evidently constructed in the same manner as the other walls, that is, as a continuous wall of travertine blocks. In Beltrami's view its present form — piers of blocks alternating with concrete filling — was due to the tearing down of that wall by the builders of the present Pantheon, who reused the blocks as foundations for the front columns of the *pronaos*.[17] Battistelli does not say a word about this; her only oblique reference to the question of whether the north wall always had the same construction is made in the context of an argument for the continuity of the two phases, *adrianea* and *pre-adrianea*:

> La posizione del colonnato frontale del pronao restò invariata nelle due fasi, come dimostra il muro *a pilae* di blocchi, *il quale evidentemente ne costituiva fin dalle origini la fondazione* (emphasis mine A. Z.) e che fu riutilizato con la medesima funzione … nella ricostruzione adrianea.[18]

Whatever one thinks about the quality of Beltrami's publication, there is no reason to doubt this particular statement, obviously based on examination *in situ*. In itself, it does not settle definitively what sort of construction the north wall supported, though it obviously makes a continuous wall decidedly more probable than a colonnade. Be that as it may, when Battistelli wonders how — in view of what she considers a ‹non-fortuitious fact› that the original stone piers were retained to support the columns of the present *pronaos* — the traditionalists can treat the north wall as being the foundations of the back of a *cella*, necessarily solid,[19] one can retort that the fact she refers to is contradicted by the only explicit testimony we have. Once we admit that the north wall was originally of the same construction as the others, the reconstruction of the whole is simple. Solid walls of travertine blocks bounding the rectangular

15 Battistelli/Virgili 1999, 147.

16 Battistelli/Virgili 1999, note 34.

17 Beltrami 1898, 55–56 and Figs. XIV and XXXV (Fig. XIV = Fig. 5 in Battistelli/Virgili 1999).

18 Battistelli/Virigili 1999, 146–147.

19 Battistelli/Virgili 1999, note 32.

structure on all sides apart from the break in the central part of the south wall corresponding to the southward projection clearly imply foundations of a building composed of a transverse *cella* and a south-oriented *pronaos*, as Lanciani postulated more than a hundred years ago.[20]

It is a fact that this kind of building is hardly compatible with the results of the recent excavations. A large podium with a flight of stairs, abutting on the north side of the rectangular structure, clearly necessitated a fitting entrance: preferably a colonnaded porch, certainly not a solid wall. But there is a simple way to reconcile one dossier with the other. We are dealing with two phases, Agrippan (the rectangular structure) and Domitianic (the podium with stairs), which had only one element in common: the foundations, retained in the second phase without any substantial alterations. Above ground, the original building gave way to a new superstructure of unknown architecture apart from one feature: the back wall of the original building, standing on the north wall of the rectangular structure, was probably replaced, entirely or in part, by a row of columns opening onto an extension of the same width as the wall, with two lateral stairs leading down to a travertine-paved piazza. Demolition of the north wall and its rearrangement into stone piers with concrete filling came about only with the next phase (Trajanic-Hadrianic), the raising of the floor by c. 1 m providing both the need and the opportunity for this undertaking. The west wall and the east wall, left just outside the new, narrower podium (38.80 m wide together with side benches), were buried in the infill, which raised the level of the piazza by c. 2 m.

Turning to the arrangement of the south side of the Pantheon, the disposition of the travertine blocks at the south side of the rectangular structure shows that the southward projection was an integral feature of its design. As said above, the depth of the projection is unknown (the digging was interrupted once the existence of the right-angled turn of the western course of the south wall had been established, with the result that the southward-running wall was exposed for only 70 cm!). To this phase can also be safely attributed the remains of marble facing of the western extremity of the south wall c. 340 cm below the present floor.[21] They prove that the south wall of the rectangular structure was meant to be seen from the area of the rotunda and that the floor of that area was almost at the level of natural deposits.[22] At this moment we are clearly at the very beginning of the process of urbanization of the central Campus Martius, which alone suffices to attribute this phase to Agrippa's activity.

And what about the two layers of concrete under the rotunda's floor? I am convinced by Battistelli's argument that they were part of the same project; but I do not think that she is right in attributing it to the Agrippan phase. There is an element of *parti pris* in it: no partisan of the original Pantheon as a transverse *cella* with *pronaos* can accept the idea of the *pronaos* breaking out into an enormous round platform. The post-Agrippan dating of the two layers on the basis of the aforementioned fragment of a brickstamp is also far from certain. My scepticism is largely due to the weirdness and ungainliness of the design of the original Pantheon in Battistelli's reconstruction. A single building composed of a huge *pronaos* and a circular *cella* of the same diameter, linked by a relatively narrow and very short passage leaving blind spots on both sides, has no known parallels in classical architecture and would go against everything we know of Roman design principles in general and of Augustan architec-

20 Battistelli herself admits that a solid foundation should imply a solid wall on top of it: while pondering why the west wall, constructed entirely of travertine blocks, should have supported a colonnade, she speculates that the extensive roof of the building was thought to require more robust lateral foundations (Battistelli/Virgili 1999, note 45).

21 Beltrami 1898, 52–54, figs. XV, XVII, XIX.

22 These remains belonged to the upper moulding of a plinth, the base of which must have lain a further 20 cm lower.

ture in particular.[23] Of course, inducement like this will not convince everybody: if we do not know a single instance of such a layout, this may be due to the scantiness of our evidence which one new finding may easily set right. But I still maintain that what might perhaps have been possible after the Neronian architectural revolution would have been inconceivable in the days of Augustus' cold classicism.[24]

A Domitianic attribution of the two layers leaves open the question of what they represent. Coloured marbles imply a pavement of a covered space; and the fact that a continuation of this pavement at some time constituted the floor of the rectangular structure certainly suggests that the said space made a whole with the superstructure erected on the latter. But a covered space as large as the rotunda raises the until now insoluble dilemma of what kind of cover that would be and what its supports were.[25] One way that the partisans of the similarity of the original Pantheon to the present one have of coping with this difficulty is to postulate an open space surrounded by a covered circular ambulatory.[26] Typologically and functionally, such a structure, however, would not be a *cella* at the rear of a building but a courtyard in front of it. The eventuality that we are dealing with an open court is further strengthened by the irregular size of the paving stones and their simple disposition from east to west. Last but not least, there is the strange southward sloping of the whole complex that cannot be wholly accounted for by the enormous pressure of the present construction. If it was a built-in feature to carry off rainwater, this would also imply an essentially open space south of the rectangular structure. Be that as it may, the evidence is too meagre and confusing to allow anything but speculations to be made about the extent of the pavement and of what kind of structure it was part.

Summing up the foregoing discussion, I am of the opinion that the traditional reconstruction of Agrippa's Pantheon as a transverse *cella* with a south-projecting *pronaos*, built on the rectangular structure under the north part of the present building and opening onto a large piazza laid just above the natural ground level of the Campus Martius, fits best our scarce archaeological data. The elements which constitute the mainstay of Battistelli's reconstruction of the original Pantheon as a round *cella* on the site of the rotunda and the rectangular structure as a north-facing *pronaos* — the north podium with stairs discovered in 1996–1997 and the marble pavement on a double bed of concrete under the floor of the present building — in my view belonged to the Domitianic phase.

To reiterate, I would like to emphasize yet again that all this is largely speculation, based on few specific data. With the evidence at our disposal, the only part of the Pantheon in its earlier phases about which we can form more affirmative opinions is the north podium with stairs revealed by the excavations of 1996–1997. For elucidating the rest we shall have to wait for a change of attitude of the relevant authorities with regard to the scientific investigation of the most magnificent monument of ancient Rome. In the meantime, we have a way of checking our reconstructions by trying to decipher the meaning of the Pantheon and its urban setting; in other words, to establish to which category of buildings it belonged and to see whether our reconstruction matches that category's architectural characteristics of the latter, as well as ascertain whether its location

23 The examples cited by Battistelli and others as precedents of the original Pantheon that they hypothesize (Battistelli/Virgili 1999, note 46; see e. g. La Rocca 1999 and Wilson Jones 2003, pp. 180–182 and fig. 9.6) concern circular buildings with porches of a much smaller width or round porticoes in front of rectangular *cellae*, and so are irrelevant to our case.

24 The so-called Tempio Rotondo in Ostia, cited by Battistelli (see the preceding note) as most closely resembling her reconstruction of Agrippa's Pantheon (in reality not very similar with its constituents of markedly different proportions and lack of an intermediate part between the *tholos* and the *propylaeum*), was built in the second quarter of the third century, ie. some 250 years later, obviously as a variation on the design of the present Pantheon.

25 Ziolkowski 1999, 55.

26 Thus esp. Loerke 1982, Loerke 1990, Thomas 1997.

and orientation make sense in the light of what we know about the surrounding topography.

In this matter, the partisans of the essential architectural continuity of the Pantheon through all its phases adopt the following propositions.[27] It was a temple of all the gods, especially Mars, Venus and Divus Iulius, patron deities of the *gens Iulia*, and so connected with the cult of the rulers in general and of Augustus in particular (this is thought to account for its form, the eastern *pantheia* and the shrines of rulers having sometimes been circular in shape). It was built in the area where legend located Romulus' ascension to the heavens and where other monuments symbolizing the more than human power and sacrality of the first emperor, ‹a new Romulus›, were to appear in the near future, with particular stress on the alleged intimate relationship between the Pantheon (north-oriented, of course) and the Mausoleum Augusti, facing each other along the same axis. The two propositions reinforce each other: the alleged reasons for the choice of the site and architectural form are cited in support of the ideology of which the Pantheon would have been an expression; and the supposed symbolic meaning of the building is advanced to strengthen the interpretation of its location, form and orientation.

I think both propositions are erroneous. First, the alleged ideological and/or functional connection between the Agrippan Pantheon and the Mausoleum Augusti (and the Augustan monuments in the northern part of the Campus Martius) is an illusion. Particularly meaningless is the assertion that the site, axis and orientation of the Pantheon were chosen to create a ‹visual link› between it and the Mausoleum Augusti. The Pantheon and the Mausoleum do not stand on the same axis; [28] but even if they did, the north-oriented *pronaos* of the former in its present form and the south-oriented entrance to the latter are c. 750 m in a straight line from one another. At such a distance, the human eye would not be able to establish a ‹visual link› between the two structures. Monuments of the northern part of the Campus Martius often quoted in this context (the Horologium, the Ara Pacis, and so on) were built a number of years later and so are utterly irrelevant to our subject.

But the decisive objection lies elsewhere. The position of all of Agrippa's works in the central Campus Martius — the Pantheon, the Basilica Neptuni, the Lavacrum (Thermae Agrippae) — was conditioned by two objective circumstances which had nothing to do with Augustan propaganda. One was banality itself: all that area, bounded to the south by the Porticus Pompei and the Minucia, and to the east by the Saepta Iulia, the monumental form of the Ovile (the precinct of the centuriate assembly, rebuilt by M. Aemilius Lepidus and dedicated by Agrippa), once owned by Marcus Antonius, became, after 30 BC, the property of Agrippa (just as Antonius had ‹inherited› it from Cnaeus Pompeius).[29] Agrippa simply located his works in his own *horti*, more precisely, on the elongated strip of land (400 m long [south-north] and c. 60-80 m wide [east-west]) between the Saepta and the Stagnum, an artificial pond which he created in the lowest part of the Campus Martius. The other condition reached back to the beginning of the Republic. Ferdinando Castagnoli demonstrated long ago that the pattern of streets and buildings of the central Campus Martius, broadly orientated on the cardinal points, conformed to the position of the Ovile.[30] The axis of the Pantheon, parallel to that of the west wall of the Saepta (still visible on the east side of the rotunda), was thus determined more than five hundred years before its construction; this being the case, it is pointless to seek symbolic meanings and hidden motives.

27 See e. g. Battistelli/Virgili 1999, 138–141, La Rocca 1999, Wilson Jones 2003, 179–180.

28 They are both inclined westwards, about 3° off the meridian. The axis of the Pantheon misses the entrance to the Mausoleum by c. 10 m; the axis of the Mausoleum passes by the outer perimeter of the Pantheon at a distance of c. 50 m.

29 Coarelli 1996a, Jolivet 1996.

30 Castagnoli 1948, 149–151.

Secondly, those who argue that the Pantheon formed a complex with the Mausoleum, separated though they were from each another by half-a-mile of greenery of the northern part of the Campus Martius, ignore the fact that the Pantheon made a most closely interrelated group with the Basilica Neptuni and the Thermae Agrippae, its actual neighbours (the Basilica almost abutted on the rotunda), really aligned with it from north to south, and that they were built by the same man during the same building campaign on a distinct piece of land with very pronounced limits.[31] The Pantheon was the northernmost element in this row of three; but is this a reason to tear it off from the others? One of them had to be in that position anyway. What is most important is that, at the time of its construction, the Pantheon was the northernmost building in the Campus Martius; beyond it there was nothing.[32] This fact, while not utterly ruling out the possibility that the Pantheon faced north, makes the latter decidedly less likely.

Second, the religious and ideological interpretation of the original Pantheon as a dynastic shrine is based on a series of misconceptions. Elsewhere I treat this matter at greater length;[33] here the following remarks will suffice.

(1) Cassius Dio's narrative, our only source on the founding of the Pantheon, makes it obvious that its cult deities were Mars and Venus, and no other:[34]

τό τε Πάνθειον ὠνομασμένον ἐζετέλεσε· προσαγορεύεται δὲ οὕτω τάχα μὲν ὅτι πολλῶν θεῶν εἰκόνας †ἐν† [ἐπὶ, σύν or προς — A.Z.] τοῖς ἀγάλμασι, τῷ τε τοῦ Ἄρεως καὶ τῷ τῆς Ἀφροδίτες, ἔλαβεν, ὡς δὲ ἐγὼ νομίζω, ὅτι ολοειδὲς ὂν τῷ οὐρανῷ προσέοικεν. ἠβουλήθη μὲν οὖν ὁ Ἀγρίππας καὶ τὸν Αὔγουστον ἐνταῦθα ἱδρῦσαι, τήν τε τοῦ ἔργου ἐπίκλησιν αὐτῷ δοῦναι· μὴ δεξαμένου δὲ αὐτοῦ μηδέτερον ἐκεῖ μὲν τοῦ πρτέρου Καίσαρος, ἐν δὲ τῷ προνάῳ τοῦ τε Αὔγουστον καὶ ἑαυτοῦ ἀνδριάντας ἔστησε.

(He [Agrippa] also completed the so-called Pantheon. It has this name perhaps because together with/besides the cult statues, that of Mars and that of Venus, it received representations of many gods; but as I believe, because having the shape of a dome it resembles the heavens. Agrippa in fact intended to erect there a statue of Augustus as well and to give the work his name; but since the latter would not accept either, he placed there a portrait statue of the elder Caesar and in the *pronaos* those of Augustus and himself.)

We see that in the *cella* there were representations of many gods (πολλῶν θεῶν εἰκόνες) but only two cult statues (ἀγάλματα), those of Mars and Venus. What is especially significant is that the representation of the elder Caesar had the low status of ἀνδριάς, a portrait statue of a human (that is, without divine attributes), like those of Augustus and Agrippa in the *pronaos*. If the original definition of the Pantheon is extractable from Cassius Dio's report, it can only be bound up with Mars and Venus.

(2) Mars was not ‹the god of the *gens Iulia*›. As a patrician clan, the Iulii worshipped Veiovis;[35] and by the Late Republic, with the spread of the notion of the *gentes Albanae*, they claimed Venus as their ancestress. In our sources there is no single piece of information about their particular links with Mars. It follows that Venus was in the Pantheon not as the Venus Genetrix of the Iulii Caesares, but as Mars'

31 On Agrippa's building activity in the central Campus Martius, see Roddaz 1984.

32 The Mausoleum, often situated by modern scholars in the Campus Martius, was certainly outside its limits. No ancient source locates it there; most significantly, the Regionary Catalogues do not include it in the list of monuments of Regio IX. Suetonius locates it *inter Flaminiam viam ripamque Tiberis* (*Aug.* 100.5). See Wiseman 1993, 220–221.

33 Ziolkowski 1994 and Ziolkowski 2007.

34 Cass. Dio 53.27.2–3. Greek text as in Boissevain 1955, 435–436, emendation of the corrupt word and translation are mine; see Ziolkowski 2007, p. 469.

35 CIL, XIV 2387: *Vediovei patrei genteiles Iuliei*.

companion, the role she had in the public cult from the moment her divine personality had taken shape. We find her at Mars' side in both Late Republican/Augustan temples of the god, those of Mars Invictus *in Circo Flaminio* and Mars Ultor in the Forum Augusti. If, therefore, in the *cella* of the Pantheon there were cult statues of Mars and Venus, the building should have been dedicated to Mars, with Venus as his *paredros*.

(3) Filippo Coarelli's widely accepted opinion that the site of the Pantheon was chosen in order to link the presumed cult of the living emperor with that of Romulus whose apotheosis, according to one thread of the tradition, took place somewhere in that area,[36] is pure speculation, not only unsupported by direct evidence but also most dubious in the light of what our texts do relate about the first king in general and his passing away in particular. They do not mention any cult place of the Campus Martius connected in any way with Romulus; it is worth observing that Plutarch, *Rom.* 27.6, when reporting the version of the king's disappearance (not an apotheosis!) outside the City, says that it happened by the *palus Caprae*, a marsh which had once covered a good part of the Campus, which shows better than anything else that in the whole area no particular site was associated with that story. The only place the Romans associated with Romulus as Quirinus was the god's unique great temple *in colle*. Founding one's conjectures on the meaning of the Pantheon on its supposed ‹Romulean connection› is thus baseless in the most profound sense of the word.

(4) Equally unfounded is the view that the real purpose of the Pantheon was to be a place of divine cult of the first emperor. The main objection is, of course, that in 25 BC, two years after the ‹restoration of the Republic›, an idea like this would have been out of the question.[37] It is true that Cassius Dio tells us that Agrippa first wanted to name it after Augustus (not dedicate it to him, as Cassius Dio's words are often misinterpreted) and put his statue in its *cella*, but he was dissuaded from doing so by the emperor. But how can a report (or gossip, or a surmise) of an unrealized intention, telling most forcibly what the Pantheon never was, be treated as a key to the meaning its founder actually conferred on it? The only hard fact about Augustus' position in the Pantheon is that his ἀνδριάς (portrait statue) stood modestly in the *pronaos*, together with that of Agrippa; and both these points exclude any possibility of a reference to his superhuman status.

To sum up. Defending the hypothesis of the continuity of architectural form and orientation of the Pantheon from Agrippa's foundation to the present building by defining it as a dynastic shrine (whatever that may mean) and making it an element of one and the same piece of urban design with the Mausoleum Augusti is meaningless, being based, respectively, on outright misconceptions and disregard of the historical and urbanistic circumstances that conditioned the urban development of the central Campus Martius in general and Agrippa's building activity in particular. As long as the Pantheon itself remains inaccessible to proper, comprehensive archaeological investigation, this hypothesis can legitimately claim support only from the evidence of the excavations of 1892–1893 and 1996–1997, fragmentary and ambiguous.
At the end of this paper I would like to raise one more aspect of the problem. At least in its

36 Coarelli 1983.

37 On the slow development of the so-called imperial cult in the City of Rome under Augustus, see Fraschetti 1990. Other fundamental readings are Taylor 1931 and Fishwick 1987. It hardly requires emphasizing that divine honours paid to some Romans in the province of Asia already under the Republic and the explosion of the cult of the younger Caesar in the East after Actium (see Price 1984) had nothing to do with the situation in Rome.

Trajanic-Hadrianic phase, the architecture of the Pantheon was that of a circular, imperial *aula*, or audience hall, poles apart from that of sacral edifices; and all that we know about the activities that took place in it are that they were public adjudications by the emperors and official readings of imperial decrees[38] — considerations which rule out its status of temple or *aedes sacra*.[39] Those who refer to it as originally a temple, dynastic or other, face, therefore, the question of whether and how this change affected its architecture (there remains the question of why it lost its original character, but this can be discussed on another occasion).

A defender of Lanciani's reconstruction of the original Pantheon has no difficulty answering this question. Temples with transverse *cellae* had relatively more internal space than those with a classical layout; this is why, for example, the near twin and contemporary of the original Pantheon in this reconstruction, the temple of Concordia *ad Forum*, was often used as the meeting-place of the imperial senate. With this trait, Agrippa's Pantheon would have made a passable public hall before the second, or already the first rebuilding, provided the opportunity to bring its architecture into line with its current function. Those, however, who advocate the basic sameness of the layout of the Pantheon through all its phases ought to explain how this could go together with so widely different purposes, in spite of two major reconstructions. To put it differently: why a temple that, in their opinion, the Pantheon was (at least in its earlier phase), had so untemple-like architecture? I have not yet come across a cogent argument to this effect.

The question is, however, whether the Pantheon was ever a temple. The simplest, most obvious meaning of the inscription on its frieze, *M AGRIPPA L F COS TERTIUM FECIT* — surely not that of a temple, as is proven by the omission of the name of the god or gods to whom it would have been dedicated and the neutral verb *fecit* instead of *vovit*/*dedicavit* — is that Agrippa founded it as a utilitarian building. In an earlier paper, while commenting on the unusual wording of the inscription, I took it for granted that the Pantheon started as a temple and interpreted its suggestive nickname and the presence of cult statues in its *cella* as vestiges of that original status.[40] Agrippa, however, might right from the start have conceived it as an atrium/basilica with sacral traits; if this were the case, then the form of the inscription would be self-explanatory. It is worth noticing that this interpretation would nullify the objection against the partisans of the basic similarity of its form from Agrippa to Hadrian and beyond, raised in the preceding paragraph.

And yet it can be shown that the Pantheon inscription bears witness to a profound change of its character, which took place when Agrippa was already dead, that is, some time after its original dedication.[41] The clue are the words *consul tertium*, literally ‹consul for the third time›; hence the alternative dating of the dedication of the Pantheon to 27 BC, the year of Agrippa's third and last consulship. This dating is certainly wrong, however there being no reason to doubt the date of 25 BC, given by Cassius Dio. But if so, what do the quoted words stand for? The other meaning of *consul tertium*, ‹three times consul›, could be used, preferably by a third party, to emphasize a given person's status and achievements, as a sort of informal homage, usually posthumous. In official epigraphs this sort of usage — ‹*n* times consul›, not ‹consul for the n^{th} time› — started, exclusively with reference to Augustus, only after 23 BC, when he adopted *tribunicia potestas* as the definite formula of his power, abdicating the consulship which he had held year after year since 31 BC. It is, therefore, most

38 Godfrey/Hemsoll 1986; Ziolkowski 1999, 60.

39 It is worth noting that the author of the *Historia Augusta* did not consider it a temple either; see *SHA*, *Hadr.* 19.10: *Romae instauravit Pantheum, Saepta, Basilicam Neptuni, sacras aedes plurimas, Forum Augusti, Lavacrum Agrippae*.

40 Ziolkowski 1994, passim.

41 A detailed argument to this effect can be found in Ziolkowski 2007, pp. 466-468.

unlikely that, in 25 BC, Agrippa would have presented himself publicly as *consul tertium*, which in turn leads to the inevitable conclusion that the inscription we read on the frieze of the Pantheon is not the original one. We can even fix the *terminus ante quem non* of its composition: Agrippa's death in March 12 BC. Judging by coins, the legend *M. Agrippa L.f. cos. tertium*, the exact wording of the Pantheon inscription, was the official way to which he was referred after his death, with *consul tertium* as a sort of posthumous *cognomen ex virtute*, a remembrance of the fact that, of all the men of his generation apart from Augustus himself, he was the only one to hold the consulship thrice.[42] If, therefore, we find this legend on the frieze of the Pantheon, this means that the inscription was put there after Agrippa's death as well, replacing the original.

Now, the removal of the original dedicatory inscription and its replacement with another, necessarily commemorative one, signifies the building's redefinition. Searching for the original identity and purpose of the Pantheon, which differ from the meaning and functions it acquired later, and for reflections of this change in its architecture, is not a whim but a desideratum.

42 See, especially, the so-called commemorative type of bronze coin with a bust of Agrippa wearing the *corona rostrata,* with the quoted legend on the obverse and a statue of Neptunus on the reverse, emitted in great quantities by the Roman mint under Tiberius, Caius and early Claudius, and widely imitated outside Italy (*The Roman Imperial Coinage*, I (2nd edition) = RIC, I, note 32). The first issue, with a similar legend (*M AGRIPPA COS TER*) around the head of Agrippa wearing a combined *corona muralis* and *corona rostrata*, appeared on the reverse of denarii struck immediately after Agrippa's death by the *monetalis* Cossus Cornelius Lentulus (RIC, I, note 414). It is worth adding that the evidence of these coins makes it pretty certain that the Neptunus from the commemorative issues represents the god's cult statue of the Basilica Neptuni and that the portrait statues of Agrippa in that building and in the Pantheon portrayed him, respectively, in the *corona rostrata* and the *corona muralis*.

Das Pantheon des Agrippa: Architektonische Form und urbaner Kontext

Andreas Grüner

> Nun machen wir die phantastische Annahme, Rom sei nicht eine menschliche Wohnstätte, sondern ein psychisches Wesen von ähnlich langer und reichhaltiger Vergangenheit, in dem also nichts, was einmal zustande gekommen war, untergegangen ist […]; auf dem Pantheonsplatze fänden wir nicht nur das heutige Pantheon, wie es uns von Hadrian hinterlassen wurde, sondern auf demselben Grund auch den ursprünglichen Bau des M. Agrippa […]. Und dabei bräuchte es vielleicht nur eine Änderung der Blickrichtung oder des Standpunktes von seiten des Beobachters, um den einen oder anderen Anblick hervorzurufen.
> (Sigmund Freud, Das Unbehagen in der Kultur, 1930)

Das Pantheon des Agrippa zählt zu den rätselhaftesten Bauten des augusteischen Rom. Weder seine architektonische Form noch seine Funktion sind bislang hinreichend geklärt. Das liegt vor allem natürlich an der Tatsache, dass die Rekonstruktion des Gebäudes bis vor wenigen Jahren völlig ungewiss war. Erst die Grabungen der späten neunziger Jahre verschafften in vielen Punkten ein klareres Bild von der Situation des ersten Pantheon. Fassen wir, bevor wir näher auf die Interpretation des Gebäudes eingehen, den Befund in knapper Form zusammen.

Aus literarischen Quellen wissen wir nur folgendes: Das Pantheon des Agrippa hatte einen hohen Giebel.[1] Im Giebel standen berühmte Giebelfiguren eines gewissen Diogenes aus Athen, der für denselben Bau Karyatiden gefertigt hat, diese Karyatiden standen auf Säulen (*in columnis*).[2] Im augusteischen Pantheon standen ferner neben anderen Götterbildern eine Statue Caesars, eine Statue des Mars und eine der Venus mit Ohrringen, die aus einer Riesenperle der Kleopatra hergestellt waren.[3] Ausserdem gab es eine Statue des Augustus, der eine Lanze hielt, und eine des Agrippa, die beide in der Vorhalle des Tempels standen.[4] Ferner verbaute Agrippa wertvolle Bronzekapitelle.[5] Unter Domitian (80 n. Chr.) wurde der Bau zum ersten Mal zerstört und renoviert,[6] ein zweites Mal unter Trajan, der, wie wir seit neuestem wissen, auch den noch heute erhaltenen Neubau errichten liess.[7]

Für die architektonische Rekonstruktion des Pantheon des Agrippa sind mehrere Arbeiten von Bedeutung. Erstens Luca Beltramis Berichte der alten Grabung von 1892–1893,[8]

1 Plin. n.h. 36, 38 *in fastigio posita signa (…) propter altitudinem loci minus celebrata.*

2 Plin a.O. *in columnis templi eius Caryatides probantur inter pauca operum.*

3 Dio 53, 27, 3. Die Ohrringe der Venus: Plin. n.h. 9, 58 *comitatur fama unionis eius parem, capta illa tantae quaestionis victrice regina dissectum, ut esset in utrisque Veneris auribus Romae in Pantheo dimidia eorum cena.*

4 Dio a.O.; die Lanze des Augustus: Dio 54, 1, 1.

5 Plin. n.h. 34, 13 *Syracusana sunt in Pantheo capita columnarum a M. Agrippa posita.*

6 Dio 66, 24, 2; Calendarium a. 354, 3; Oros. adv. pag. 7, 12, 5.

7 Vgl. hierzu den Beitrag von Lise Hetland in diesem Band.

8 Beltrami 1898.

erschlossen durch die synoptische Auswertung und Interpretation dieser Berichte durch Kjeld De Fine Licht[9] und Gottfried Gruben[10]; die Berichte der jüngsten Grabungen 1996–1997[11], ergänzt durch Eugenio La Roccas Supplementeintrag im Lexicon Topographicum[12]. Die frühere Lehrmeinung, nach der das Pantheon des Agrippa nach Süden ausgerichtet war, ist durch die neuen Grabungen eindeutig widerlegt worden und muss hier daher nicht mehr erörtert werden (Abb. 1).[13]

Im 19. Jahrhundert fand man unter dem Pronaos des trajanischen Baus ein rechteckiges, 19.82 m langes Podium.[14] Die Nordseite fällt mit dem Podium des heutigen Baus zusammen. Jedoch war der Vorgängerbau mit 43.76 m breiter als der trajanische Pronaos.[15] Im vorderen Bereich des Podiums wurden in regelmässigem Abstand aufeinanderfolgende, durch eine Caementiciumfüllung verbundene Travertinpfeiler nachgewiesen.[16] Bei den Pfeilern kann es sich nur um Stützenfundamente eines dekastylen — bzw. mit Anten oktostylen — Pronaos handeln.[17] Bei den Grabungen von 1996–97 wurden Reste einer der beiden Treppen an den Seiten des ca. 2.25 m hohen, mit Marmor inkrustierten Podiums aufgedeckt.[18] Vor der Front lag ein Travertinplattenpflaster.[19]

Im Süden sprang der vortrajanische Pronaosblock auf einer Länge von ca. 21 m nach Süden vor.[20] Von diesem Risalit konnte nur der westliche Fundamentansatz aus Travertinblöcken dokumentiert werden. Die Südseite des Pronaos besass eine Marmorplattenverkleidung, von der noch Reste im westlichen Bereich nachgewiesen wurden. Die Bereiche seitlich des vorspringenden Baukörpers waren also auf Sicht gearbeitet.[21]
Vom rückwärtigen Teil des vortrajanischen Pantheon sind lediglich Teile einer Pflasterung sowie der Abschnitt einer runden Umfassungsmauer erhalten. Dieser ca. 10 m lange Rest der Umfassungsmauer zieht sich an der Aussenseite des hadrianischen Tambourfundaments entlang und ist, wie G. Gruben verdeutlichte, nur als «freistehende Grenzmauer auf augusteischem Niveau» erklärbar.[22]

Agrippas Pantheon besass also, um diese Befunde zusammenzufassen, einen nach Norden gerichteten Pronaos auf einem langrechteckigem Podium.[23] Dieses Podium wurde durch zwei seitliche Treppen erschlossen, zwischen den Treppen erstreckte sich ein Tribünenvorbau. Die dekastyle Front überragte ein Giebel mit Skulpturen. Ein Risalit, der nach Süden vorsprang, vermittelte zwischen dem rechteckigen Vorbau und dem hypäthralen Temenos dahinter: Bei diesem kreisrunden Sakralbezirk handelte es sich um einen gepflasterten Hof von ca. 44 m Durchmesser, den wohl eine ca. 2 m hohe Mauer begrenzte. Von möglichen weiteren Einbauten im Inneren des Hofes, etwa einer umlaufenden Halle, an deren Front man, ähnlich wie bei den Portiken des Augustusforums, die bezeugten Karyatiden unterbringen könnte, ist nichts nachgewiesen.
Eine schematische Rekonstruktion von Agrippas Pantheon mag die Grössenverhältnis-

9 Fine Licht 1968.
10 Gruben 1997.
11 Battistelli/Virgili 1999. Vgl. den Beitrag von Paola Virgili in diesem Band.
12 La Rocca 1999.
13 Im Folgenden referiere ich in gekürzter Form die bei Grüner 2004, 495 ff. ausführlicher analysierten Ergebnisse der früheren Grabungen, Sondagen und Überlegungen zum augusteischen Pantheon.
14 Fine Licht 1968, 173 ff. mit Abb. 193; Gruben 1997, 55 ff. mit Abb. 29. 30; Battistelli/Virgili 1999, 142 ff. mit Abb. 1 - 10.
15 Fine Licht 1968, 174.
16 Battistelli/Virgili 1999, Abb. 5.
17 La Rocca 1999, 281.
18 Battistelli/Virgili 1999, Abb. 1-6.
19 Battistelli/Virgili 1999, Abb. 7.
20 Fine Licht 1968, 176; Gruben 1997, 55.
21 Battistelli/Virgili 1999, 147 Anm. 40.
22 Zum sog. ‹Muro Cordonato› s. Fine Licht 1968, 260 Anm. 2 zu S. 92; Gruben 1997, 60 mit Abb. 30; La Rocca 1999, 280 f.; Battistelli/Virgili 1999, 148 Anm. 42.
23 Vgl. Grüner 2004, 500.

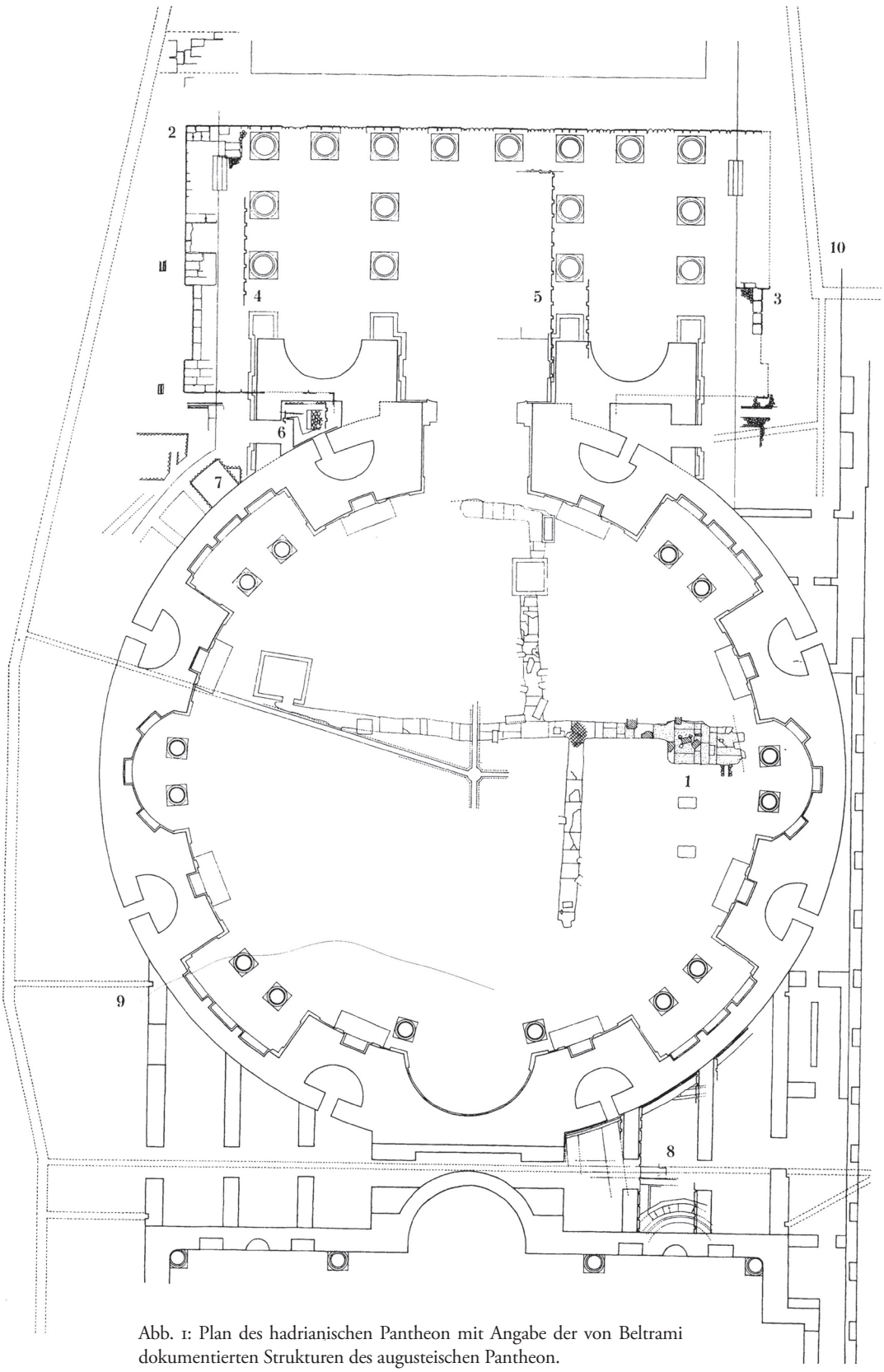


Abb. 1: Plan des hadrianischen Pantheon mit Angabe der von Beltrami dokumentierten Strukturen des augusteischen Pantheon.

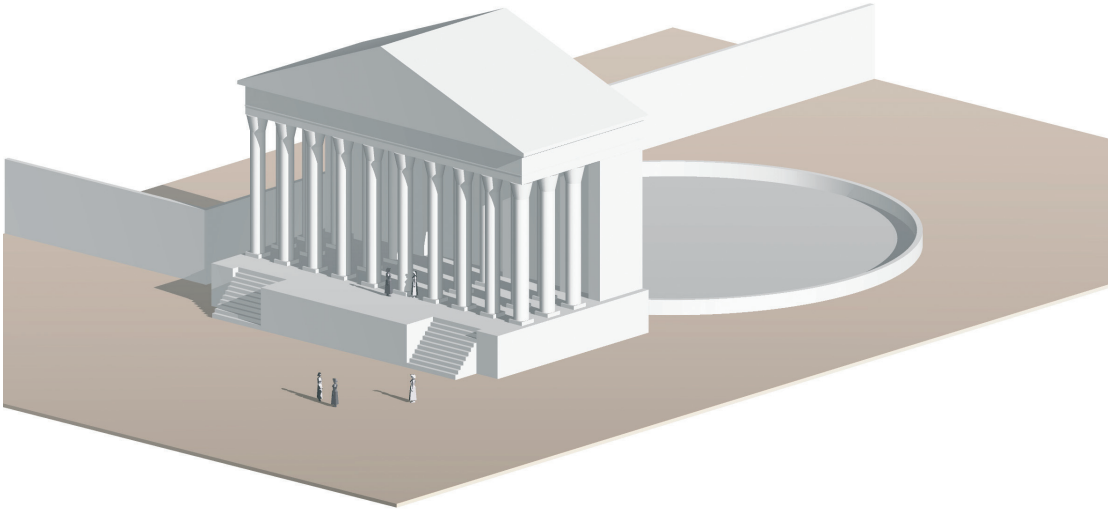


Abb. 2: Hypothetische Rekonstruktion des ersten Pantheon.

se der Baukörper zueinander vor Augen führen (Abb. 2); der stark hypothetische Charakter der Rekonstruktion muss nach dem vorab erläuterten Überlieferungszustand des Gebäudes nicht näher betont werden.

Schon auf den ersten Blick ergeben sich bei dieser eigenwilligen architektonischen Gestalt drei Probleme:

1. In welcher Tradition steht die eigenartige Form eines runden hypäthralen *templum*?
2. Wie kommt es zu der eigenwilligen Kombination eines runden Hofs mit einem monumentalen, zehnsäuligen Pronaos?
3. Warum war das Gebäude nach Norden, und nicht nach Süden, zur Stadt hin orientiert?

Problem Nr. 1, Ursprung und Bedeutung des runden Hofs, soll hier nicht Thema sein. Ich habe an anderer Stelle vorgeschlagen, den Rundbezirk in die Tradition italisch-republikanischer Sakralbezirke in Form runder Höfe zu stellen.[24] Es handelte sich bei diesen Sakralbezirken um runde *templa*, die von einer Mauer umzogen waren. Als Parallele bietet sich hier vor u.a. das sog. Argeerheiligtum archaischer Zeit auf dem Esquilin an.[25]

In der Folge wird es — in einem ersten Schwerpunkt — um die Fragen 2 und 3 gehen, den Fragen nach der Kombination von Pronaos und Rundbezirk und dem Problem der Nordorientierung. Mit dem archäologischen Befund kommen wir nun allerdings nicht weiter, zumindest zum gegenwärtigen Zeitpunkt. Es scheint daher sinnvoll, die genannten Probleme durch einen urbanistischen Ansatz zu lösen. Prinzipiell gilt es, das Verhältnis des Gebäudes zu seinem direkten städtischen Umfeld zu analysieren und damit Bedürfnisse, Möglichkeiten und Zwänge zu klären, die sich wiederum auf die Position und architektonische Gestalt des Gebäudes auswirkten.

24 Grüner 2004, 506 ff.

25 Grüner 2004, 506 f. mit Abb. 5. Zu ergänzen wäre in diesem Zusammenhang, dass die Form des runden Temenos in den wenigen Fällen, in denen wir diese Architekturform im griechischen Bereich nachweisen können, meist mit dem Kult von Heroen in Zusammenhang steht. Wären die Vergleichsbeispiele nicht derart selten, unkonventionell und verstreut, könnte man hier einen architektursemantischen Bezug zum Konzept des ‹Augusteum› herstellen. Übrigens besass auch das Ustrinum des Augustus eine kreisrunde Form, Strabo 5, 3, 8.

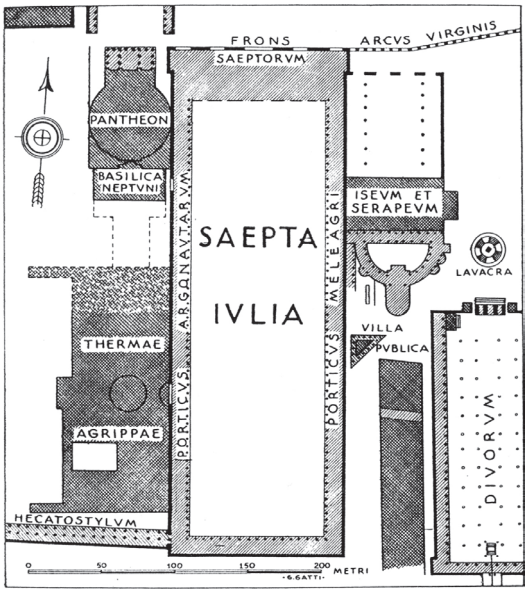


Abb. 3: Die Monumenta Agrippae in der hohen Kaiserzeit (nach Gatti).

Im Gegenzug liefert das Pantheon wichtige Hinweise zur Entwicklung des mittleren und nördlichen Marsfelds. Die urbanistische Entwicklung des Marsfelds und ihre Einflussfaktoren bilden damit den zweiten Schwerpunkt der folgenden Überlegungen.
Zunächst aber einige Bemerkungen zur Baupolitik des Agrippa (Abb. 3 und 4).

Die Baupolitik des Agrippa im Norden der Metropole

Auf den ersten Blick fügt sich das Pantheon fugenlos in das hinlänglich bekannte «ideologische System» ein, in das wir seit Paul Zanker die Produkte der augusteischen Epoche zu pressen gewohnt sind. Im Rahmen der augusteischen Stadterweiterung nach Norden errichtet, sollte es nach Cassius Dio zunächst dem Herrscherkult des Augustus dienen.[26] Dieses *Augusteum* musste Agrippa aber auf persönlichen Wunsch des Prinzeps in *Pantheum* umbenennen.[27] Trotzdem stellte man die Statue des Augustus in der Vorhalle des Gebäudes auf.[28] Insgesamt scheint sich also auch am Pantheon das notorische Bescheidenheitsbemühen des Augustus zu bestätigen.[29]
Dieser vermeintlich eindeutige ideelle Kontext erweist sich bei näherem Hinsehen aber als gar nicht mehr so eindeutig. Das beginnt schon damit, dass man bisweilen die urbane Erweiterung des Marsfelds, wenn schon nicht ausdrücklich, so doch implizit und fälschlicherweise als Werk des Augustus behandelt:[30] Entsprechend leichtfertig unterstellt man dem gesamten Stadtviertel eine einheitliche Konzeption. Tatsächlich findet sich im gesamten nördlichen Marsfeld bis in das Jahr 13 v. Chr. aber nur ein einziges Gebäude, das tatsächlich von Augustus errichtet wurde: sein Grabmal.[31] Und auch danach hält sich der Prinzeps mit Neubauten sehr zurück. Bis zu seinem Tode baut er auf dem Marsfeld nur seinen Verbrennungsplatz und

26 Dio 53, 27, 3.

27 Der Name *Pantheum* zum ersten Mal bei Plin. n.h. 9, 58. 34, 13. 36, 38; vgl. die Arvalbrüderakten zum Jahre 59 (CIL vi 2041).

28 Dio a.O.

29 Vgl. Zanker 2003, 146.

30 Bezeichnenderweise wird bei der Besprechung der Bauaktivitäten Agrippas auf dem Marsfeld bei Zanker 2003, 144 ff. die Selbstdarstellung Agrippas als «sehr zurückhaltend» markiert. Diane Favro (Favro 1996, 119) versucht die Abhängigkeit von Augustus folgendermassen zu begründen, wenn sie im Bezug auf die Bauten des Agrippa im Marsfeld äussert: «In effect, by championing piety and the restoration of the Republic, the princeps implied all environmental changes in Rome resulted from his efforts.» Tatsächlich gibt es keinen Hinweis dafür, dass Augustus das Bauprogramm seinem Schwiegersohn diktierte; die tiefgreifenden Unterschiede zwischen den Bauprogrammen beider Männer sprechen eher dafür, dass Agrippa eigenständig agierte, freilich in engster Rücksprache mit dem Machthaber.

31 Zur Datierung des *Tumulus Iuliorum* vgl. von Hesberg/Panciera 1994, 54 f. Zum Mausoleum des Augustus vgl. ferner Davies 2000, 137 ff.; Rehak 2006, 35 ff.

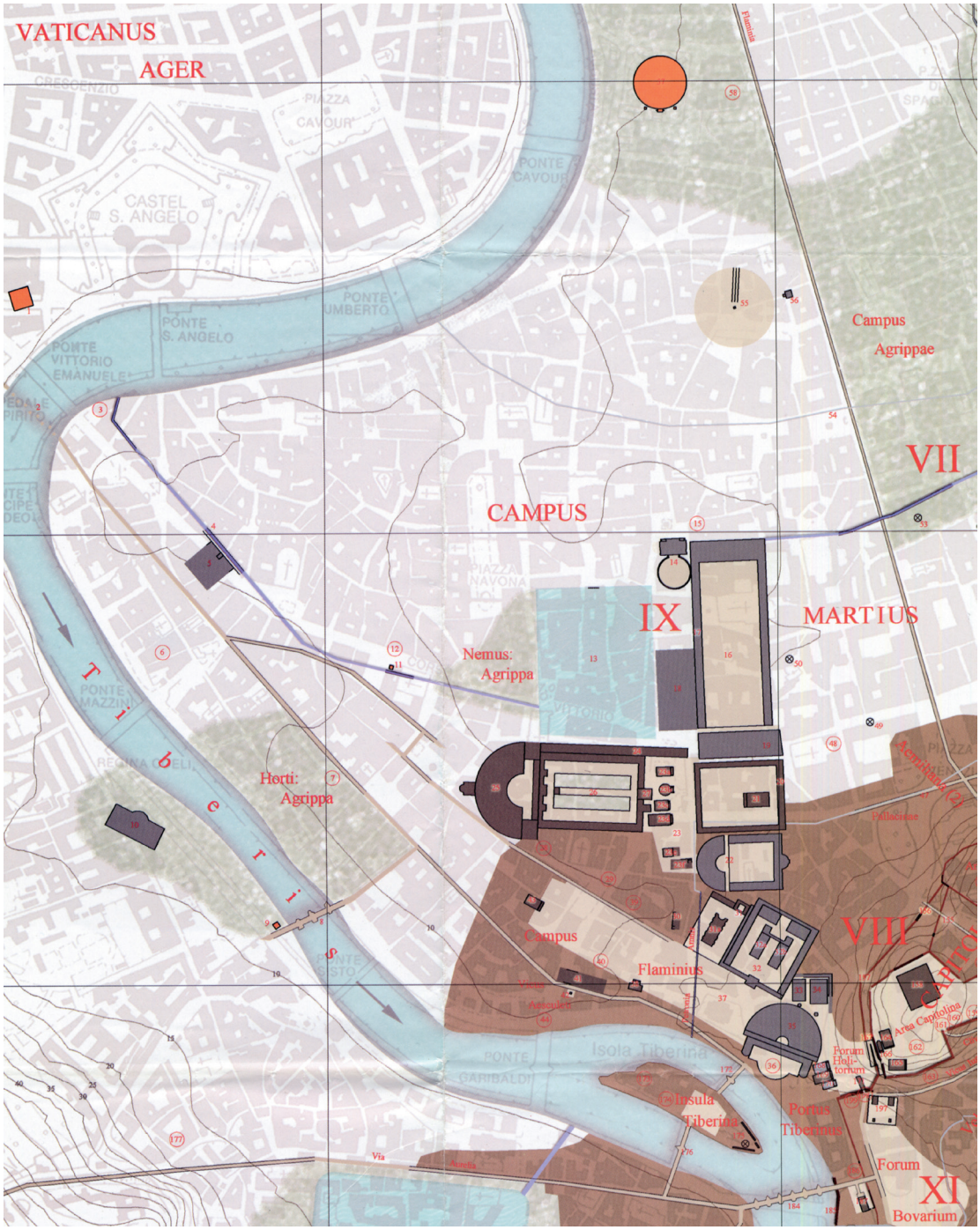


Abb. 4: Die Bebauung des Marsfelds in augusteischer Zeit (nach Haselberger).

die ‹Sonnenuhr›.[32] Diese wenigen Gebäude konzentrieren sich ausserdem in einem relativ kleinen Bereich des Campus, im Zwickel zwischen Via Flaminia und Tiber.

Die eigentliche urbane Systematisierung leistete ein anderer, Agrippa.[33] Nur zu selten macht man sich klar, in welchem Ausmass Agrippa im Norden Roms tätig wurde. Seine Neubauten entstanden zum grossen Teil auf privatem Boden — Boden, der von Pompeius über Mark Anton in seinen Besitz gelangt war.[34] Die Gebäude, Park- und Freizeitanlagen zogen sich wie ein riesiger Gürtel von Trastevere bis zum Pincio. Dieser Gürtel setzt im Westen mit dem Pons Agrippae ein, der das Marsfeld mit dem etruskischem Tiberufer verband.[35] Diese Brükke trug ein ganzes Statuenprogramm augusteischer Zeit, darunter zwei doppelt lebensgroße Bronzestatuen und eine Victoria; vor allem aber war an den Pfeilern der Brücke ein Pegelmesser in Form einer Skala angebracht, welche den Tiberstand in Fuss mass.[36]

Im westlichen Marsfeld folgten entlang des Tibers riesige Parkanlagen, die Horti Agrippae, der suburbane Wohnsitz Agrippas.[37] Parkanlagen prägten auch das folgende Areal; nördlich des Pompeiustheaters erstreckte sich das Nemus Agrippae, ein öffentlicher Garten.[38] Ein grosser künstlicher Zierkanal, der sog. Euripus, durchzog diesen Park — ein Architekturelement, das in den spätrepublikanischen Villen gang und gäbe war.[39] Agrippa übertrug es hier, zum Wohl des *populus Romanus*, ins Gigantische. Der Kanal wiederum entwässerte einen riesigen Pool von ca. 45'000 Quadratmetern Wasserfläche, das Stagnum Agrippae.[40]

Mit dem Stagnum sind wir bereits bei den Agrippabauten des zentralen Marsfelds. Diese Bauten wurden offenbar als monumentale urbane Einheit wahrgenommen, obwohl die Funktionen der einzelnen Bauwerke sehr unterschiedlich waren. Ihr verbindendes Glied war der Bauherr, Agrippa, und so bezeichnet Tacitus später den gesamten Komplex als *Monumenta Agrippae*[41] — das ist für die Interpretation des Kontexts insofern bemerkenswert, als in der Semantik des Wortes *monumentum* natürlich Architekturen wie Grabmäler und Siegeszeichen mitschwingen.

Diese Monumenta umfassten zunächst die riesigen Saepta, das alte republikanische Wahlgelände.[42] Caesar hatte mit der Monumentalisierung des Gebäudes begonnen, zumindest der Rohbau wurde durch M. Aemilius Lepidus fertiggestellt, und Agrippa weihte 27 v. Chr. die Anlage ein. Sie umfasste mindestens zwei Hallen von jeweils mehr als 300 Metern Länge. Mit mehr als 35'000 Quadratmetern schuf Agrippa hier das zweitgrösste Gebäude Roms nach dem Circus Maximus. Agrippa hatte offenbar entscheidenden Anteil am Erschei-

32 Zum Ustrinum und seiner höchst umstrittenen Lokalisierung zuletzt Rehak 2006, 33 ff.; zum ‹Horologium› ebd. 79 ff., mit einer erneuten, ausführlichen Diskussion der Thesen Buchners, die in der Tendenz zu einer bedenkenswerten, teilweisen Rehabilitierung von dessen scharf kritisierten Ergebnissen führen.

33 Die Bautätigkeit Agrippas auf dem Marsfeld behandeln ausführlicher Shipley 1933, 37 ff.; Tortorici 1990; Roddaz 1984, 249 ff. (zum Pantheonensemble 261 ff.) mit scharfsinniger Gesamtbewertung 295 ff.; La Rocca 1984, 87 ff.; Wiseman 1993, 223; Favro 1996, 206 ff. 252ff.; Haselberger 2002, 75 ff. s.v. Campus Martius; Kolb 2002, 346 ff.; Zanker 2003, 144 ff.; Grüner 2004; Rehak 2006, 20 ff.; Tietz 2006.

34 Den Grundbesitz Agrippas in Rom diskutiert Roddaz 1984, 238 ff.; zur Besitzverteilung auf dem Marsfeld vgl. auch La Rocca 1984, 96 mit Anm. 39; Haselberger 2002, 142 s.v. Horti Agrippae.

35 Zum Problem des Pons Agrippae eingehend Shipley 1933, 66f.; Lloyd 1979; Roddaz 1984, 282 ff.; Coarelli 1999; Haselberger 2002, 191 f. s.v. Pons Agrippae.

36 Coarelli 1999, 107.

37 Roddaz 1984, 238 ff.; Coarelli 1996; Haselberger 2002, 141 f. s.v. Horti Agrippae.

38 Haselberger 2002, 180 f. s.v. Nemus: Agrippa.

39 Shipley 1933, 53 ff.; Lloyd 1979; Roddaz 1984, 282 ff.; Romanelli 1990, 52; Coarelli 1995; Haselberger 2002, 121 f. s.v. Euripus. Zum Villenbezug Zanker 2003, 145 ff.

40 Lloyd 1979; Roddaz 1984, 282 ff.; Buzzetti 1999; Haselberger 2002, 235 s.v. Stagnum Agrippae.

41 Tac. ann. 15, 39.

42 Shipley 1933, 37 ff.; Gatti 1934; Gatti 1937; Roddaz 1984, 256 ff.; Tortorici 1990, 21 ff.; Gatti 1999; Haselberger 2002, 219 s.v. Saepta Iulia; Tietz 2006, 185.

Abb. 5: Rom, Arkaden der Aqua Virgo unter dem Palazzo Sciarra.

nungsbild des Gebäudes, denn noch später war dieser Komplex als *Porticus Agrippiana*[43] und *Saepta Agrippiana*[44] bekannt. Fast vergessen ist ein weiterer Bau der Superlative, das Diribitorium, die Wahlhalle, welche die Saepta im Süden abschloss.[45] Hier konstruierte Agrippa das grösste jemals in Rom errichtete Dach mit Balken von 100 Fuß Spannweite. Als der Dachstuhl unter Titus verbrannte, war man nicht mehr in der Lage, die Konstruktion zu renovieren und liess das Diribitorium als offenen Hof stehen.

Westlich der Saepta schlossen sich die 12 v. Chr. geweihten, ein bereits 25 v. Chr. inauguriertes *Laconicum* ersetzenden oder erweiternden Agrippathermen an, die erste monumentale Thermenanlage Roms;[46] nördlich davon befand sich wohl ein Vorläufer der hochkaiserzeitlichen Basilica Neptuni;[47] dann folgte das Pantheon.

Mit diesen Gebäuden war die Reihe der Neubauten, die Agrippa auf dem Campus Martius errichten liess, aber nicht zu Ende. Quer über das östliche Marsfeld zogen sich die Arkaden der 19 v. Chr. eingeweihten Aqua Virgo (Abb. 5), die Thermen, Stagnum, Euripus und den Rest des Marsfelds mit Wasser versorgte.[48] Auf der anderen Seite der Via Flaminia folgte eine weitere riesige Anlage, der Campus Agrippae;[49] leider kennen wir von diesem Areal so gut wie nichts. Zumindest gab es hier nach Cassius Dio wieder grosse Grünanlagen mit *dromoi* (Prachtalleen) und einen weiteren Grossbau, die Porticus Vipsania, errichtet von Vipsania Polla, der Schwester des Agrippa[50]. In der Halle installierte Augustus nach Agrippas Tod dessen grosse Karte des römischen Reiches.

43 Schol. in Iuv. 6, 153; zur eindeutigen Identifikation mit den Saepta vgl. Haselberger 2002, 236 s.v. Stoa of Poseidon.

44 SHA Alex. 26.

45 Tortorici 1990, 26 ff.; Torelli 1995; Haselberger 2002, 102 f. s.v. Diribitorium.

46 Hülsen 1910; Shipley 1933, 47 ff.; Lloyd 1979, 196; Roddaz 1984, 278 ff.; Tortorici 1990, 47 ff.; Ghini 1999; Haselberger 2002, 244 f. s.v. Thermae: Agrippa.

47 Zur verwirrenden Diskussion um die Basilica Neptuni / Stoa Poseidonos / Poseidonion / Porticus Agrippae / Porticus Agrippiana am klarsten Haselberger 2002, 236 f. s.v. Stoa of Poseidon. Vgl. zuletzt Tietz 2006, 189 ff.

48 Lloyd 1979; Le Pera 1990; Haselberger 2002, 49 s.v. Aqua Virgo.

49 Roddaz 1984, 291 ff.; Haselberger 2002, 72 s.v. Campus Agrippae.

50 Haselberger 2002, 208 s.v. Porticus Vipsania.

Diese Systematisierung der stadtrömischen Peripherie wirkt sehr kohärent. Agrippa gelang es, innerhalb weniger Jahrzehnte das gesamte nordwestliche Suburbium mit einem breiten Gürtel an Neubauten und Parkanlagen zu erschliessen, die Stadt zu erweitern und gleichzeitig auf monumentale Weise abzuschliessen.[51] Auf die Person des Augustus deutet bei diesem Grossprojekt aber nur wenig hin; vielmehr sind alle Bauten bereits durch ihren Bauherrn direkt mit Agrippa verbunden, was sich zunächst in der Namensgebung vieler Bauten, später noch klarer im kumulativen Begriff der *Monumenta Agrippae* äussert.

So einheitlich der Gesamtplan wirkt, so schwer scheint es aber, die Funktion der einzelnen Bauten auf einen Nenner zu bringen. Auch ein übergreifendes Programm erschliesst sich nicht auf den ersten Blick. Auffällig ist zunächst nur, dass es sich bei den meisten Bauten um reine Nutzbauten handelt. Die einzige Sakralarchitektur — und damit stossen wir bereits auf die erste Merkwürdigkeit — ist das Pantheon. Das Pantheon fällt aber auch in anderer Hinsicht aus dem Konzept Agrippas. Was aber ist das Konzept Agrippas?

Das Konzept Agrippas

Es gibt nun tatsächlich ein Stichwort, dem sich fast alle Bauprojekte Agrippas unterordnen, und das ist das Element des Wassers. Auf dem Marsfeld wird das besonders deutlich. Lassen wir die Bauten vor diesem Hintergrund noch einmal Revue passieren: Da war eine Brücke mit Wasserstandsanzeiger an den Pfeilern; eine langer künstlicher Kanal; ein riesiges Schwimmbecken; die Thermen; und schliesslich ein neuer, aufwendiger Aquädukt, der das ganze Viertel mit Wasser versorgte. Nicht nur in der Funktion der Bauten, sondern auch in der Nomenklatur offenbart sich das Thema. Die westliche Halle der Saepta nannte man nach einem grossen Gemälde der Argonauten die Porticus Argonautarum; daneben stand die Basilica Neptuni; schliesslich erwähnt Cassius Dio ein Poseidonion, das beim Brand des Jahres 80 n. Chr. zerstört wurde und wohl auch auf Agrippa zurückgeht.

Abb. 6: Paris, Louvre, Campanaplatte mit der Darstellung der von Agrippa im Circus Maximus aufgestellten ‹Delphine›.

Diese auffällige Häufung von wassertechnischen Anlagen beschränkte sich nicht nur auf das Marsfeld. Auch in der Stadt selbst beschäftigte sich Agrippa vor allem mit dem Thema Wasser, und das seit seiner Ädilität im Jahre 33 v. Chr. So liess er in ganz Rom Hunderte von Brunnen aufstellen, die alten Aquädukte restaurieren, die Aqua Julia und die Aqua Virgo neu errichten und etablierte vor allem einen umfassenden Verwaltungsapparat, der die Grundlage der Wasserversorgung Roms für die gesamte folgende Kaiserzeit bilden sollte.[52] Viele davon waren architektonisch und plastisch reich dekoriert; so etwa der Lacus Servilius bei der Basilica Iulia mit

51 Rehak 2006, 22. «Thus, by his death, Agrippa had extended a string of important edifices, framed by public gardens, across the entire Campus from east to west.»

52 Zu diesen Massnahmen mit umfassendem Quellennachweis Roddaz 1984, 148 ff.

Abb. 7: Glanum (Saint-Rémy-de-Provence), Tempel der Valetudo, Dedikationsinschrift des Agrippa.

einer Skyllastatue.[53] Die Cloaca Maxima restaurierte Agrippa vollständig, um zur Einweihung mit einem Boot die gesamte Kloake abzufahren.[54] Selbst bei eigentlich ganz anders kontextualisierten Projekten verwies Agrippa auf das Wasser: Einen der beiden neuen Rundenanzeiger im Circus Maximus errichtete er 33 v. Chr. nicht nur in Form von sieben Delphinen, sondern machte aus der ganzen Anlage auch noch einen Brunnen (Abb. 6).[55]

Agrippa setzte sein Konzept auch noch in den Provinzen fort: In Glanum in Südfrankreich monumentalisierte er eine Quelle als Nymphäum und liess an der gleichen Stelle einen Tempel für Valetudo errichten (Abb. 7).[56] Nicht weit davon entfernt in Nîmes konstruierte Agrippa mit dem grössten Aquädukt des Reiches eine der ‹Ikonen› der römischen Architektur, den Pont du Gard,[57] in Nîmes selbst ist die erste Systematisierung des grossen Quellbezirks in augusteischer Zeit wohl auch auf Agrippa zurückzuführen.[58]

Woher rührte dieses ausserordentliche Interesse an Wasserbauten? Die Verwaltung der Ädilität und das Amt des curator aquarum, das Agrippa einrichtete und bis zu seinem Tod innehatte, erklären dieses Interesse weniger, als dass sie dessen Folge wären. In der Vergangenheit wurde mehrfach der Zusammenhang zwischen den militärischen Leistungen Agrippas im Bürgerkrieg und dessen deutlicher Akzentuierung Neptuns betont. Dieses Konzept demonstrieren sehr eingängig die Münzen.[59] Auf ihnen trägt Agrippa in vielen Fällen die *corona rostrata*.[60] Sie erinnert im speziellen an die entscheidende Rolle Agrippas bei den Seesiegen von Mylae, Naulochos und Actium, im allgemeinen an die Funktion Agrippas als Flottenchef des Augustus.

Agrippa — beziehungsweise seine Zeitgenossen — stilisierten die *corona rostrata* zum Markenzeichen des Agrippa. Mit ihr erscheint er nicht nur auf zahlreichen Münzen, sondern

53 Fest. ed. Lindsay 370-372 *Servilius Lacus (…) in quo loco fuit effigies Hydrae posita a M. Agrippa.*

54 Berühmt der Preis der Kloaken bei Plin n.h. 36, 104; s.a. Dio 49, 43, 1.

55 Zu den Delphinen im Circus Humphrey 1986, 262 ff.

56 Zu diesem Ensemble Roddaz 1984, 396 f.

57 Zum Pont du Gard und der Wasserversorgung des antiken Nemausus vgl. die neueren Publikationen von Fabre u.a. 2000; Veyrac 2006; auf Agrippa spezifiert Roddaz 1984, 398 ff.

58 Roddaz 1984, 398 f.

59 Zur Münzprägung des Agrippa Roddaz 1984, 593 ff.; Grant 1990.

60 In Kombination mit der Mauerkrone; auf Prägungen des C. Marius Tromentina, des C. Sulpicius Platorinus und des Cossus Cornelius Lentulus, Roddaz 1984, 601 f., Nr. a. b1. c1. Abb. 2; vgl. die späteren Asse ebd. 610. S. a. Grant 1990, Abb. 5 (BMC 1 S. 23 Nr. 110).

Abb. 8: Agrippa mit corona navalis. Auf der Rückseite Figur des Neptun. Postumer As des Caligula.

auch auf Gemmen,[61] und sogar im achten Buch der Aeneis. Dort heisst es: *parte alia ventis et dis Agrippa secundis / arduus agmen agens, cui, belli insigne superbum, / tempora navali fulgent corona rostrata* «die Schläfen glänzen ihm vom Kranz mit den Schiffsvorderteilen, jenem grossartigen Siegeszeichen.»[62] Sein Porträt zeigen auch Reliefs in Verbindung mit dem pars-pro-toto des *rostrum*, so auf dem marmornen Schiffsschnabel in Leipzig, wo Agrippa von einer Victoria gekrönt wird.[63] Die Affinität der Person Agrippas zum Themenkreis Meer/Flotte wurde nach seinem Tod noch gesteigert. Unter Caligula werden Asse geprägt, auf der Vorderseite Agrippa erscheint, während die Rückseite Neptun zeigt (Abb. 8–10).[64]

Abb. 9: Leipzig, Antikenmuseum der Universität, marmorner Schiffsschnabel augusteischer Zeit mit der Darstellung von Agrippa mit Victoria.

Abb. 10: As, Münzstätte Nemausus, 10–14 n. Chr. Porträts von Agrippa und Augustus auf dem Avers.

Vor diesem Hintergrund erscheint es kein Zufall, dass sich die Bautätigkeit Agrippas vornehmlich auf Wasserarchitekturen konzentrierte. Dass die Errichtung eines Neptunium und die Wahl Neptuns zum persönlichen Schutzgott auf Agrippas Seesiege rekurrieren, ist offensichtlich und wurde in der Nachfolge Paul Zankers mehrfach betont.[65]

Das Konzept Agrippas ist aber umfassender. Nicht nur die Ikonographie des Agrippa, das Neptunium, die Porticus Argonautarum und das Amt des curator aquarum sind Teil einer konsequenten Selbststilisierung, sondern auch die auffällige Konzentration auf Wasserbauten. Das Grundmotiv dieser Stilisierung, das Wasser, leitete sich von den prägenden und historisch entscheidenden Leistungen Agrippas als Flottenkommandant ab. Das galt also auch für die Funktion zahlreicher Architekturen: Die Wasserbauten verwiesen den Betrachter — ebenso wie die Wassersymbolik in der Ikonographie — immer wieder auf diese Taten zurück. Insofern konnte man die Bezeichnung *monumenta Agrippae* für die Bauten des Marsfelds tatsächlich im Sinne von Siegesmonumenten interpretieren.

Von einer besonderen, von der Forschung des öfteren (wohl unter dem Eindruck von Cassius Dio 53, 23, 4[66]) behaupteten Bescheidenheit,[67] was Agrippas architektonische Selbstrepräsentation im Allgemeinen

61 So etwa auf den Exemplaren in der Bibliothèque Nationale in Paris: Roddaz 1984, 631 f. mit Abb.40 f.

62 Verg. Aen. 8, 682 ff.

63 Zanker 2003, 89 mit Abb. 63; Roddaz 1984, 628.

64 Zu dieser Prägung eingehend Roddaz 1984, 607 ff. mit Abb. 5; Grant 1990, 15 f. Nr. 10. mit Abb. 9.

65 Zanker 2003, 147; Kolb 2002, 350; Tietz 2006, 196 f.

66 Favro 1996, 119 leitet die verallgemeinernde Bemerkung «the renown associated with each major architectural projects in Rome gradually came to reflect back to the fame of Rome's first citizen» explizit aus dieser Passage her.

67 Zuletzt Tietz 2006, 198, vgl. Zanker 2003, 147.

und im Generellen gegenüber Augustus betrifft, kann unter diesen Voraussetzungen allerdings kaum mehr die Rede sein. Jeder Zeitgenosse wusste, wem er die Trabantenstadt im Norden zu verdanken hatte, und jeder erkannte die symbolische Programmatik der architektonischen Funktion und Nomenklatur. Spätestens in der Vorhalle des Pantheon, wo die Statue Agrippas selbstbewusst derjenigen des Princeps gegenüberstand,[68] dürfte die Rolle Agrippas jedem Betrachter deutlich geworden sein.

Es versteht sich von selbst, dass bei der Auswahl der Bauprojekte nicht ausschliesslich (und vielleicht sogar nicht vorrangig) die programmatischen Überlegungen Agrippas massgeblich waren, sondern dass hier natürlich auf verschiedenste Bedürfnisse Rücksicht genommen wurde.[69]

Da sind zunächst die — implizit oder explizit geäusserten — Wünsche breiter Bevölkerungsschichten der Hauptstadt. Jene Annehmlichkeiten, die den Mitgliedern der Oberschicht schon lange zugänglich waren, konnten nun aufgrund der technischen und finanziellen Möglichkeiten ins Monumentale gesteigert, auch der Masse eröffnet werden.[70] So entstanden die grossen Parks, Hallen, Bäder und Pools, obligate Elemente der republikanischen Villenarchitektur, und das berühmte Diktum des Agrippa, die Gemälde und Skulpturen sollten aus dem Exil der Senatorenvillen befreit werden, bringt diesen Aspekt auf den Punkt.[71]

Hinter den Bauten Agrippas stand natürlich auch das — wohl in nicht geringerem Masse von Aussen herangetragene — Gebot der augusteischen Urbanistik, das Erscheinungsbild der Hauptstadt demjenigen der hellenistischen Metropolen anzunähern, ja diese darin zu übertreffen.[72]

Innerhalb dieser Rahmenbedingungen liegt die Entscheidung Agrippas, das Element des Wassers in programmatischen Zusammenhang mit der eigenen Person zu stellen, auf der Hand, eignen sich Wasserbauten doch einerseits hervorragend für Vergnügungsstätten jeglicher Art, andererseits kann die Integration von Wasseranlagen den repräsentativen Wert eines Gebäudes, ja eines ganzen Stadtviertels, enorm heben. Das Element des Wassers in dieser Weise für sich zu nutzen, war damit ein ebenso naheliegender wie genialer Schachzug. In der Gesamtheit betrachtet, stellt sich damit auch nicht die Frage, inwieweit jedes einzelne Gebäude Agrippas vom Betrachter als Teil dieser Idee wahrgenommen und vom Bauherrn durch Inschriften und Symbole explizit in diesem Sinne markiert wurde; letzteres dürfte vom Neptunium bis zum Pont du Gard in unterschiedlichen Graden geschehen sein. Der konzeptuelle Hintergrund von Agrippas Bauaktivitäten dürfte jedoch keinem, der unter Augustus durch die zahlreichen Wasserbauten des mittleren Marsfelds streifte, entgangen sein.

Innerhalb dieser Konzeption ist das Pantheon nun allerdings ein Fremdkörper. Im Gegensatz zu den meisten anderen Bauten Agrippas hatte es — zumindest soweit wir wissen — nichts mit Wasser, Schiffen oder Neptun zu tun; abgesehen davon, dass sich vielleicht schon unter Augustus direkt hinter dem Pantheon die Basilica Neptuni anschloss. Es fiel also nicht nur in seiner Funktion als Sakralbau, sondern auch in seiner Konzeption als Gebäude, das nicht direkt mittels Wassersymbolik auf die Person des Agrippa verweist, aus dem Rahmen der übrigen Neubauten des Marsfelds.

Das erklärt sich sehr leicht durch die Funktion, die dem Pantheon zunächst zugedacht war; wie erwähnt, wollte Agrippa ein *Augus-*

68 Dio 53, 27, 3.

69 Die vielfältigen Hintergründe der Baupolitik des Agrippa umreisst sehr ausgewogen Roddaz 1984, 295 ff.

70 Zum Vorbild der Villa für die Bauten auf dem Marsfeld Zanker 2003, 146.

71 Plin. n.h. 35, 26 *exstat eius oratio magnifica et maximo civium digna de tabulis omnibus signisque publicandis, quod fieri satius fuisset quam in villarum exilia pelli.*

72 Zum Vorbild der hellenistischen Metropolen, insbesondere Alexandrias, für Agrippa s. Roddaz 1984, 297 f.

teum bauen. Als solches war es natürlich auf die Person des Augustus bezogen. Nur leicht kaschiert stand das Pseudo-Augusteum damit als Pendant dem Neptunium programmatisch gegenüber, so wie das Porträt des Agrippa auf Münzen dem Porträt des Augustus zugesellt war, auf anderen Agrippa an der Seite des Augustus sass[73] — und wie in der Vorhalle des Pantheon die Statue des Prinzeps der Statue seines Admirals gegenüberstand. Diese Dichotomie Augustus-Agrippa, die sich nicht nur in der Ikonographie, sondern natürlich auch in der realen Machtausübung manifestierte, sollte, wie wir sehen werden, auch für die urbanistische Neugestaltung des Campus Martius von entscheidender Bedeutung sein. Damit kommen wir zum urbanistischen Kontext des Pantheon.

Die problematische Nordausrichtung des Pantheon

Die Ausrichtung des augusteischen Pantheon nach Norden stellt für einen stadtrömischen Tempel — wie auch für römische Tempel im allgemeinen — eine seltene Ausnahme dar. Die Probleme beginnen dabei bereits mit der auffällig exakten Orientierung nach einer Himmelsrichtung; dies könnte allerlei Anlass zu kosmologischen Spekulationen bieten, an denen es beim Pantheon ja bekanntermassen nicht gerade mangelt.[74] Ein Blick auf Lothar Haselbergers Plan des augusteischen Rom zeigt allerdings, dass die Nord-Südausrichtung — die im Übrigen nicht ganz exakt ist — eine Folge des urbanistischen Kontexts ist (Abb. 11).

Ausschlaggebend für die Orientierung der Gebäudekomplexe im mittleren Marsfeld waren ganz offensichtlich frühere Bauten in dieser Gegend: der Tempelbezirk am Largo Argentina und die Porticus Minucia. In leichter Abweichung verlängert zunächst Pompeius diesen Komplex nach Westen Richtung Tiber. Sein Konkurrent Caesar lässt es sich daraufhin nicht nehmen, in unmittelbarer Nachbarschaft einen eigenen Grossbau von nahezu den gleichen Dimensionen zu beginnen, die später von Lepidus und Agrippa vollendeten Saepta. Auch er richtet diesen Grossbau an der Minucia aus, diesmal aber an ihrer Nord-Südachse, und zwar im Anschluss nach Norden. Cornelius Balbus schliesslich füllte den übriggebliebenen Raum nach Süden, wiederum in Anlehnung an die Nord-Südachse der Porticus Minucia, mit seinem Theater samt Crypta.

Für Agrippa gab es keinen Anlass, von dieser vorgegebenen Orientierung abzuweichen. Das Viertel wuchs also wie heutzutage ein Gewerbegebiet: An die Saepta und das Diribitorium lehnten sich im Westen die Agrippathermen, nördlich davon vielleicht die Basilica Neptuni und dann auf jeden Fall das Pantheon an; und daran wiederum orientierte sich das grosse Stagnum, wie die Anfang der achtziger Jahre aufgedeckten Reste des Nordeingangs zweifelsfrei belegen.[75]

Die Nord-Südorientierung des Pantheon verschuldet sich also zweifelsohne dem urbanistischen System des mittleren Marsfelds.

Das erklärt nun aber keineswegs, weshalb sich das Pantheon des Agrippa nach Norden öffnete. Diese seit den Grabungen der neunziger Jahre unbestreitbare Tatsache scheint zunächst nicht sonderlich spektakulär; die Nordorientierung des Pantheon ist heute so selbstverständlich, dass man sie nicht weiter hinterfragt.

Im urbanistischen Kontext der augusteischen Zeit liegen die Dinge aber anders. Denn so gut wie alle voraugusteischen Tempel des südlichen Marsfeld orientieren sich entweder am Stadtzentrum, also nach Süden, oder sie halten sich an eine der Ausfallstrassen, die nach

73 BMC 1 S. 23 Nr. 110 (AV Proträt des Augustus, RV Porträt des Agrippa); BMC 1 S. 23 Nr. 115 (RV: Augustus und Agrippa auf dem Bisellium sitzend. Vgl. Grant 1990, die genannten Prägungen dort Nr. 6 und 7.

74 Extremes Beispiel für zügellose Interpretationswut im Falle des Pantheon: Sperling 1999.

75 Ghini 1988, 169 ff. Taf. 31. Abb. 18–20; Buzzetti 1999, 344.

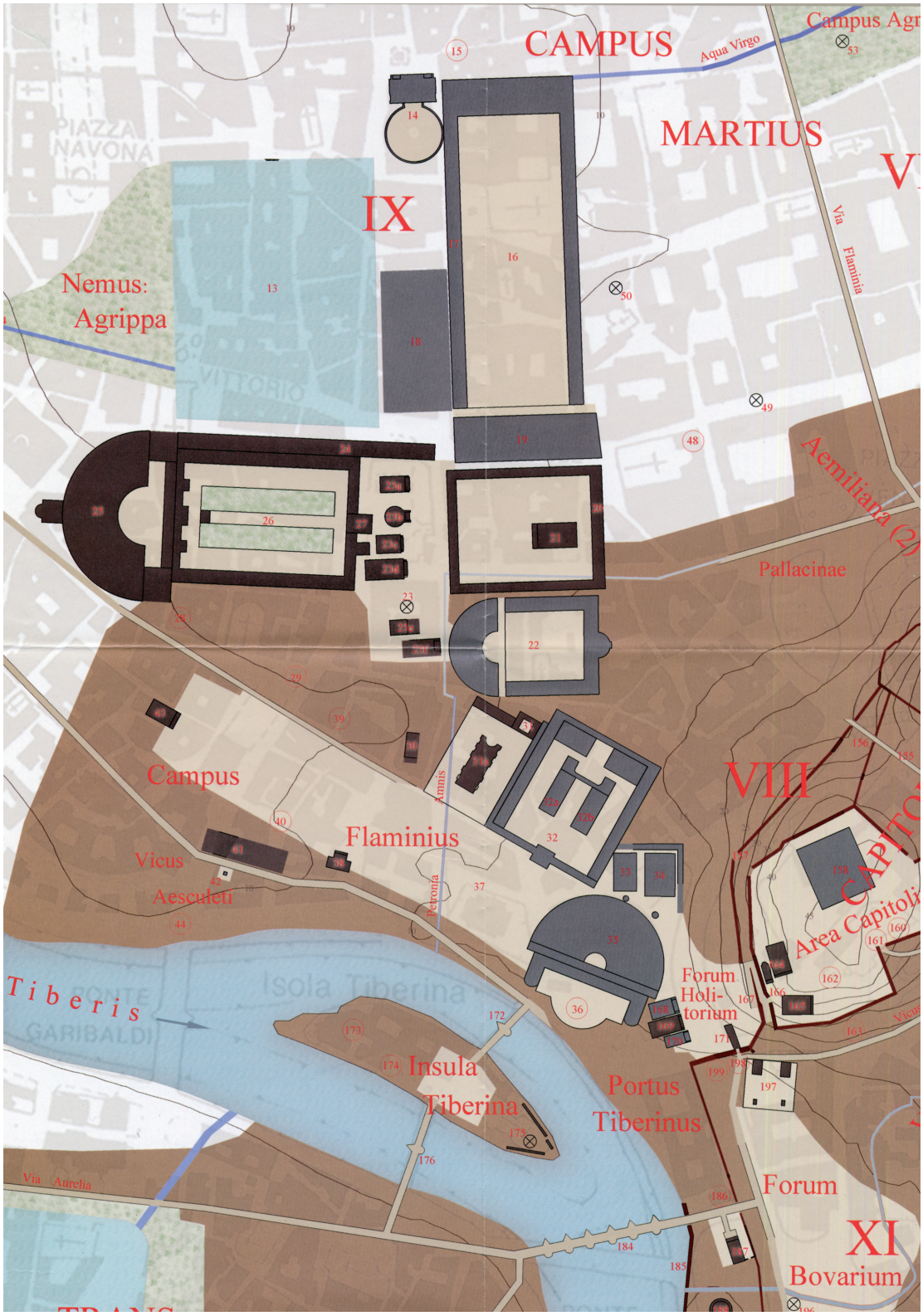


Abb. 11: Die Orientierung der Bauten des mittleren Marsfelds in augusteischer Zeit (nach Haselberger).

Norden beziehungsweise Nordwesten aus der Stadt herausführten. So blickten Bellona- und Apollo Medicus-Tempel auf die Porta Triumphalis. Die benachbarten Tempel der Porticus Metelli richteten sich auf den Circus Flaminius; und den Circus Flaminius passierte jeder Römer, der vom Forum Boarium aus Richtung Nordwesten ging. Die Tempel am Largo Argentina präsentieren sich den Besuchern des Marsfelds, die von der Via Lata kommen. Der Tempel in der Porticus Minucia vetus zeigt zwar nach Westen, befindet sich aber in einem geschlossen Hallenkomplex und bietet demjenigen die Stirn, der die Hallen vom Largo Argentina aus betritt — dem urbanen Verteiler dieses Quartiers.

Die riesige, möglicherweise zehnsäulige Front des Pantheons aber zeigt nach Norden. Sie wendet sich fast demonstrativ von der Stadt ab. Dass sie damit dem Reisenden, der sich auf der Via Flaminia von Norden der Stadt nähert, einen imposanten Prospekt bieten möchte, erscheint als alleinige Begründung mehr als fraglich; das Pantheon ist dafür viel zu weit von der Straße entfernt, an der engsten Stelle nämlich immer noch mehr als 300 Meter; darüberhinaus dürfte die Strassenrandbebauung der Via Flaminia, wohl in erster Linie Gräber, einen freien Blick in vielen Bereichen verhindert haben. Wieso hat man den Tempel also nicht nach Süden ausgerichtet — in Richtung der neuen Thermen, als großartigen Blickfang für die Passanten, die an den Rändern des Stagnum, im Hain des Agrippa und am Euripus entlang flanieren?

Feld und Fassade

Nun ist eine Fassade, noch dazu eine solch monumentale wie die des augusteischen Pantheon, nur dann sinnvoll, wenn sie sich an ein grosses Publikum richtet. Daher plaziert man aufwendige Fassaden meist an denjenigen Stellen, an denen möglichst viele Passanten gezwungen sind, diese Fassade zu betrachten; an urbanen Knotenpunkten also, Plätzen oder Kreuzungen, oder an verkehrsreichen Achsen, Strassen, Hallen oder auch Flussufern. Die spätrepublikanisch-frühaugusteischen Grossbauten, Tempel, Ehrenbögen und Gräber suchen dementsprechend die Nähe zu Verkehrsadern und landschaftlich wie urbanistisch exponierten Punkten; man denke etwa an die Bauten auf dem Forum Romanum: an die monumentale Tabulariumsfassade, die den Nordprospekt der Platzanlage hinterfängt und erhöht, an den Augustusbogen und den Tempel des Divus Iulius an der gegenüberliegenden Stirnseite des Forum Romanum, an die langen Fassaden der beiden Basiliken; oder an die Lage von Siegesmonumenten an grossen Überlandstrassen, den Bogen des Augustus an der Milvischen Brücken etwa, den Fluchtpunkt der von Rom kommenden Via Flaminia, oder die spektakuläre Lage des Tropaeum Augusti von La Turbie und das Grab des Munatius Plancus in Caieta. Eine Fassade, die weder auf einen Platz, eine Strasse oder auf ein irgendwie systematisiertes Vorfeld zeigt, wäre absurd. Das Vorfeld einer Fassade ist für ihre Wirkung ebenso wichtig wie die Fassade selbst.

Beim Pantheon scheint, wenn wir wiederum den Plan des Marsfelds in augusteischer Zeit zurate ziehen, nun aber genau jener besagte absurde Fall vorzuliegen. Das Pantheon öffnet sich auf das Nichts, eine riesige Schwemmebene mit einer Wiese, die zwar immer schön grün war, wie Strabo in seinem Abschnitt über das Marsfeld betont, aber eben eine Wiese.

Nun wurde vor einiger Zeit zurecht festgestellt, dass derjenige, der in augusteischer Zeit das Pantheon verliess und immer genau nach Norden lief, irgendwann auf das Mausoleum des Augustus stiess; genauer gesagt, nach mehr als 700 Metern.[76] In der Tat scheint ein Sichtbezug zwischen beiden Bauten vorzuliegen; die Achse des Pantheon fluchtet auf das kaiserliche Grabdenkmal.

Wie man diesen Bezug nun ideologisch aufladen möchte, sei an dieser Stelle dahingestellt. Klar ist, dass die Verbindung Pantheon-

76 Davies 2000, 40 ff. mit Abb. 94.

Mausoleum, so hintergründig sie auch sein mag, nicht ausreicht, um eine Ausrichtung einer monumentalen zehnsäuligen Fassade auf eine grüne Wiese zu begründen, auf der sich im näheren Vorfeld der Fassade weder eine Hauptverkehrsachse, eine elaborierte Platzanlage oder eine ähnliche urbane Systematisierung archäologisch oder literarisch nachweisen lässt — noch dazu, wenn der Bezugspunkt 700 Meter entfernt ist und die Fassade einem extrem aufwendigen, besucherreichen monumentalen Neubau- und Vergnügungsviertel mit Schwimmbad, Theater und Einkaufshallen den Rücken zukehrt.

Nun kann uns das Augustusmausoleum dem Rätsel der Pantheonnordorientierung tatsächlich etwas näherbringen, allerdings unter einem anderen Aspekt. Es scheint bislang kaum aufgefallen zu sein, dass die Zugangssituation dieses Mausoleums im Kontext der zeitgenössischen Grabarchitektur fast ebenso absurd erscheint wie diejenige des Pantheon. Wer nur einige hundert Meter einer beliebigen römischen Gräberstrasse entlanglief, der wird festgestellt haben, dass alle Monumente um die Gunst der Passanten buhlen, ja in eine Art Wettstreit miteinander treten, und ihre Fassaden folgerichtig der Strasse zuwenden — das ist wenig erstaunlich, ansonsten hätte man sich ja nicht an den Rändern der Ausfallstrassen drängeln müssen. Nun liegt auch das Augustusmausoleum an einer solchen Ausfallstrasse. Der grösste Grabbau Roms wendet seine Front mit großer Tür, Obelisken und den Tafeln der Res Gestae nun aber nicht der Via Flaminia zu, sondern richtet sich auf eben jene weite, leere Schwemmwiese, auf die sich auch die Fassade des Pantheon öffnet.

Bei jener mysteriösen Schwemmwiese handelt es sich natürlich nicht um eine gewöhnliche Wiese, sondern um den Campus Martius; und zwar jenen Bereich des Marsfelds, der in frühaugusteischer Zeit offenbar noch nicht bebaut war — oder vielleicht besser, bewusst freigehalten wurde; mit zwei Ausnahmen, der alterwürdigen Ara Martis, die, wie wir sehen werden, auf jener Freifläche gelegen haben muss, sowie später dem Ustrinum Domus Augustae und dem Ara Pacis-Horologium-Komplex, der sich aber nicht zufällig an den Rand des Feldes drängt.

Methodisch gesehen, steht man damit vor einer eigenartigen Situation. Wir versuchen, ein urbanes Zentrum zu rekonstruieren, das archäologisch und bauhistorisch eigentlich gar nicht rekonstruierbar ist, da es sich nur um eine grüne Wiese handelt; keine Pflasterung also, keine nachweisbaren Verkehrsachsen, und offensichtlich auch keine grösseren Denkmäler, die den Platz besetzen und gestalten würden — gewissermaßen eine positive Leerstelle. Hinzu kommt, dass diese Leerstelle ungeheuer gross ist; wir erwähnten die Entfernung zwischen Mausoleum und Pantheon. Wenn wir hierbei einen urbanistischen Gestaltungswillen annehmen wollen, so können wir diesen extremen archäologisch-urbanistischen Sonderfall nur eingeschränkt mit jenen Methoden untersuchen, die wir für gewöhnlich bei antiken Platzanlagen anwenden. Prinzipiell stehen bei der Untersuchung dieser spezifischen Platzanlage zwei Möglichkeiten zur Verfügung:

1. Die Definition dieses urbanen Raumes ex negativo, d.h. die Eingrenzung von seinen Rändern her;
2. Literarische Quellen, die uns über die performativen Aspekte dieses Raumes informieren.

Pantheon und Mausoleum als Platzrandbebauung

Schon beim ersten Fall, der Eingrenzung des Gebiets von seinen Rändern her, gibt es einige Schwierigkeiten. Gewöhnliche Platzbegrenzungen, wie wir sie etwa von römischen Fora kennen — Basiliken, Hallen etc. — fallen wegen der Grösse des zu begrenzenden Raumes teilweise aus; darüber hinaus können wir — wiederum wegen der Grösse — nicht damit rechnen, dass alle Grenzen dieses suburbanen Raumes systematisch definiert waren. Dennoch lässt sich einiges über die Strategie sagen,

mit der Augustus und v.a. Agrippa die Systematisierung diese gewaltigen Areals angingen.
Am deutlichsten wird die systematische Begrenzung des Raumes an seiner Südseite, auf die bereits Diane Favro in ihrem suggestiven Rundgang über das Marsfeld des Jahres 14 n. Chr. hinwies.[77] Die Aqua Virgo muss auf den auf der Via Flaminia von Norden kommenden Reisenden wie eine Stadtmauer gewirkt haben. In der Tat begrenzte die Wasserleitung das freie, suburbane Areal sehr abrupt. Auffällig ist, dass die letzte Strecke der Aqua Virgo eine bestimmte Grenzlinie definiert, an der sich auch die zwei nach Westen folgenden Monumentalbauten Agrippas orientieren, die Saepta sowie das Pantheon. Etwas nach Süden verschoben, setzt sich diese Begrenzung in der Nordfront des Stagnum fort.
Die gemeinsame, mehr als 300 Meter Frontlinie von Aqua Virgo, Saepta und Pantheon muss auf den Betrachter wie eine kohärente Fassade gewirkt haben. Sie definierte die Südseite des Campus Martius nicht nur, sondern dominierte sie auch. Leider wissen wir über das Aussehen der Saeptanordfront nicht Bescheid;[78] aber selbst, wenn es sich nur um eine durchgehende, stuckverkleidete Wand gehandelt hätte, wäre der Anblick vom freien Feld aus monumental gewesen. Die Rolle der Pantheonfassade in dieser Gebäudeabfolge ist eindeutig: Die wohl dekastyle Front schloß den langen Zug dieser Front eindrucksvoll ab. Zumindest auf dieser Seite muss der freie Campus wie ein riesiges Forum gewirkt haben.
Ponderiert wurde diese Front auf der gegenüberliegenden Nordseite vom Augustusmausoleum. Der Bezug zwischen Nord- und Südseite des nördlichen Campus Martius, auf den bereits Lothar Haselberger hinwies,[79] manifestierte sich auf doppelte Weise: Zum einen durch den erwähnten Axialbezug Pantheon-Mausoleum, der möglicherweise eher als ästhetische Strategie denn als ideologisches Konstrukt zu begreifen ist. Hier stehen sich zwei gewaltige Monumentalbauten gegenüber, welche die freie Fläche des dazwischenliegenden Platzes gewissermassen einklammern — derart monumentale Bauten waren schliesslich auch nötig, um einen Freiraum von solchen Ausmassen zu definieren.
Zum zweiten spiegeln sich in der Verteilung der Bauten im Norden und Süden die Bauherren: Im Süden stehen die Projekte des Agrippa, im Norden das Mausoleum des Augustus, eine Verteilung, die später durch die Sonnenuhr (die Ara Pacis stiftete der Senat) noch verstärkt wurde.
Mit Sicherheit dürfte die Begrenzung des Raumes an vielen Stellen durch organische Fronten, also Baumreihen verstärkt worden sein. Im Norden belegt Strabo die berühmten Parks um das Mausoleum,[80] im Süden schlossen sich westlich des Stagnum Agrippae wohl das Nemus Agrippae, ebenfalls eine grosse Parkanlage, und, in der Ferne, die Horti des Agrippa an. Im Norden dürften die zwei, später drei Obelisken als aparter Blickfang gedient haben.
Die Demarkationslinie im Süden war aber nicht nur ein mehr oder weniger willkürlicher Abschluss der Monumenta Agrippae nach Norden hin. 1592 fand man im Bereich des Palazzo Serlupi an der Via del Seminario, in der antiken Topographie also vor der Nordfront der Saepta, einen heute verlorenen Travertinblock mit folgender, mehrfach kopierter Inschrift:

77 Favro 1996, 261: «In effect, the Aqua Virgo, Saepta, and Pantheon form an ensemble, confirming the identification of the vast northern Campus Martius as an Augustan enclave.»

78 Lediglich die Innenfront der domitianischen Saeptanordseite ist auf der Renaissanceumzeichnung (Cod. Vat. Lat. 3439) eines mittlerweile verlorenen Fragments 36a des severischen Marmorplans erhalten; dort erkennt man einen Mauerzug mit grossen Öffnungen oder eine Arkadenreihe; Richardson 1992, 341 s.v. Saepta Iulia spricht von einer «ample lobby separated from the open area to the south by a wall in which there were at least eight doors». Der Raum vor der Nordfront scheint auch in der späteren Kaiserzeit frei geblieben zu sein, was für eine in irgendeiner Form monumentalisierte Fassade (freilich wieder des domitianischen Baus) sprechen könnte.

79 Haselberger 2002, 76.

80 Strab. 5, 3, 8.

> id quod intra / cippos ad camp(um) versus / soli est Caesar August(us) / redemptum a privato publicavit.[81]
> Caesar Augustus kaufte all das, was innerhalb der Grenzsteine zum Campus hin an Boden vorhanden ist, von Privatleuten auf und schenkte es der Öffentlichkeit.

Offensichtlich markierte die Südfassade des Marsfelds zugleich die Grenze zwischen den beiden Grundherren des Marsfelds, Agrippa und Augustus bzw. dem römischen Volk. Agrippa schob also seine Bauten, vor allem natürlich die Pantheonfassade, bis ganz an das Ende seines Grundstücks, um eine einheitliche Fassade zu konstruieren.
Diese Inschrift ist aber noch aus einem zweiten Grund für unsere Untersuchung relevant. Sie belegt nämlich, dass die Freifläche zwischen Pantheon und Mausoleum unter Augustus tatsächlich kein Brachland war oder ein dünn, aber chaotisch bebautes Vorstadtareal. Genauso wie beim Augustusforum kaufte der Prinzeps hier Grundstücke von Privatleuten auf — aber nicht als Bauland, sondern um das Marsfeld in eine öffentliche Fläche zu verwandeln und möglichen privaten Bauspekulanten den Boden zu entziehen. Das setzt aber voraus, dass die grüne Wiese tatsächlich ein zentrales Element der urbanistischen Planung war.
Schliesslich bezeugt die Inschrift, was unter Augustus tatsächlich unter *Campus* verstanden wurde: Die Formulierung *intra cippos ad campum versus* scheidet die Freifläche nördlich der Grenzsteine — den eigentlichen *Campus* — begrifflich ganz klar von den südlich angrenzenden Neubaugebieten.
Fazit: Um das urbane Konzept des nördlichen Marsfeldes in augusteischer Zeit zu verstehen, darf man nicht von den monumentalen Neubauten ausgehen, sondern von der paradoxerweise weitgehend unbebauten Wiese des Campus Martius. Sie war das Zentrum, um das geplant wurde. Keiner der gewaltigen Neubauten wirkte als Bezugspunkt für andere Bauten; vielmehr ordnen sich sämtliche Grossbauten dieser Freifläche in ihrer Mitte unter. Bei aller Monumentalität handelt es sich bei Pantheon, Saepta und Mausoleum also nicht um beherrschende Solitäre, sondern eigentlich um eine Platzrandbebauung; eine Platzrandbebauung, die in ihrer Grösse nur von der riesigen Freifläche zwischen ihnen übertroffen wurde, und deren Grösse wiederum die Monumentalität der umgebenden Bauten ästhetisch und urbanistisch begründete. Erst vor diesem urbanistischen Hintergrund lässt sich, wie wir noch sehen werden, die eigenwillige architektonische Gestalt des augusteischen Pantheon verstehen.

Der Campus als Handlungsort

Diese Betrachtung bliebe jedoch einseitig, würde man sich nur auf die architektonischen Informationen zum augusteischen Marsfeld stützen. Will man sich die Bedeutung des Pantheons für die Anlage des Campus Martius — und die daraus resultierenden Anforderungen an die Pantheonarchitektur — vergegenwärtigen, müssen auch auf die performativen Aspekte des Marsfelds berücksichtig werden. Das um so mehr, als uns Informationen über die Gestaltung des Platzes selbst, wie gesagt, fehlen (und wohl fehlen müssen).
Hier ist allerdings nicht der Ort, um im Einzelnen sämtliche Handlungen, Riten und Feste zu analysieren, die in der späten Republik bzw. frühen Kaiserzeit auf dem Marsfeld stattfanden; die Funktionen dieses Areals sind allgemein bekannt: Der Campus Martius diente als Platz für die Volksversammlung; auf dem riesigen Gelände campierte das siegreiche Heer, bevor es zum Triumph in die Stadt einzog; hier fanden die grossen Volksversammlungen statt, genauso wie die grossen Entsühnungszeremonien von Volk und Heer; das Gelände war ein ständiges riesiges Sport- und Wehrübungsgelände ebenso wie ein Ort ephemerer Volksbelustigungen.

81 CIL VI 874 (in cippo Tiburtino decempedali»); Dessau 5935 (in PIR 1897). Roddaz 1984, 257 f. 292 Anm. 349.

So geläufig uns diese Aspekte sind, so selten macht man sich klar, was die ständige Präsenz von Menschen, nicht nur bei aussergewöhnlichen Massenveranstaltungen, sondern auch im Alltag für dieses suburbane Multifunktionsgelände eigentlich bedeutete.
Der zentrale Punkt bei der Interpretation dieses Geländes ist die banale Tatsache, dass das Marsfeld der grösste Versammlungsort der Stadt war. Insofern bildete dieser Raum nicht nur einen Fixpunkt des urbanen Lebens, ebenso wie das Forum und das Kapitol; er war zudem ein zentraler Bezugspunkt der Identität des römischen Volkes. Hier präsentierte sich, anders als auf dem engen Raum des Forums, die Bürgerschaft tatsächlich in ihrer gesamten Masse. So ist es nur konsequent, dass die performativen Akte, die hier stattfanden, für das Selbstbild des römischen Gemeinwesens von zentraler Bedeutung waren; man denke nur an den Triumph, die Volksversammlung und die Lustrationsriten. Anders aber als auf den anderen grossen Bezugspunkten der städtischen Identität — Forum, Capitol, Circus Maximus — manifestierten sich die genannten Akte bis Caesar wenn überhaupt, dann nur in ephemeren Architekturen (sehen wir einmal von der Ara Martis ab).
Die Grösse des Areals, die Menschenmassen, die sich dort versammelten, seine Multifunktionalität und der ganz unterschiedliche Charakter der genannten Veranstaltungen hatten aber auch schwerwiegende Konsequenzen für die Gestaltung der Freifläche selbst. Sie verhinderten eine architektonische Fixierung, ja überhaupt jegliche urbanistische Systematisierung der grossen grünen Wiese. Gladiatorenspiele und Sühnezeremonien waren Ereignisse, die völlig unterschiedliche Ansprüche an eine etwaige Architektur gestellt hätten. Zudem wäre eine Architektur, die solchen Massen gewachsen gewesen wäre, selbst in augusteischer Zeit kaum denkbar gewesen. Genau hier lag nun aber der Vorzug des Marsfelds: Auch das grosse Pompeiustheater konnte nur eine begrenzte Zahl von Menschen aufnehmen; und selbst dem riesigen Circus Maximus waren architektonische. logistische und urbanistische Grenzen gesetzt. Das Marsfeld hingegen bot einer nahezu unbegrenzten Anzahl an Menschen Platz.

Funktion und Expansion. Ein urbanistischer Konflikt

Caesar und nach ihm Augustus und Agrippa erkannten das ungeheuere ideelle und repräsentative Potential, das in diesem Gelände steckte.
Bezeichnend dafür ist der berühmte megalomane Plan Caesars, den Tiber umzuleiten und dadurch das Marsfeld zu vergrössern. Das Vorhaben zeigt die Bedeutung, die man dieser Freifläche beimass; und es zeigt vor allem, dass mit dem Ausgreifen der städtischen Bebauung nach Norden einerseits der Prestigewert der Schwemmebene stieg, andererseits aber übergreifende urbanistische Konzepte erforderlich waren. Die Freifläche war gefährdet, da der Expansionsdruck der Metropole nach Norden immer stärker wurde. Dieser Expansionsdruck spiegelt sich in der Projektskizze bei Cicero wieder:

> scilicet casu sermo a Capitone de urbe augenda, a ponte Mulvio Tiberim perduci secundum montis Vaticanos, campum Martium coaedificari, illum autem campum Vaticanum fieri quasi Martium campum.[82]
> Dann kamen wir durch Capito zufällig auf das Thema der Stadterweiterung, nämlich dass der Tiber von der Milvischen Brücke ab die vatikanischen Hügel entlang geführt werden solle, das Marsfeld zugebaut, jener Campus Vaticanus aber praktisch zum Campus Martius werden solle.

Vor dem geschilderten Hintergrund einer immer weiter nach Norden drängenden Bebauung erscheint das Projekt Caesars viel weniger

82 Cic. Att. 13, 33, 4.

wahnwitzig, als es im ersten Augenblick den Anschein haben mag. Vielmehr hätte Caesars weitsichtiger Plan nichts anderes als die konsequente Lösung eines schwerwiegenden urbanistischen Konflikts dargestellt: Verlagerung der multifunktionalen Freifläche weiter nach Nordwesten, Erschliessung des dadurch freigewordenen Brachlands durch monumentale Architekturen. Der Campus war letztlich die einzige Fläche, die nicht nur dem Zentrum relativ nahe lag, sondern durch ihre spezifischen Funktionen bis dato in weiten Teilen unbebaut geblieben war und damit grosszügige, auf dem Reissbrett gezogene architektonische Projekte ermöglichte. Derartige Vorhaben dürften in anderen Bereichen des stadtrömischen Suburbium kaum realisierbar gewesen sein. Dort hätten ungünstige topographische Bedingungen wie langgestreckte Täler und Hanglagen aufwendige Substruktionen erfordert; hätten Lager- und Handelsbauten, unendliche Nekropolen und ausgedehnte Horti eine Enteignung unmöglich gemacht; hätte nicht zuletzt jene unvermeidliche urbane Struktur einer zersiedelten Metropolenperipherie grössere Planungen in akzektabler Entfernung vom Zentrum verhindert.

Was bedeutet das alles nun konkret für das Pantheon? Zunächst einmal, wiederum ganz banal, dass vor der Front dieses Heiligtums permanent identitätsstiftende sakrale und politische Handlungen vollzogen wurden. Diese Handlungen zeichneten sich in erster Linie dadurch aus, dass hier zehn-, ja bisweilen hunderttausende Bürger zusammenkamen, mehr als an jedem anderen Ort der Stadt Rom. Man stelle sich die Massen vor, die dem Ritus der Suovetaurilien beiwohnten und um die Stier, Schwein und Schaf herumgeführt werden mussten, oder die Bürger, die hier stundenlang auf die Abstimmungen oder die Gladiatorenspiele in der benachbarten Saepta warteten; ganz abgesehen von den Spielen, die auf dem Campus selbst stattfanden. Stets wurden die Massen von der Fassade des Pantheon hinterfangen.

Abb. 12: Rom, Museo Nazionale delle Terme, Staatsrelief mit dekastylem Tempel.

Die Verbindung von Ritus und Architektur veranschaulicht sehr eindrucksvoll eine berühmte Episode bei Sueton. Die Szene spielt kurz vor dem Ende des Augustus auf dem Marsfeld und wurde post festum als Vorzeichen für den nahen Tod des Prinzeps interpretiert:

> Cum lustrum in campo Martio magna populi frequentia conderet, aquila eum saepus circumvolavit transgressaque in vicinam aedem super nomen Agrippae ad primam litteram sedit; quo animadverso vota, quae in proximum lustrum suscipi mos est, collegam suum Tiberium nuncupare iussit.[83]
> Als er (Augustus) auf dem Campus Martius vor der großen Masse des Volkes (*magna populi frequentia*) die Reinigungsriten zelebrierte, flog ein Adler mehrere Male um ihn herum, flog dann zum Tempel nebenan (d. i. das Pantheon) und setzte sich über den Namen des Agrippa, und zwar auf den ersten Buchstaben; als Augustus das sah, befahl er seinem Kollegen die Gelübde, die man für das folgende Lustrum abzulegen pflegt, auszusprechen.

Auch wenn eine solche enge Verknüpfung zwischen Sakralakt und Architektur natürlich die Ausnahme war, so zeigt die Geschichte doch

83 Suet. Aug. 97, 1.

Abb. 13: Rom, Museo Nazionale delle Terme, Staatsrelief mit dekastylem Tempel Detail.

sehr prägnant, welche Funktion die Pantheonfassade als Rahmenarchitektur des Marsfeldes erfüllte. Die Fassade hinterfing das Geschehen und erhöhte es, so wie die Bühnenwand die Wirkung eines Theaterstücks steigert.

Cassius Dio vermerkt bezeichnenderweise gerade in jener Phase, in der Agrippa den Bau des Pantheon konzipierte beziehungsweise gerade in Angriff nahm, eine erhöhte Aktivität auf dem Marsfeld; möglicherweise verspürte man gerade während dieser Veranstaltungen, die zu den ersten großen Massenveranstaltungen des Regimes gehörten, das akute Bedürfnis, die unbefriedigende urbane Situation des Marsfelds zu verbessern. 28 v. Chr., drei Jahre vor der Fertigstellung des Gebäudes also, hielt man die Actiumspiele ab, die im vierjährigen Rhythmus unter Leitung jeweils einer der vier großen Priesterschaften stattfinden sollten. Im Rahmen dieser Spiele, so Cassius Dio, organisierten die Spielgeber auch einen gymnischen Agon. Dabei «konstruierte man auf dem Marsfeld ein hölzernes Stadion, und auch Gladiatorenspiele mit Gefangenen fanden statt.»[84]

Wie sich das duale Konzept der Marsfeldbegrenzung mit den Augustusbauten im Norden, den Agrippabauten im Süden in den performativen Akten auf dem dazwischenliegenden Brachland wiederspiegelte, zeigt der anschliessende Kommentar bei Cassius Dio zu eben jenen Spielen des Jahres 28 v. Chr.: «Diese Veranstaltungen wurden mehrere Tage fortgesetzt, und man brach sie auch dann nicht ab, als Augustus plötzlich erkrankte; Agrippa übernahm nämlich neben den eigenen Pflichten als Spielleiter auch die des Augustus».[85]

Im selben Jahr feierte Augustus als Censor zudem den Abschluss des Lustrum — inklusive der bereits erwähnten feierlichen Reinigungsriten, wiederum auf dem Campus. Fünf Jahre später, am Ende des nächsten Lustrum, fand diese Zeremonie bereits vor der Front des neuen Pantheon statt.

Der wichtigste Staatsakt der römischen Bürgerschaft spielte sich nun nicht mehr auf einer ausgefransten Freifläche ab, sondern hatte einen architektonischen Rahmen bekommen. Das Bild des Kaisers, der vor der gigantischen Fassade des Pantheon die Sühneriten zelebriert, muss auf die anwesenden Bürger sehr eindrucksvoll gewirkt haben; und wie es scheint, strahlte dieses Bild auch auf die monumentale Staatskunst aus: Das Staatsrelief Vatikan-Thermenmuseum zeigt einen zehnsäuligen Tempel, in dessen Giebelfeld Mars, Rhea Silvia sowie die Wölfin mit den Zwillingen und zwei Hirten zu sehen sind (Abb. 12 und 13).[86]

Die im frühkaiserzeitlichen Rom völlig aussergewöhnliche Zehnsäuligkeit des dargestellten Bauwerks macht es — neben weiteren Erwägungen, die an anderer Stelle näher zu diskutieren sind — angesichts der Grabungsbefunde unter und vor dem trajanischen Pantheonpronaos sehr plausibel, dass es sich bei diesem,

84 Dio 53, 1, 5.

85 Dio 53, 1, 6.

86 Rom, Museo Nazionale Romano Inv. 165 (der obere Teil des sog. Staatsreliefs Vatikan-Thermenmuseum); Köppel 1983, 135 ff. Nr. 36.

bislang noch keinem Gebäude sicher zuzuordnenden Relief um das augusteische Pantheon (bzw., je nach Datierung des Reliefs, seinen domitianischen Nachfolger) handelt. In jedem Fall wäre der zentral im Giebel dargestellte Mars ein klarer Verweis nicht nur auf die göttliche Abstammung des Augustus, sondern auch auf den eponymen Gott des Campus.

Vielleicht war der Bezug der Pantheonfassade zu Mars auch noch konkreter. Aus dem Passus bei Sueton geht eindeutig hervor, dass der Marsaltar, an dem die Zeremonie des Lustrum vollzogen wurde, in der Nähe des Pantheon mit Blickbezug zu dessen Fassade stand. Wenn nun das Pantheon nach Norden ausgerichtet ist, so muss die Ara Martis auf dem Feld vor dem Pantheon gelegen haben. Das wäre auch im Hinblick auf die auf dem Relief dargestellte Szene plausibel: Dargestellt wäre dann nämlich eine der staatstragenden kultischen Handlungen, die auf dem Campus Martius stattfanden. Und das ist mit grosser Wahrscheinlichkeit das Lustrum. Die Szene war bereits früher Gegenstand der römischen Staatskunst gewesen, so etwa bei dem Suovetaurilienrelief im Louvre. Wenn nun das Relief tatsächlich die Lustratio zeigt, so lag die Ara Martis in unmittelbarer Nähe vor der Front des Pantheon.

Mausoleum — Pantheon — Ara Martis

Mit dem Marsaltar kommen wir zu jenem Monument, das offenbar im Zentrum der augusteischen Neuordnung des nördlichen Marsfelds stand. Lokalisieren wir die Ara Martis auf der großen Freifläche vor dem Pantheon — woran nach der Suetonstelle kein Weg vorbeiführt — so ergibt sich nicht nur für das Pantheon selbst, sondern auch für das Augustusmausoleum ein klarer Bezugspunkt. Das Mausoleum hätte sich dann nämlich auf die uralte Kultstätte des Mars geöffnet, dessen Bedeutung für das augusteische Ideengerüst nicht näher ausgeführt werden muss.

Gleichzeitig könnte das Pantheon gewissermassen zum Heimattempel für den Mars auf dem Marsfeld geworden sein, der bislang möglicherweise noch kein angemessenes Kultgebäude besessen hatte. Jedenfalls hatte bereits Caesar den Plan, einen monumentalen Marstempel auf dem Marsfeld zu errichten. Laut Sueton wollte Caesar jenes riesige Becken, das er anlässlich des dreifachen Triumphs von 46 v. Chr. auf dem Marsfeld ausgehoben und für eine Naumachie genutzt hatte und das sich nur in einer jener Senken des zentralen Marsfelds, möglicherweise an der Stelle des späteren Stagnum, befunden haben kann, wieder verschütten und an dieser Stelle einen Marstempel errichten, *quantum nusquam esset*.[87] Möglicherweise spukte jenes Vorhaben noch im Kopf Agrippas; zumindest seine zehnsäulige Vorderfront hätten Caesars Vorstellungen nach einem Tempel von nie gesehener Grösse wohl entsprochen.
Ob es sich deswegen beim Pantheon um den vielumstrittenen Tempel des *Mars in Campo* handelte, steht auf einem anderen Blatt. Unbestritten ist jedoch, dass Mars im Pantheon verehrt wurde: Das wissen wir von Cassius Dio, der eine Statue des Mars im Pantheon explizit erwähnt.[88]

87 Suet. Caes. 44, 1 *in primis Martis templum, quantum nusquam esset, extruere repleto et complanatu lacu, in quo naumachiae spectaculum ediderat.*

88 Dio 53, 27, 2.

Ergebnisse

1. Die urbanistische Funktion des augusteischen Pantheon

Fassen wir die Beobachtungen zusammen. Das Pantheon ist nach Norden orientiert, weil es aufs engste mit der freien Fläche des Campus Martius und dessen Gott verbunden ist. Das gilt erstens (urbanistisch) für die augusteische Gestaltung des Campus, in der das Pantheon den krönenden Höhepunkt einer mehr als 300 Meter langen Fassade einnimmt. Damit hinterfängt es zweitens (ästhetisch) die auf diesem Gelände stattfindenden Massenveranstaltungen. Drittens (religiös) stand das Pantheon wohl in direktem topographischen und auch rituellen Bezug zum altehrwürdigen Marsaltar. Schliesslich nimmt es viertens (ideologisch) durch seinen Giebelschmuck direkten Bezug auf den eponymen Gott des Feldes, seinen Altar und damit natürlich auch auf die Genealogie des Herrscherhauses.

Durch die Orientierung von Pantheon und Augustusmausoleum auf den Marsaltar ergibt sich ein ideelles System von Ara Martis, Augustusmausoleum und Augusteum/Pantheon. Dieses System manifestierte sich nicht nur im Giebelschmuck des Pantheon mit Mars und Romulus, sondern auch in der urbanistischen Gestaltung. Die Ara Martis war gewissermaßen das Bindeglied zwischen Pantheon und Mausoleum. Alle drei bildeten gemeinsam eine Achse, die von der Gemeinschaft der Götter im Pantheon über den Altar des Mars, dem Ahnherrn der Julier und Schutzherrn des Campus, zum Princeps und seiner Dynastie im Mausoleum führte. Um diese Achse feierte die Bürgerschaft ihre Riten und Feste.

2. Urbaner Kontext und architektonische Form

Kommen wir auf das zweite zu Beginn angesprochene Problem zu sprechen, die ungewöhnliche und neuartige Verbindung eines altrömischen runden Sakralbezirks mit einem monumentalen, zehnsäuligen Pronaos. Diese etwas eigenwillige Verbindung zweier heterogener Elemente erklärt sich relativ einfach, wenn man die Bedürfnisse, die das skizzierte urbanistische Umfeld an das Gebäude stellte, in Betracht zieht. Gegeben war ein runder Bezirk, der das kultische Zentrum eines neuen Stadtviertels bilden sollte. Dieser Bezirk befand sich nun allerdings an einer Stelle, an der eine prachtvolle und grosse Front unbedingt nötig war — aus den erwähnten Gründen der kaiserlichen Repräsentation vor dem Volk. Eine kleinere Fassade hätte an dieser Stelle lächerlich gewirkt. Der Rundbezirk als solcher konnte nicht ohne Abschluss nach Norden bleiben. Also entschied man sich, an den Rundbezirk einfach das Vorderteil eines herkömmlichen Tempels anzusetzen.

Letztlich handelt es sich bei dem Pronaos des augusteischen Pantheon also um eine Blendfassade; eine Blendfassade, die man wohl nicht zuletzt deswegen so gross dimensionieren konnte, weil es sich nur um einen Pronaos handelte und nicht um einen vollständigen Tempel der traditionellen Art. Das augusteische Pantheon ist damit das Produkt einer spezifischen urbanistischen und sakralen Situation. Agrippas Architekten versuchten, zwei heterogene Bedürfnisse — das Konzept eines runden Temenos auf der einen, einer repräsentativen Monumentalfassade auf der anderen — miteinander zu vereinen; mit dem Ergebnis, dass eine heterogene Architektur entstand.

Die architektonische Einheitlichkeit war der Preis, den die Architekten für diesen Kompromiss zu zahlen hatten. Diese Uneinheitlichkeit nahm man aber in Kauf. Offensichtlich wollte oder konnte man auf keinen der beiden Aspekte verzichten. Im Nachhinein sollte sich dieser Kompromiss dann freilich als wegweisend herausstellen: Mit ihm war das Konzept eines völlig neuen Gebäudetyps geschaffen, der die Architekturgeschichte der nächsten Jahrtausende prägen sollte, wenn auch noch sehr unausgereift. Die Meisterleistung, das hybride Geschöpf des Agrippa zu einer architektonischen Einheit zu verwandeln, ohne dabei seine wesentlichen Merkmale zu zerstören —

diese Meisterleistung blieb dann allerdings den Architekten der trajanischen Zeit vorbehalten. Mit den avancierten bautechnischen Möglichkeiten des zweiten Jahrhunderts entwickelten sie über dem augusteischen Grundriss ein neues Gebäude. Dabei bedienten sie sich zahlreicher Architekturmodule, die bereits in anderen Grossbauten der trajanischen Zeit erprobt worden waren: der monumentalen Kuppel etwa, deren Vorläufer in den gewaltigen Exedrahalbkuppeln der Thermen zu sehen sind, den Marmorböden, wie sie in den Exedren des Trajansforums ausgelegt wurden, nicht zuletzt des Baukastensystems der Ordnungen, deren Säulen, Kapitelle und Gebälke normiert importiert und in Serie gefertigt wurden.

3. Urbanistische Entwicklungsstrukturen des Campus Martius in augusteischer Zeit

Die Entwicklung des Marsfelds in augusteischer Zeit wird erst verständlich, wenn man das Gesamtareal in zwei Sektoren scheidet: Zum einen den Bereich des mittleren Marsfelds, die *Monumenta Agrippae*, zum anderen den Bereich des nördlichen Marsfelds, den eigentlichen Campus. Diese beiden heterogenen Bereiche unterscheiden sich nicht nur in den gestaltenden Auftraggebern — Agrippa auf der einen, Augustus und der Senat auf der anderen Seite —, sondern auch (und vor allem) in ihrer urbanistischen Struktur und Entwicklung.

Im Bereich des mittleren Marsfelds wuchs die Bebauung in einem assoziativ-axialen Modus. Wie wir sahen, wurde die Stadterweiterung der augusteischen Zeit durch das Achsensystem determiniert, das die Bauten der späten Republik vorgaben. Die Bauten Agrippas orientierten sich nach diesen Achsen, wobei sie in mehreren Fällen direkt an die älteren Bauten anschlossen. Trotz des Achsenbezugs scheint es aber keinen ‹Masterplan› gegeben zu haben, der das Brachland in ein divisives Raster eingeteilt hätte, in welches die Bauten hernach eingefügt worden wären. Vielmehr schlossen die Bauten assoziativ aneinander an, mal parallel zu den Vorgängerbauten, mal im rechten Winkel dazu. Eine klare Grenze gab es nur im Norden: Dort etablierten die Fronten der Monumentalbauten Aqua Virgo, Saepta und Pantheon eine durchgehende, klar definierte Grenze hin zum unbebauten Campus. Diese Grenze war, wie der erwähnte Cippus des Augustus zeigt, wohl juristisch vordefiniert.

Diese agglutinierende Erweiterung lässt sich in der römischen Urbanistik häufiger beobachten: Das bekannteste Beispiel liefert die Entwicklung der Kaiserfora. Dort entstand im Lauf der früheren Kaiserzeit ebenfalls ein System an Grossbauten, welche sich axial an den jeweiligen Vorgängerbauten ausrichteten und mit ihren Aussenfronten direkt an diese anschlossen, ohne in ein übergreifendes Raster eingebunden zu sein; statt dessen frass sich das Gebäudesystem assoziativ in das Häusermeer der umgebenden Wohnbebauung, so wie die Bauten des Agrippa immer weiter in das unbebaute Brachland des Campus vordrangen.

Im anderen urbanistischen Sektor des Marsfelds, dem Campus, lag der Fall anders. Dort gab es ein Zentrum, die freie Fläche des Campus, um das sich die Bauten im Laufe der Zeit gruppierten — das erwähnte Schema der Platzrandbebauung. Mausoleum, Sonnenuhr, Ara Pacis sowie die Nordfronten der *Monumenta Agrippae* rahmten das Platzareal. Saepta und Pantheon bildeten dabei gewissermassen das Scharnier zwischen der axial-assoziativen Wachstumsstruktur des mittleren Marsfelds und der zentripetalen Struktur des eigentlichen Campus. Beide Systeme definierten zugleich Lage und Orientierung des Pantheon, das südliche System die Lage, das nördliche die Orientierung.

Ausblick: Die Entwicklung des Campus nach Agrippa

Wie entwickelte sich nun die grosse Freifläche des Campus Martius, nachdem Agrippa den Süden des Areals architektonisch gefasst hatte? Es ist kaum verwunderlich, dass sich dieses Gebiet im Laufe der augusteischen Zeit zu einem Ort entwickelte, in dem man seine Loyalität mit dem Princeps dokumentieren konnte. Den

Anfang hatte Agrippa mit seinem verhinderten, in seiner Symbolik aber schon allein durch die beiden Statuen in der Vorhalle für alle eindeutigen ‹Augusteum› gemacht. Später folgte der Senat: Die Ara Pacis — und dieser Aspekt wurde bislang noch nicht genügend fokussiert — steht in direkter Tradition des Pantheon. Wie vorher Agrippa, so nutzt nach der Rückkehr des Princeps aus dem Westen der Senat die riesige, durch die Randbebauung eigentlich sanktionierte Freifläche, um die Verbundenheit mit dem Herrscher vor den Augen der Bürgerschaft mit einem Sakralgebäude zu bekräftigen. Das Templum des Senats rückt freilich an die Via Flaminia, einerseits die Strasse als Ort der Rückkehr bezeichnend, andererseits die Funktionen des Campus respektierend.

Doch die Ara Pacis ist kein Einzelfall. 1547 fanden sich auf dem Platz vor dem Palazzo Altemps — also gewissermaßen mitten auf unserer «grünen Wiese» — zwei Inschriftenbasen, die leider nur durch Abschriften überliefert sind.[89] Zusammen mit den Inschriften wurden fünf monumentale Theatermasken aus Stein gefunden, die wohl zum selben Ensemble gehörten — ein Monument, das genauerer Betrachtung wert wäre.

Die erste der beiden Inschriften stellte Quinctilius Varus während seines Konsulats im Jahre 13 v. Chr. gemäss Senatsbeschluss auf, die andere Tiberius sechs Jahre später. Beide Inschriften erinnern an *ludi votivi pro reditu imp(eratoris) Caesaris Divi f(ili) Augusti*, an Votivspiele anlässlich der glücklichen Rückkehr des Prinzeps.

Das Faszinierende an diesen beiden Inschriften ist die Tatsache, dass sie versuchen, den ephemeren Charakter der Veranstaltungen, die ja nur wenige Tage dauerten und architektonisch keine Spuren hinterliessen, zu umgehen. Als Male versteinerten sie die *memoria* an jene Festhandlungen, welche die Verbundenheit von Feldherrn, Senat und Volk mit dem Princeps dokumentierten. Sie reihen sich damit in jene Kette von Monumenten ein, welche sich in augusteischer Zeit an den Rändern des Campus gruppierten und in direktem Zusammenhang mit Augustus und seiner Dynastie standen. Zusätzlich zur Ara Pacis dokumentierten hier Varus und Tiberius ihre Verbundenheit mit dem Kaiser, die sich — wie bei der Einweihung der Ara Pacis auch — zunächst nur in einer ephemeren rituellen Handlung auf der grossen grünen Wiese manifestiert hatte.

Im Prinzip entwickelt sich das Marsfeld in der folgenden Kaiserzeit urbanistisch konsequent weiter. Die Determinanten des Wachstumsprozesses bleiben die gleichen wie schon in caesarischer und augusteischer Zeit. Auf der einen Seite steht das Bedürfnis, die aus mehreren Gründen extrem attraktive suburbane Freifläche des nördlichen Campus mit Monumentalbauten zu gestalten, das bebaute Areal nach Norden zu erweitern. Diesem expansiven Druck von Süden her stehen nun die traditionellen Funktionen des Campus entgegen, die grosse Brachlandareale benötigen.

Am Stadtplan des kaiserzeitlichen Marsfelds lässt sich sehr schön ablesen, wie diese beiden Faktoren das urbane Wachstum im 1. Jh. n. Chr. steuern. Denn ganz offensichtlich bleibt die Grenze, die Agrippa mit Pantheon und Saepta definierte, für sehr lange Zeit gewissermassen sakrosankt. Zwischen Pantheon und Augustusmausoleum entstehen für lange Zeit keine monumentalen Neubauten. Der erste, der es wagt, diese Grenze zu überschreiten, ist Nero: Mit seinen Thermen rückt er die Bebauungskante nördlich des Stagnum um ein grosses Stück nach Norden vor. Aber auch Nero respektiert die grosse grüne Wiese, denn das Meiste des Campus bleibt unangetastet.

Und selbst die Kaiser des zweiten Jahrhunderts disziplinieren das urbanistische Wachstum in diesem Bereich Roms vehement: Zwar entstehen nun nördlich von Pantheon und Saepta die monumentalen Temene von Matidia- und Hadrianstempel. Aber auch diese Bauten wagen sich nicht über neronischen Thermennordfront hinaus, sondern bilden mit dieser

89 CIL VI 385. 386. Zu den Inschriften ausführlich Palmer 1990, 14 ff. (mit früherer Lit.).

eine neue, wiederum klar definierte Ost-West-Begrenzung nach Norden hin. Diese neue ‹Frontlinie› ersetzt Agrippas alte, von Pantheon, Saepta und Virgo markierte Bebauungsgrenze.[90]
Erst in der nächsten Generation fällt das letzte Tabu, die freie Wiese zu bebauen. Bezeichnenderweise sind es nun allerdings spezifische Monumente des Kaiserkultes respektive der kaiserlichen Selbstdarstellung, welche das alte Gebot der Freifläche endgültig unterlaufen, die Ustrina und Ehrensäulen der antoninischen Herrscher.

Rückblickend betrachtet verläuft die Erweiterung der Stadtbebauung nach Norden hin zeitlich und vor allem topographisch in ganz klaren Grenzen. Die Bebauung schiebt sich im Laufe der Zeit in Registern von Süden nach Norden fort:
– Register 1 wird durch die republikanische Bebauungsgrenze der Nordfronten von Pompeius-theater/Hecatostylum, Largo Argentina und Porticus Minucia gebildet.
– Register 2 definiert Agrippa mit der Nordgrenze seiner *monumenta*.
– Register 3 füllen Nero (Thermen), gefolgt von Domitian (Stadium) und Hadrian (Kaiserkultstätten).
– Mit Register 4, den antoninischen Kaiserkultmonumenten, ist die Entwicklung abgeschlossen. In der Folgezeit dürfte sich die Bebauung in diesem Bereich noch verdichtet haben, etwa durch Wohnbauten.

Diese Erweiterung nach klar begrenzten Registern ist für die stadtrömische Topographie ein absoluter Sonderfall. Derartig klar definierte Bebauungsgrenzen liefern im antiken Normalfall nur Stadtmauern. Der urbanistische Normalfall war auch im kaiserzeitlichen Rom — wie bei den Megacities unserer Tage — eine ins Suburbium streuende Zersiedelung (‹suburban spread›).[91]
Erklären lässt sich dieses disziplinierte Wachstum nur durch die traditionellen Funktionen des Campus, die eine Freifläche erforderten. Das bedeutet aber auch, dass diese Freifläche dann zur Disposition steht, wenn die Funktionen wegfallen; dies scheint spätestens in antoninischer Zeit der Fall gewesen zu sein. Es wäre nun sehr interessant, die oben angedeuteten, identitätsstiftenden Funktionen des republikanisch-augusteischen Campus einzeln nach ihrem Fortbestehen in der Kaiserzeit zu untersuchen. In jedem Fall ist klar, dass einstmals so bedeutende Handlungen wie die Wahlen im Laufe der frühen Kaiserzeit verschwanden und damit ebenso die damit verbundenen Versammlungen des Volkes auf der grossen Wiese. Hinzu kam, dass viele der ephemeren republikanischen Einrichtungen, wie Theater, Rennstrecken und Gladiatorenarenen, im Laufe der Kaiserzeit immer häufiger in feste Steinbauten verwandelt wurden, die an verschiedenen Stellen der Urbs die Aufgaben der vorläufigen Gerüstbauten des Marsfelds übernahmen. Das vor der Stadt campierende, auf den Triumph wartende Heer hauste in den grossen Höfen, Gärten und Portiken des mittleren Marsfelds.
Auffällig ist freilich, dass die Funktionen jener Bauten, die ab hadrianischer Zeit den verbliebenen Rest des Campus endgültig füllen, sich deutlich von den früheren Bauten des

90 Es wäre zu erwägen, ob im Zentrum der Platzanlage nördlich des trajanischen Pantheon nicht die *Ara Martis in campo* der hohen Kaiserzeit stand; der Platz wäre dann sozusagen der systematisierte, ‹marmorgefaßte› Rest der grossen grünen Wiese der augusteischen Zeit, die von den umliegenden Neubauten auf ein Minimum beschnitten worden wäre. Für diese Interpretation könnte der Befund einer Grabung unter Alexander VII. sprechen, im Zuge derer in einem Keller unter einem Haus gegenüber dem Pantheon, genau im Zentrum der kaiserzeitlichen Platzanlage, die Reste eines großen Marmorfundaments aufgedeckt wurden, das fälschlicherweise als «Arcus Pietatis» angesprochen wurde («Di rincontro a detto tempio [i.e. das Pantheon] in una cantina fu cavata la parte di un gran basamento di marmo», Lanciani 1994, 214).

91 Zu diesem zentralen Aspekt der stadtrömischen Urbanistik grundlegend Haselberger 2002, 97 ff. s.v. Continentia.

Marsfelds unterscheiden. Es handelt sich fast durchweg um grosse Sakralbauten des Kaiserkults, vor allem Ustrina.

Nichts könnte deutlicher den Funktionswandel dieses Areals beschreiben. Die gemeinschaftsbildenden Rituale und Festivitäten der Republik hatten ihre Bedeutung verloren, und diese Leerstelle füllte der Kult um das Kaiserhaus aus — ein Satz, der kurioserweise nicht nur für den nördlichen Campus Martius, sondern *grosso modo* für Rom im allgemeinen gilt. Der Campus blieb einer der wichtigsten identitätsstiftenden Orte der römischen Bürgerschaft; nur die Rituale und Bezugspunkte änderten sich.

Abbildungsnachweise

Abb. 1: nach Fine Licht 1968, 175 Abb. 193.
Abb. 2: CAD-Graphik Dipl. Ing. Julia Groß (Samedan, CH).
Abb. 3: nach Tortorici 1990, 29 Abb. 3.
Abb. 4: nach Haselberger 2002, Beilage.
Abb. 5: nach Nash 1961, I 55 Abb. 51.
Abb. 6: nach Humphrey 1986, 183 Abb. 83.
Abb. 7: nach Rolland, Henri: Fouilles de Glanum (XI^{e} Supplément a «Gallia»), Paris 1958, Taf. 36, 3.
Abb. 8: Photo http://www.coinarchives.com.
Abb. 9: Photo Museum für Abgüsse klassischer Bildwerke München, Photothek.
Abb. 10: Photo http://www.coinarchives.com.
Abb. 11: nach Haselberger 2002, Beilage.
Abb. 12: Photo Museum für Abgüsse klassischer Bildwerke München, Photothek.
Abb. 13: Photo Museum für Abgüsse klassischer Bildwerke München, Photothek.

Fig. 1: Junction between the rotunda and transitional block (*avancorpo*) at high level (author).

The Pantheon and the Phasing of its Construction

Mark Wilson Jones

The constructional phasing of the Pantheon has long been central to two closely related issues of great importance for the appreciation and interpretation of the building, firstly its date, and secondly its appearance. Opinion about dating divides either side of a watershed in the 1890s. Up until then Agrippa's famous inscription fronting the portico was generally taken at face value, while subsequently brickstamps have provided the primary basis for assigning the building to the emperor Hadrian — if not his predecessor Trajan. But these are just the broad trends within which fluctuating opinions have strived to account for perceived differences between the main parts of the structure.

Michelangelo spoke for many Renaissance observers who believed the Pantheon to be built in phases, first the rotunda up to the interior order, second the rest of the rotunda together with the dome, third the portico (it is unclear if the so-called transitional block was assigned to the second or third phase).[1] Such theories were bound up with a sustained vein of criticism directed in part at the attic of the interior elevation,[2] in part at the exterior and especially the awkward junction of its circular and orthogonal geometries (Fig. 1).[3] Two phases were more popular than Michelangelo's three, as exemplified by Andrea Palladio's belief that Agrippa added the portico to a Republican rotunda, or Carlo Fontana's clearly illustrated hypothesis of 1694 (Fig. 2). Going beyond Demontiosus' proposal of 1585 for the interior, Fontana imagined a simple masonry first phase, with both the portico and the columnar scheme of the interior being attributed to a later remodelling.[4] As late as the 1930s Giuseppe Cozzo persisted with the idea of differential phasing, arguing that the rotunda alone was built first (in the time of Agrippa), with all the rest being added in the reign of Septimius Severus.[5] Such ideas undoubtedly have a seductive appeal, and indeed even today Giovanni Belardi, the director of the Pantheon on behalf of the Soprintendenza per i Beni Architettonici e per il Paesaggio di Roma, champions a variant on Cozzo's hypothesis. Thus the core of the existing Pantheon would date to the time of Agrippa, when it served as the hot room of his bath complex, entered from the south; it only became a north-facing temple in the time of Hadrian, when a new front was added, along with new construction at the top of the drum

1 Vasari 1963, 275–276. A seventeenth-century source (Cod. Barb. Lat. 4309, f. 11v) also reported Michelangelo's judgment that the first phase was so good as to be «the product of angels», which implies that the other phases were not so good. Cf. Buddensieg 1976, 265.

2 Buddensieg 1976; Marder 1989; Pasquali 1996, chs. 5 and 6; Wilson Jones 2000, 189–191.

3 Buddensieg 1976; Davies et al. 1987; Wilson Jones 2000, 187–190, 199–202.

4 For Demontiosus see Pasquali 1996, 12–14, fig. 6; Fontana 1694.

5 Palladio 1570, iv, 73; Cozzo 1929.

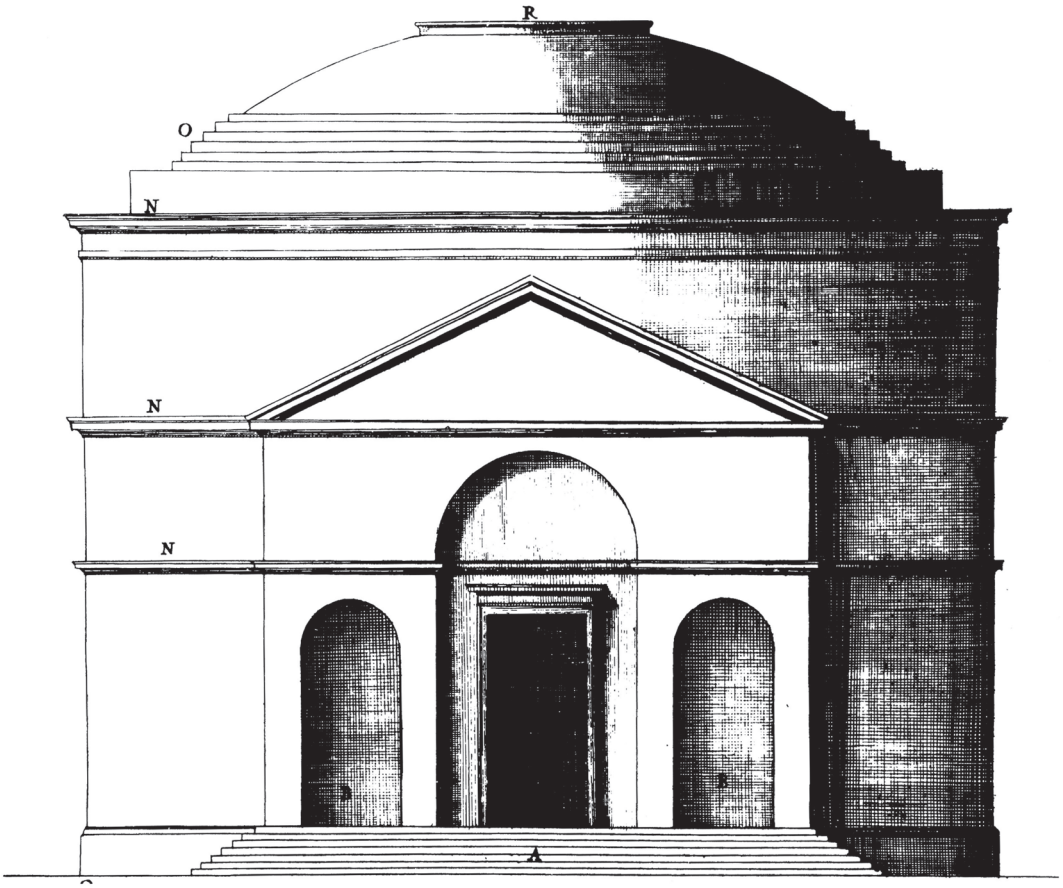


Fig. 2: Carlo Fontana: the Pantheon in its supposed ‹original› state.

and the base of the dome for the sake of resolving structural problems.[6]

After the 1890s most scholars accepted the findings of Heinrich Dressel and Georges Chedanne based on brickstamps recovered from the Pantheon, which established that all its brick and concrete parts (save for repairs) belonged to the first half of the second century AD. This was confirmed and fine-tuned in the 1930s by Julien Guey and Herbert Bloch, who comprehensively dismissed Cozzo's misguided reading of the brickstamps.[7] The excavations conducted under the portico by Luca Beltrami and Pier Olinto Armanini in the 1890s, together with later observations by A. M. Colini and Italo Gismondi, further suggest that the portico and the transitional block were made — or at least planned — at the same time as each other (see below). Wolf-Dieter Heilmeyer's stylistic analysis later showed that the marble architecture of the Pantheon, both inside and out, can be assigned to the Trajanic-early Hadrianic period.[8] The inevitable conclusion that the whole edifice was erected more or less in one period undermined phasing interpretations like those by Michelangelo, Palladio, Fontana and Cozzo. In fact the attic may now be recognized as a vital ingredient of a brilliant and coherent interior scheme, one that deliberately spurned a predictable radial solution in favour of a dynamically

6 Belardi 2007a, 39–41, 71–72 and 127–138; cf. Croci 2007, 274.

7 Guey 1936; Bloch 1947 (esp. 14–26 for his critique of Cozzo's theories).

8 Heilmeyer 1975.

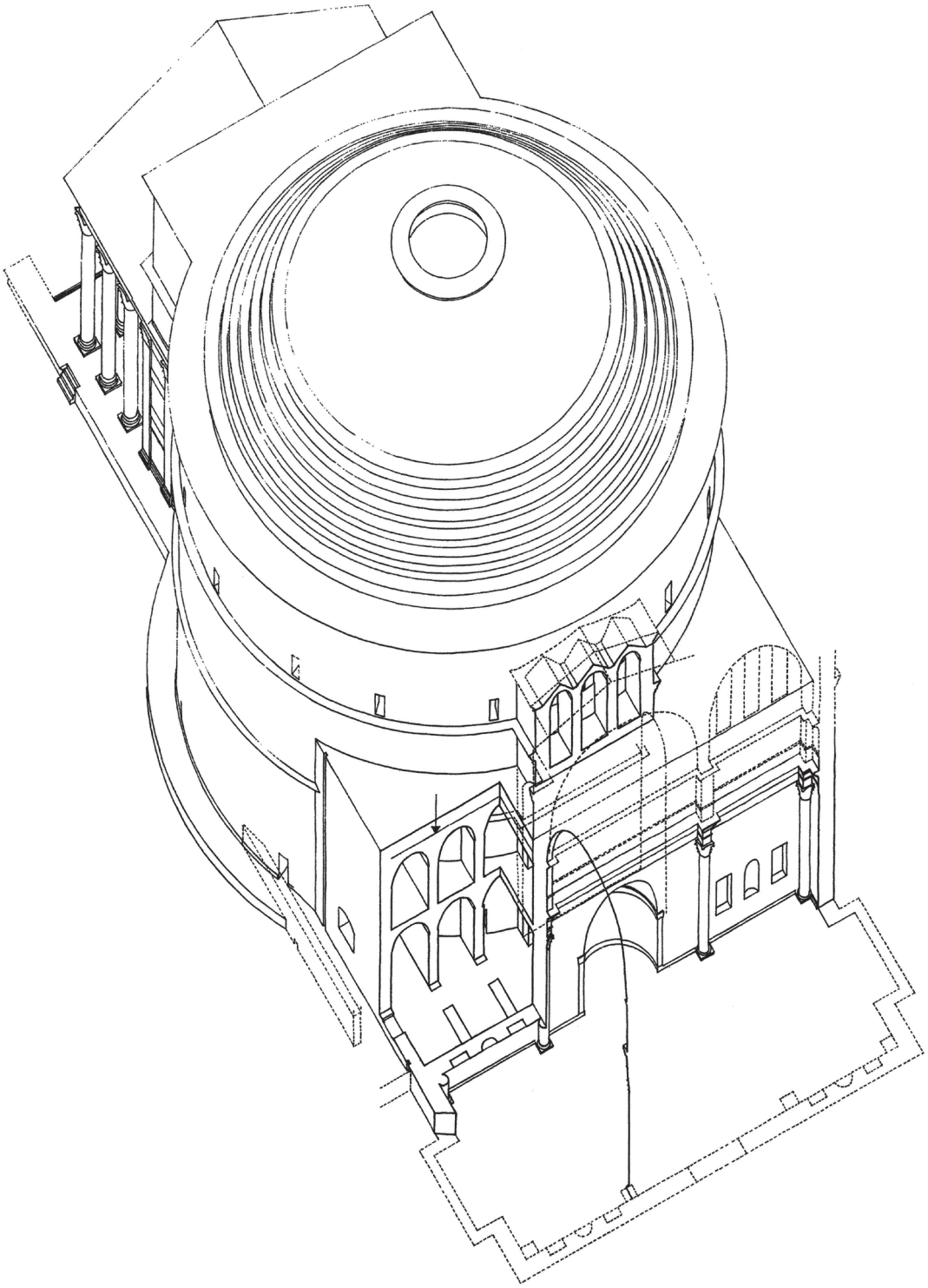


Fig. 3: Isometric of the rear (south) of the Pantheon and the *grottoni* (Fine Licht 1968, fig. 175).

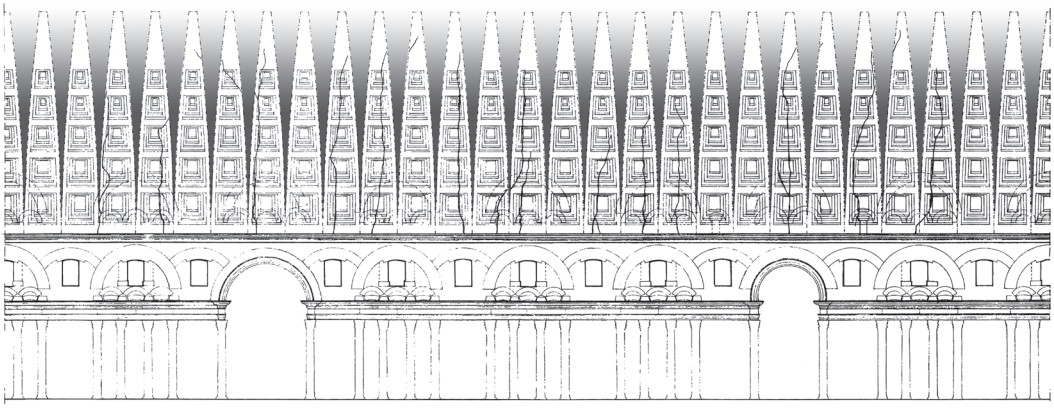


Fig. 4: Orthogonal projection of the interior of the Pantheon showing the principal cracks, after Terenzio (Ippolita D'Ayala Valva, in Wilson Jones 2000, fig. 9.21a).

rhythmical experience.[9] From this it is clear that the attic belonged to a unified and deliberately orchestrated whole. At both ends of the long axis, however, the exterior disappoints. The unconvincing junction of the rotunda with the transitional block and portico at the front eludes a positive interpretation, as does that with the so-called *grottoni* at the rear. It has been argued that these junctions would have been scarcely visible in antiquity on account of the way the building was originally framed,[10] yet such reflections, though perhaps valid to some degree, by no means eliminate the problems. Brickstamp analysis may tell us that all the masonry of the Pantheon is roughly contemporary, but a quick glance is enough to show that the *grottoni* and the upper parts of the transitional block butt up against the rotunda, having evidently been added later (Fig. 1). How can these apparently contradictory signals be reconciled? What is the true nature of the constructional sequence by which the Pantheon was built?

The present contribution seeks to resolve these questions, firstly in the case of the *grottoni* on the basis of ocular observation and previous reports, and secondly in the case of the transitional block on the basis of a new survey of one of the staircases.

Junction between the rotunda and the *grottoni*

The name *grottoni* refers to the annexe sandwiched between the rotunda and the adjacent basilica to the south consisting of six parallel walls and associated floors and vaulting that define a series of spaces on two levels. These support the remains of a solid brick vault overhead and attachments with the rotunda that have been restored as a kind of bridge connecting it with the basilica (Fig. 3). In origin the *grottoni* seem to have served no obvious ceremonial or utilitarian purpose, and the crude fashion in which the fabric butts up against the rotunda gives it all the appearance of an afterthought.[11]

That such an intervention should have been necessary has been linked to the array

9 Marder 1989; Loerke 1990, esp. 30 ff.; Wilson Jones 2000, 191–196.

10 MacDonald 1982, 113; Cf. Lugli 1962, 24; Wilson Jones 2000, 202.

11 The lack of bond was noted by Fea 1820, 18, and confirmed later by others including Terenzio 1932, 54; Guey 1936, 237, n. 5. For the complex as a whole see Fine Licht 1968, 157–171. For the proposal that the *grottoni* could have functioned at some stage as library service space, see Claridge 2007, esp. 79.

Fig. 5: The rear of the Pantheon at high level (author).

of more or less vertical cracks that punctuate the rotunda. Typically these run from about half way up the dome to some way down the drum. The cracks on the interior of the dome were mapped in the 1930s by Alberto Terenzio during restoration works (Fig. 4). Today most of them are substantially obscured by modern finishes or repairs, although a few can be traced on the exterior of the rotunda (the most easily accessible portion within the upper level of the *grottoni*). The survey drawings presented here later also show a crack that runs down the east staircase.[12] The causation for the cracking in general can be attributed to a combination of factors: shrinkage associated with the curing of the concrete during construction; and thermal creep and ground movement; moreover, once cracks had appeared for these reasons seismic activity may then have served to worsen them.[13] The cracks can further be linked to the behaviour of Roman domes in terms of statics. They perform less like modern monolithic shells created using reinforced concrete, and more like arrays of tapering sections of masonry comparable with the segments of an orange; these segments tend to open up due to outward lateral thrust and hoop tension, both of which are characteristic of unreinforced domes.[14] As a result the dome does not match a perfect hemisphere, but, as shown in the recent campaign of laser scanning undertaken by

12 Terenzio 1932; on p. 52 he promised a detailed report relating to the restorations of 1930–1931, but this remains unpublished.

13 Croci 2007, 286–287.

14 Mainstone 1975, 116-117; Hutchinson/Mark 1986; Mark 1990, 60 ff. Cf. Moore 1995; Heyman 1988.

the Karman Center, the crown has slumped by almost 60 cm.[15]

The separation between the rotunda and the *grottoni* can perhaps be explained as a deliberate device adopted to avoid damage that could have resulted from differential settlement.[16] Otherwise it has been assumed that the *grottoni* were created after the completion of the dome, as an improvised countermeasure aimed at resisting its outward pressure and the spread of the cracking.[17] However my observations suggest that the relation between cause and effect is more complex. It appears that the work on the *grottoni* began earlier than the dome. The key point here concerns the connection between the rotunda and the *grottoni* on the upper levels — a connection quite unlike that which occurs below. Instead of casually butting up to the rotunda as at low level, the ‹bridge› has a cornice that meets the middle cornice of the rotunda at a bonded mitre, or in other words in a premeditated relationship.[18] Further overhead the rotunda displays scarring where the fabric originally supported by the bridge used to be (Fig. 5). The drum is not smooth, as we should expect had an extraneous construction simply fallen away. Instead material integral to the rotunda has been pulled away

Fig. 6: The crack near the north-south axis of the Pantheon, behind the main exedra as seen from inside the *grottoni* (author).

along with the buttressing.[19] Despite the lack of bond below, then, it seems that the rotunda and the *grottoni* were bonded at high level.

The buttress walls were therefore initiated after the drum had risen to around a third of its height, but none the less they *caught up with the drum* by the time it was two-thirds complete, and before the dome was begun.[20] Unless work on the rotunda was suspended for a period — a possibility that cannot be excluded — the *grottoni* were presumably built very fast. It happens that a rapid pace of work is attested at Trajan's Baths by dates scribed in red pigment on walls of similar technique (brick-faced

15 My interpretation of a cross-section kindly supplied by Nikolaos Theocharis of the Karman Center in October 2006 suggests that the rotunda leans outward fractionally. Five-metre-high sections of the upper two levels of the exterior lean outwards by about 2.5 cm or 1 in 200. This can be understood as a corollary of the slumping of the dome. Cf. Pelletti 1989.

16 Cozzo 1928, 280–281. Cozzo (281) claims that this «espediente costruttivo … è largamente applicato nelle construzioni Severiane del Palatino», without going into specifics, while stating that Piranesi, Fea and Lanciani had already noted this phenomenon in the case of the disjunction between the rotunda, transitional block and portico. See also Rivoira 1925, 53, for similar ideas concerning towers attached to fortification walls; I thank Gene Waddell for this reference.

17 Lugli 1962, 31–32; Moore 1995, 7. Fine Licht 1968, 189, implies a structural function.

18 Cozzo 1928, fig. 207; Fine Licht 1968, 163, fig. 179.

19 Cozzo 1928, 283–285; his explanations, however, are flawed. For photographs of this area taken from high level see Belardi 2007a, 316, 329.

20 This needs to be confirmed by detailed examination, but to date I have not succeeded in gaining permission for the necessary access.

concrete); the dates indicate that over a period of around two and a half months one wall rose by an astonishing 15 metres. The entire substructures of the baths were probably executed in a single season,[21] and between one and two seasons can be conjectured for the *grottoni*, at least as regards everything above the foundations (presuming these to have been made during the preceding year). A relatively swift intervention concurs with the rough chronological equivalence between the brickstamps from the *grottoni* and those from the rotunda.[22]

This sequence implies that the *grottoni* represent an improvised response to defects that occurred at an early stage of construction, *before* the rotunda had reached high level and *before* the addition of the dome. The chief clue as to the motivation is a huge crack located in the southern sector of the rotunda, approximately on the axis of the main apse (Fig. 6). Where it can be observed on the upper floor of the *grottoni* it measures approximately 5–8 cm in width, as opposed to 1–2 cm in the case of the three other cracks in the rotunda that are also visible in this area. Moreover, unlike most of the cracks around the whole rotunda, which tend to peter out earlier, this one reached ground level.[23] In short, some factor, or combination of factors, conspired to make the situation in this part of the structure worse than anywhere else. Perhaps the weight of the building produced traction or tilting in the ground and the foundations of a kind that tended to cause the two halves either side of the main axis to pull away from each another. It may be remembered that the Pantheon stands not on rock but on clay.[24] The drawings published by Beltrami in 1898 show that the Agrippan structures under the portico slope towards the south, while the new survey by the Karman Center indicates that the existing floor level drops by almost 40 cm from the front of the portico to the main apse. This slope may at least in part be attributed to settlement due to the great weight of the rotunda. But whatever may be the exact causation, the very existence of the *grottoni* and the manner in which they were constructed undoubtedly speaks of a crisis that was related to structural distress or constructional difficulty.

Junction between the rotunda and the transitional block

On the opposing entrance side of the Pantheon the junction between the rotunda and the transitional block can best be observed in the two staircases either side of the entrance. Here there is no apparatus of marble revetment to hinder inspection, while the stairs themselves facilitate access — an enormous practical advantage. Hardly the most glamorous part of the Pantheon, these staircases have received relatively little study. This tendency goes back to the Renaissance; a plan by Giuliano da Sangallo for example, otherwise fairly accurate, assigns to the stairs a triangular configuration quite different from the actual one. Desgodetz went on to show decent plans of the stairs in his famous survey of the 1680s, yet they were still treated rather summarily by comparison with the great efforts spent on documenting all the rest. A professional survey of the stairs in both plan and section had to await Achille Leclère's efforts of 1813.[25] Desirous of more in-

21 Volpe 2002, 383, presumes a wall thickness c. 1.20 m, i. e. 4 ft or two bipedales thick, the same as that of the four internal walls of the *grottoni* (Fine Licht 1968, 157).

22 Lugli 1962, 32. On brickstamps see Guey 1936; Bloch 1947, 108–109, 112, 116–117; Fine Licht 1968, 189.

23 Photographs from the first half of the 20th century attest to the presence of this crack at floor level in the main apse (Archivo fotografico Soprintendenza per I Beni Architettonici e per il Paesaggio di Roma, neg. 2967), although today this is impossible to observe due to modern repairs. For further photographs of the same crack seen from the *grottoni* side see Belardi 2007b, fig. on p. 69 (neg. 6184), and p. 73, fig. 26.

24 Fine Licht 1968, 92; Moore 1995, 7; cf. Croci 1998, 125; Croci 2007, 266.

25 Roma Antiqua 2002, 100–123.

formation, in 2005 and 2006 I supervised and contributed to a new survey of the East Stair, chosen because it is better preserved than its approximate mirror image on the west.[26] This gave rise to the drawings illustrated in Figures 7, 8 and 9, comprising a set of plans and two sectional elevations looking towards the rotunda. These drawings also help locate certain pertinent details such as the soundings (*saggi*), made mostly in the first half of the 20th century, where the rotunda wall (labelled ‹A›) meets the side walls (‹B› and ‹D›) of the transitional block. The relationship between the rotunda, stair and transitional block in three dimensions is shown in the form of a cut-away in Figure 10.

Today the East Stair is entered from one of the two great apses of the portico, the original doorway on the flank having been blocked up. It is contained by four walls rising from a trapezoidal plan, with the stairs making six full turns plus an extra seventh flight against the curved wall of the rotunda. The stairs have been reconfigured at both top and bottom, while the flights and landings present a mixture of ancient material and modern surfaces. Yet there is enough of the former to show that the existing arrangement follows the original reasonably faithfully.

The first result of my inspection, conducted in the expert and congenial company of Giangiacomo Martines and Cinzia Conti, confirms what many have affirmed or suspected in the past, namely that at *high level* there is a complete, and completely obvious, disjunction between the fabric of the rotunda and that of the transitional block. Wherever the soundings allow us to inspect their meeting at high level, the rotunda presents intact finished surfaces that can only have existed if it had been built first.[27]

The situation is not however at all the same *at low level*, where instead the rotunda and the transitional block are unified. This unity is less glaringly evident than is the disunity above, primarily because the Pantheon stands intact and is not a ruin. None the less it is the inescapable conclusion reached on examining various kinds of evidence, including soundings, *bipedalis* courses, the construction of the stairs, connections with the chambers in the drum, and structural performance. Here I shall concentrate on the soundings and the courses of *bipedales*.

The question of bonding in the lower half of the stairs is effectively resolved by a single sounding at the second landing of the West Stair at the junction between the rotunda and the shorter side wall. This is the largest of the soundings in either staircase, and at almost 1.5 m tall, between 30 and 49 cm wide, and up to 63 cm deep it provides an ample view into the ‹guts› of the fabric (Fig. 11). This shows firstly that there is no gap or crack at the junction; secondly that mortar consistent in composition runs uninterrupted from one side (the rotunda) to the other (the transitional block); thirdly that the lower of the two courses of *bipedales* visible in the sounding includes a whole *bipedalis* which passes unbroken across the junction. This is especially decisive; it would have been impossible to insert so large an element after the original construction. The two bodies of fabric are therefore bonded at low level, and contemporary with one another.[28]

Courses of *bipedales* (sometimes known as ‹bonding courses› or ‹through courses›) are of particular interest because of the practice for them to traverse at intervals the entire thick-

26 I am grateful to several people for their kind help with this project: to Giovanni Belardi for permission for access and facilitation, to Cinzia Conti and her students Roberta Zaccara, Tomaso De Pasquale and Mariangela Perrota for help with surveying, again to Roberta Zaccara and to Robert Grover for drawing up the results, and to Giangiacomo Martines and Cinzia Conti for precious observations *in loco*. The full results will be published in a forthcoming article.

27 For photographs of soundings that show this disjunction at high level see Belardi 2007b, 74, figs. 30–31, 76.

28 For further photographs of this sounding see Belardi 2007b, 75, figs. middle-left and bottom-right; 77, middle-left.

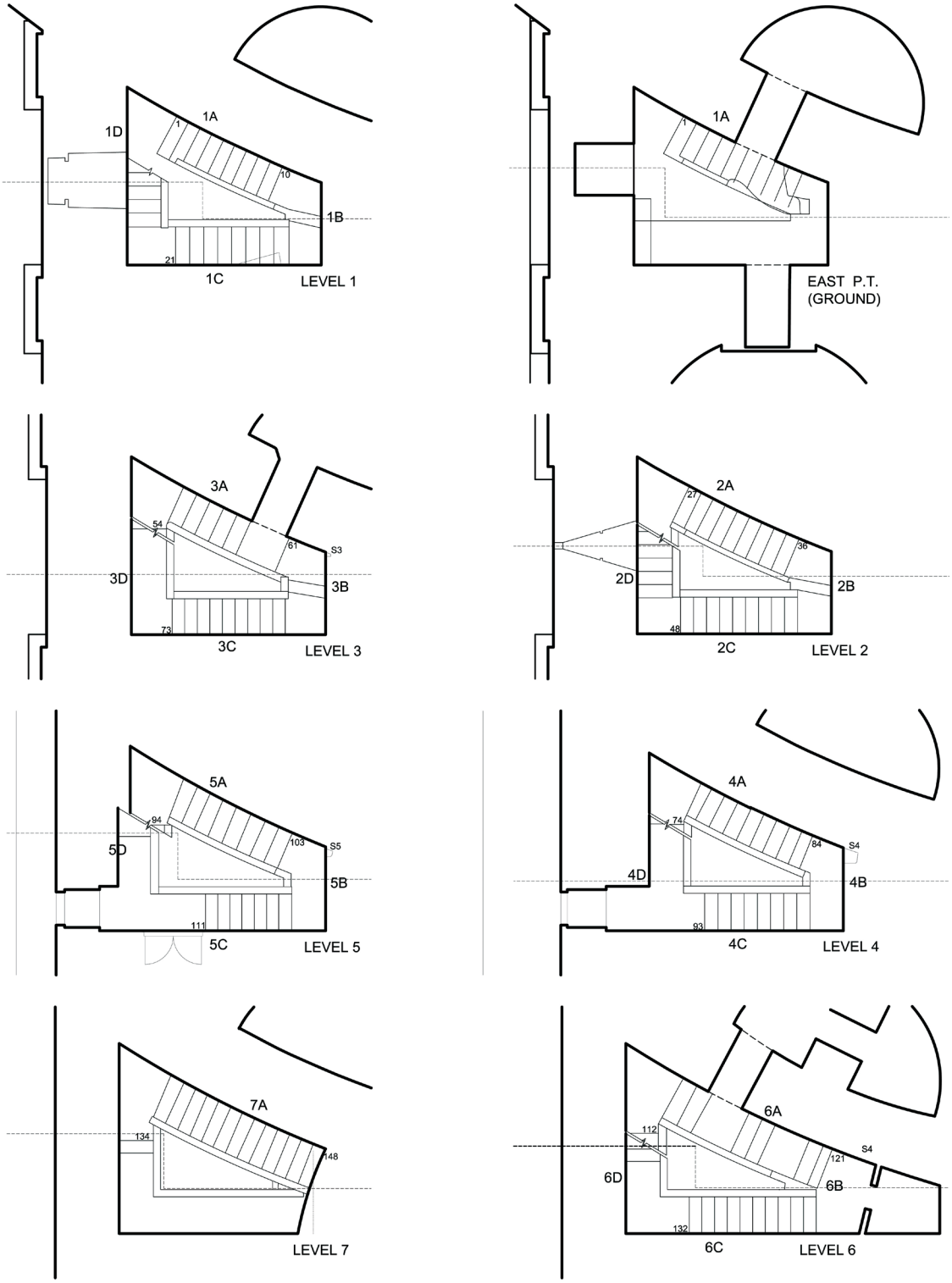


Fig. 7: Plans of the East Stair, 1 : 150 (author, Roberta Zaccara and Robert Grover).

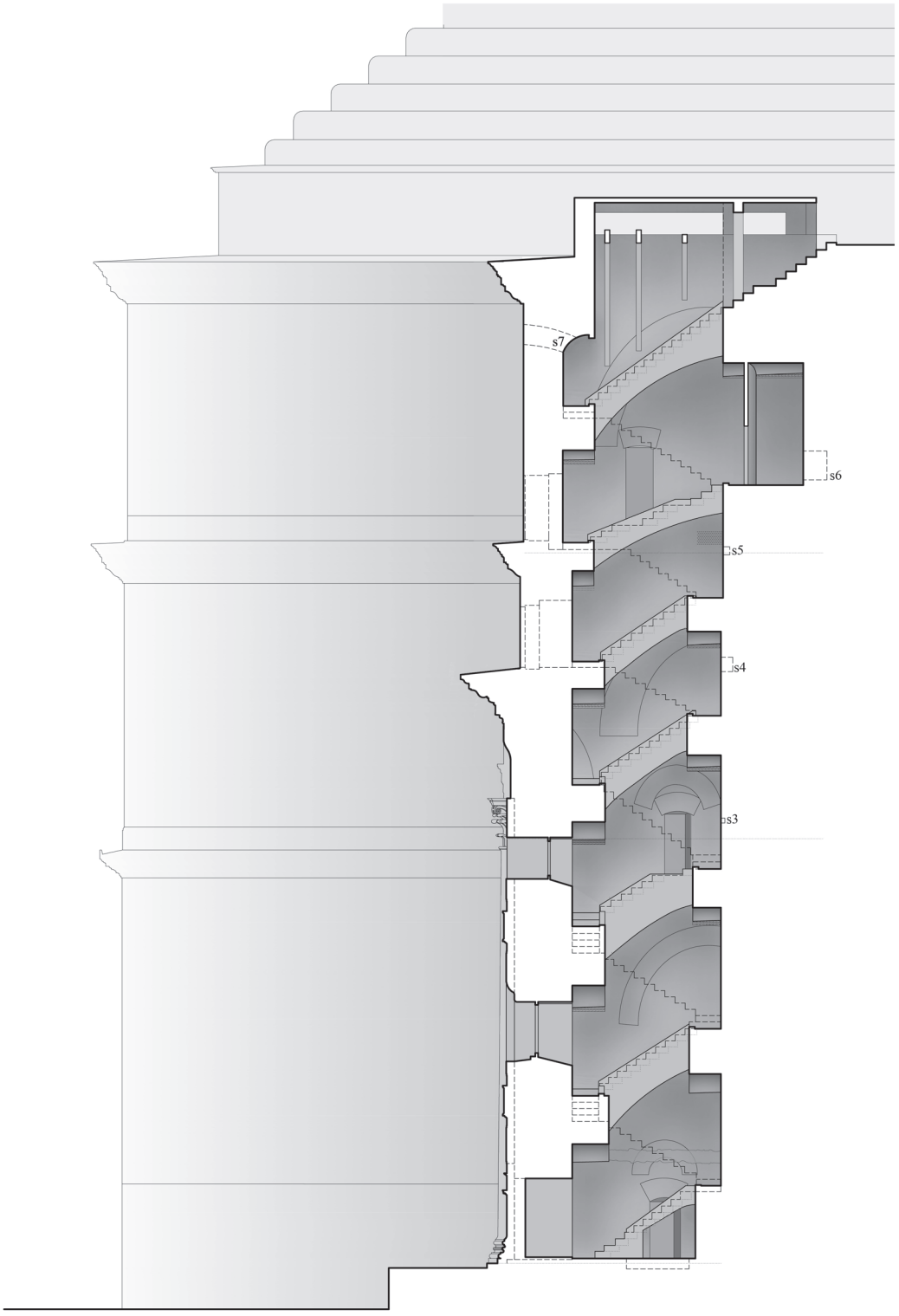


Fig. 8: Section of the East Stair, 1 : 200 (author, Roberta Zaccara and Robert Grover).

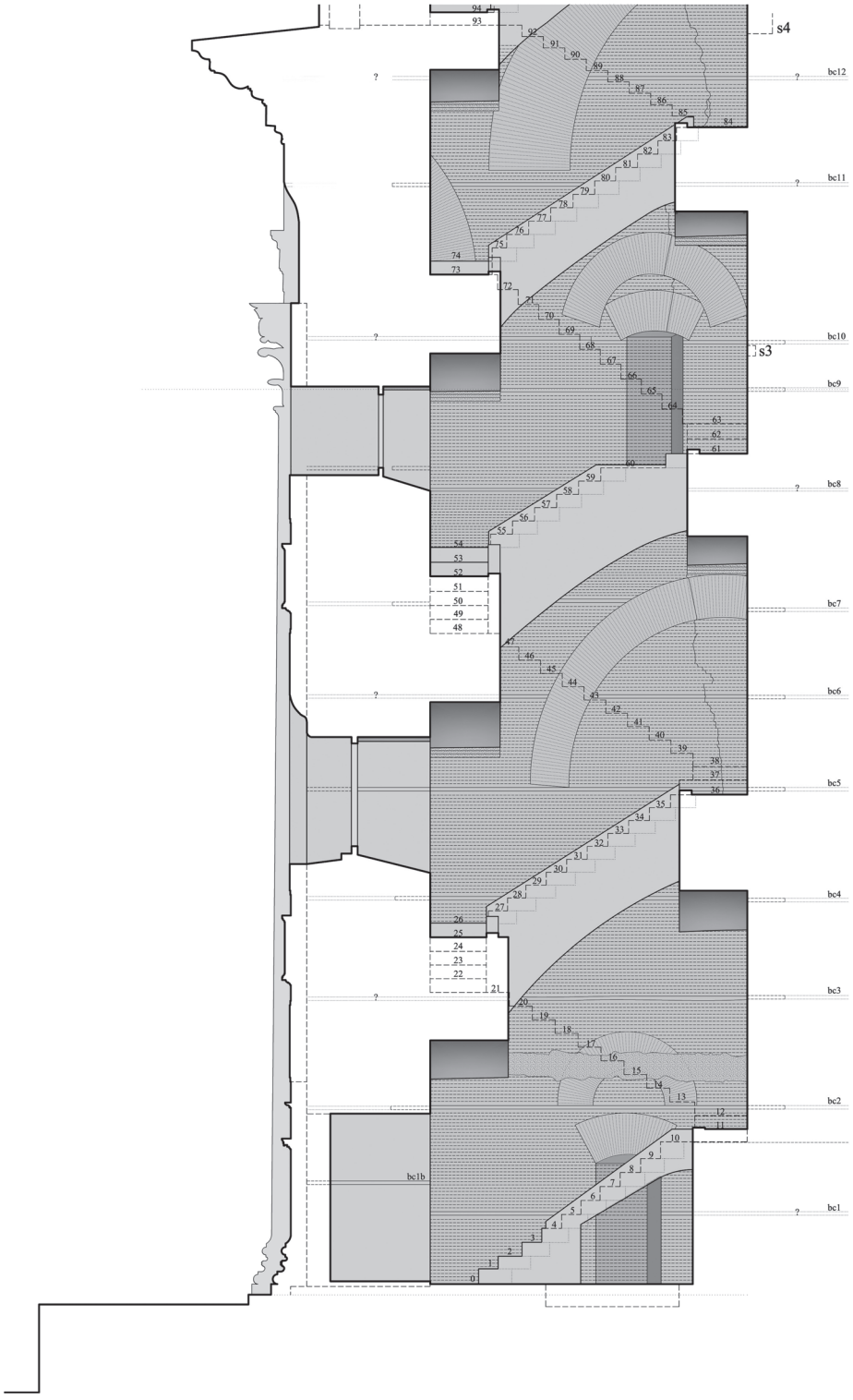


Fig. 9: Detail section/elevation of the lower half of the East Stair, 1 : 100 (author and Robert Grover).

Fig. 10: Cut-away of a 3-dimensional virtual model of the Pantheon (Robert Grover).

ness of construction, like the layers in a layer cake. As Figure 9 shows, in the lower half of the East Stair the *bipedales*, allowing for some exceptions, typically run at the same level around all four walls (A, B, C and D). This suggests, although it cannot prove, that the walls were coeval (in sympathy with the conclusion just reached for the lower half of the West Stair).

Inspection of the courses of *bipedales* on the upper levels was hampered by the presence of limewash and poor lighting conditions, so I concentrated attention at the level of the sixth turn of the stairs, where there is a connection with one of the third tier of chambers running around the drum (Fig. 8). Here it is possible to observe the construction from the staircase right through to the interior surface of the dome, thanks to a small opening piercing otherwise solid construction. This reveals that a course of *bipedales* runs at the same level throughout all this fabric. It is important to note that this occurs above the level where the rotunda and the transitional block become separate. Though the former was clearly built before the latter, this alignment of the bonding course points to a continuity of intention

and supervision and thus temporal proximity. In effect, then, the transitional block merely suffered a hiatus. Operations were evidently halted about half way up (while work on the rotunda continued), resuming probably within the space of a few months or years.
It may also be observed that the connections between the stairs and the semi-circular chambers in the drum are essentially intact, and show no sign of major ancient modifications (as opposed to minor modern interventions).[29] From this and the above it is clear that the staircase as a whole was conceived as a single project, and since it dovetails with both the rotunda and the transitional block it naturally follows that these two also form part of a unified conception.

The connection between the transitional block and the portico

The nature of the connection between the transitional block and the portico has been investigated by Colini and Gismondi. Although full documentation of the evidence that they used is lacking, they deduced that the foundations for both were made at the same time.[30] In their view the parent blocks of the capitals of the pilasters responding to the portico columns are embedded into the transitional block too deeply and neatly for them to have been inserted later (Fig. 12, left).[31] Another significant observation relates to the brickwork facing of the transitional block just above the portico roof, and in particular the presence of a single inclined line of *bipedales* (Fig. 12, right) rising in sympathy with the pitch of the roof. The *bipedales* cannot have been inserted later, so the roof must have been contemplated at the time the upper parts of the transitional block was built.[32]

Fig. 11: Sounding no. 2 in the West Stair, second level, at the junction between the rotunda and the transitional block (author).

The portico cannot therefore have been added in a completely separate campaign, even if, as was the usual Roman practice, the positioning of the columns and associated revetment necessarily awaited the completion of the masonry transitional block. So whereas the *grottoni* represented an afterthought, it is certain that the rotunda, the transitional block and the portico all belong to a single endeavour, albeit one in which parts were built sequentially for one reason or other.
To summarize the results of this examination so far, the fabric of the Pantheon reveals the following:

– The *grottoni* to the south were not part of the original project; they were added after

29 It is with regret that I have to disagree with Belardi's report (Belardi 2007b, 72), which cites «forti rimaneggiamenti della muratura», while stating that in the West Stair «si legge perfettamente ancora la tamponature del vano originale.» I can see no evidence of modifications or infilling.

30 Colini/Gismondi 1926, 83, 87–92. Cf. Beltrami 1898, 41–46; Cozzo 1928, 281–282, fig. 192; Fine Licht 1968, 59–63, 85–88, 189.

31 Colini/Gismondi 1926, 70–73.

32 Colini/Gismondi 1926, 75–77.

the commencement of the rotunda, but were built so quickly as to catch up and become united with it by the upper levels.
– The rotunda and transitional block are bonded at the bottom; both are part of a unitary project which included the staircases.
– About half way up the elevation the procedure changed; work carried forward on the rotunda alone, with the rest of the transitional block following on later.
– The upper part of the transitional block belonged to essentially the same project as the lower half, albeit possibly modified. The interruption of the work on the transitional block was relatively brief, probably no more than several months or a few years.
– The portico was planned as part of the project from the outset, but in line with normal practice its construction was not undertaken until after the transitional block was substantially complete.

Chronology

Thus far we have been concerned with the dating of the various parts relative to each other. What about absolute dating? On the basis of the studies of first Dressel and Chedanne and then Guey and Bloch, it is clear that the great majority of brickstamps recovered from the Pantheon *in situ* belong either to the late Trajanic or early Hadrianic periods.[33] Exemplars of the same or similar stamp types are dispersed in different parts of the building, including the rotunda, the transitional block (both its lower and upper parts) and the *grottoni*.[34] Thus all the brick and concrete parts must be roughly contemporary, subject to the differential progress of the works already described.

Establishing more exactly the start of construction is controversial, however. We have become used to attributing the building *in toto* to Hadrian, but as Lise Hetland shows in her paper, re-examination of the brickstamps tends to shift the dating earlier. There is an excellent possibility that the Pantheon was designed and begun in the late Trajanic period, as proposed by Heilmeyer in the 1970s largely on the basis of stylistic comparisons.[35]

The end date is less problematic, though still not entirely free of controversy. Given how common are stamps datable to 123 (the year in which stamps were imprinted particularly assiduously), their absence in the Pantheon is significant. The superstructure must have been completed more or less by this year. Further time was needed for the raising of the portico and for finishing its marble and bronze carapace, which points to a dedication date for the project between 125 and 127. The occasion may have taken place not long after Hadrian's return to Rome in the summer of 125 at the end of his first tour of the empire.[36]

In proposing a completion date around this time Bloch found one particular difficulty troubling. This concerned a single stamp returning a date of AD 123 that was recorded by Rodolfo Lanciani on a *scaglia* (small ‹flake› or fragment) at a little above ground level, thus threatening to postpone the date of the entire edifice. Bloch got around this simply by assuming it to have been reported incorrectly, since (leaving aside repair material) it alone out of all the brickstamps found *in situ* was not dat-

33 Guey 1936; Bloch 1947, 14–19, 102–117, esp. 112; Fine Licht 1968, 180-190; Heilmeyer 1975. Occasional Antonine and Severan stamps result from repair works.

34 Bloch 1947, 112, quoted Guey's expression for their distribution: «un peu partout dans la bâtisse» (Guey 1936, 233). Bloch agreed that Guey had «deduced the only possible conclusion», namely that all the major parts of the building were built at the same time. In Lapenna 2007a, however, it is suggested that these interpretations are not necessarily superior to Fea's Augustan dating.

35 Heilmeyer 1975. For support for part of Heilmeyer's thesis, his attribution of the building to Apollodorus, see Wilson Jones 2000, 192–193, 212; Viscogliosi 2001, esp. 158–159; Martines 2003, 14–15; Heene 2005. The idea was earlier floated tentatively by Bloch (1937, 116).

36 Bloch 1947, 117. Cf. Fine Licht 1968, 186; MacDonald 1982, 96; Boatwright 1987, 134–135; MacDonald/Pinto 1995, 17–19.

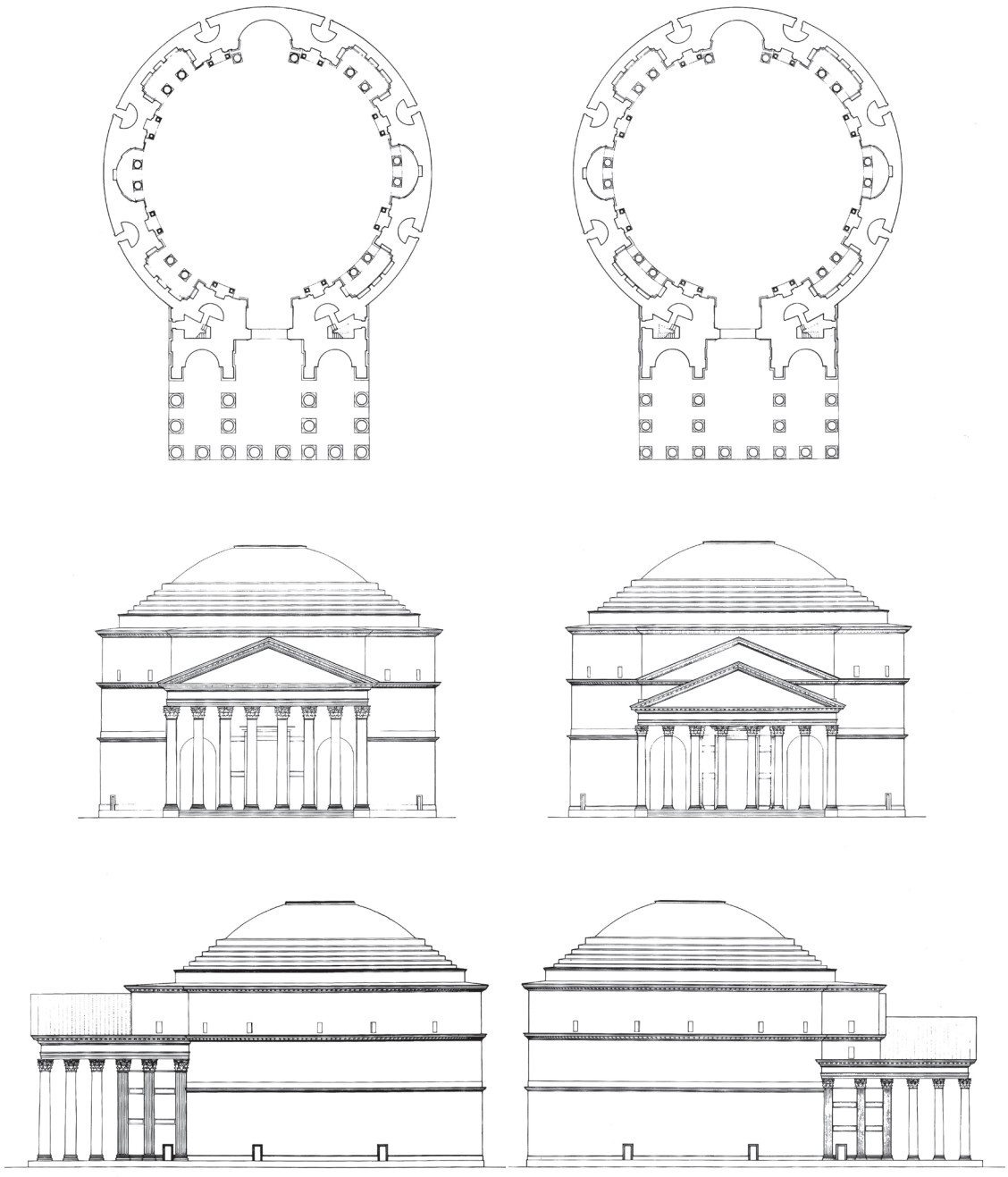


Fig. 12: Pantheon plans and elevations, intended and as executed (Wilson Jones 2000, fig. 10.12).

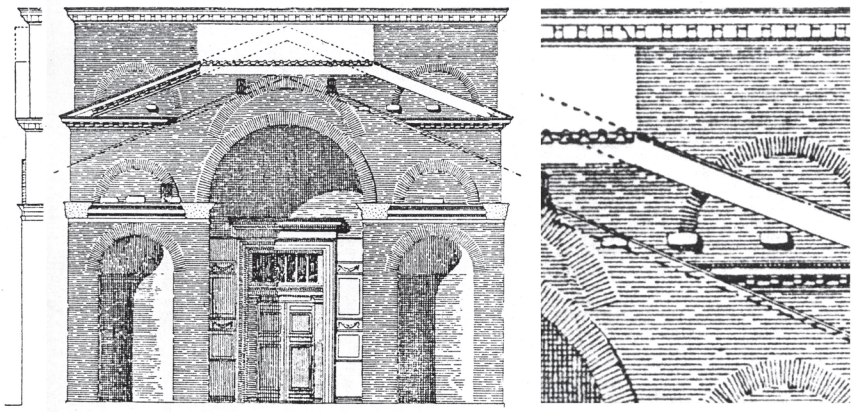


Fig. 13: Elevation of the transitional block (shown without the portico), with detail (right) at high level showing the inclined line of *bipedales* just above the line of the portico roof (Colini/ Gismondi 1926).

able to before 123.[37] Lanciani's record, however, reads as if it were accurate,[38] and he may be taken at his word. The key to reconciling this with all the other evidence is the find-spot of the *scaglia*, just behind one of the marble pilasters where the columnar system of the portico meets the transitional block, near its north-east corner. As just mentioned, it was general practice for stone facings to be put in place after the backing, and Colini has confirmed that this was indeed the case for the Pantheon. In all likelihood Lanciani's *scaglia* was fill material or packing used in positioning the pilasters. This would date the portico to between late 123 and 125, which fits in well with the dedication date already proposed of 125 to 127.

There are thus two main possibilities for the duration of the project from conception to completion: either a period of seven or so years (c. 118/9 to c. 125/6), if we give credence to Bloch, or one roughly five years longer (c. 113/4 to c. 125/6), if we give credence to Heilmeyer and Hetland, which on balance I think we should.

It is now pertinent to turn to another paper presented at the Bern conference, that of Janet DeLaine. In the normal course of events, she argued, a construction period of five or six years would be perfectly feasible for a building like the Pantheon. It is true that the great thickness and complexity of the drum required uncommon care and deliberation, but such a period does not seem too short when one considers the speed of Roman construction generally, and the specific case of the Baths of Caracalla. The gigantic superstructure of the central block was erected in not much more than three years, while the inauguration of the complex (albeit not quite complete on the perimeter) took place not much more than five years after conception.[39]

But from what we have seen earlier, events at the Pantheon were far from normal, and its construction could well have been unusually protracted. Delays were presumably generated by the improvised erection of the *grottoni*. Delays are also implicit in the hiatus in building the transitional block. (It remains difficult to say whether these two delays ran separately or concurrently.) These delays could account for the five or more year difference between DeLaine's hypothetical construction period and the likely actual construction period.

37 Bloch 1947, 114. However Lapenna 2007 persists in following Dressel's and Beltrami's superseded attribution of several stamps to 123 or thereabouts.

38 Davies et al. 1987; Wilson Jones 2000, ch. 10. For shipwrecked cargoes of ancient marbles see P. Pensabene 2002, 3–67, esp. 34–46.

39 DeLaine 1997, 15–16.

Attempts at explanation

What now remains is the explanation behind the problems at the front end of the building. We have seen how the curious phasing of the *grottoni* was probably a response to concerns about the cracking and the stability of the rotunda; Could a structural problem explain the interruption of work on the transitional block? (Such interruption, it may be noted, temporarily denied just the kind of buttressing to the upper part of the rotunda that the builders were keen to provide by erecting the *grottoni*). In point of fact, there is relatively little sign of structural distress visible in the East Stair.

If the interruption in building the transitional block cannot be imputed to structural problems, it seems legitimate to look for explanations that might shed light on the shortcomings of the design of the exterior that have so preoccupied commentators since Michelangelo's day. Together at first with Paul Davies and David Hemsoll, I have argued that 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 originally planned with sixteen columns incorporating 50 ft (15.2 m) monolithic shafts of Egyptian granite (Fig. 13). These columns would have been set out on the same centres as those of the actual portico, presumably with the same distribution of materials, that is, eight shafts of grey granite from the quarries at Mons Claudianus in front, eight of pink granite from Assuan behind. According to this theory the decision was made to employ 40 ft (12.2 m) shafts instead only after work had started on site, for some reason unknown — perhaps because a consignment of 50 footers had sunk en route between Alexandria and Rome.[40] It is significant that Roman monolithic column shafts tended to be standardized in multiples of 4 (1.2 m) and/or 5 ft (1.5 m) lengths, and 30 (9.1 m), 40 and 50 ft lengths were the dominant larger sizes. Shafts 40 ft long thus represented the next major step down from 50 ft, and, moreover, were much more common and therefore more likely to be available (perhaps by diverting them from another project).[41]

The compromise hypothesis seeks to account for a series of features that are sufficiently unusual or perverse as to raise the question of whether they were really intended in the first instance. Indeed, all such solecisms and curiosities would simply not have existed in the hypothetical original project.[42]

The curious fact of the transitional block being bonded with the rotunda at low level, but unbonded at high level, can be seen to be part of the same picture. The compromise hypothesis happens to fit remarkably the sequence of construction observed. It allows us specifically to envisage the following stages: first a properly unified project, embracing rotunda, transitional project and portico; second the start of works on site, with progress on this unified project up to approximately half way up the elevation; third an unforeseen catastrophe (the non-arrival of the intended columns); fourth a hiatus of not more than a few years, during which time work continued on the rotunda alone; fifth the recommencement of the transitional block according to a revised project. In short, the case for the compromise hypothesis appears to be significantly strengthened by detailed analysis of the fabric of the Pantheon.

40 Davies et al. 1987; Wilson Jones 2000, ch. 10. For shipwrecked cargoes of ancient marbles see Pensabene 2002, 34–46.

41 On column proportions and standardized sizes see Wilson Jones 1989; Wilson Jones 2000, 148, 155, 208, Appendix B; Pensabene 2002, 24–25; Barresi 2002.

42 The original list of nine solecisms (Wilson Jones 2000, 203) has now been expanded to twelve, as presented at this conference (to appear in a chapter entitled «Building on Adversity» of a collected volume of essays on the Pantheon co-edited with Tod Marder, to be published by Cambridge University Press).

Conclusion

In the spirit of moving debate forward, it seems opportune in conclusion to engage briefly with objections relating to the compromise hypothesis presented by Lothar Haselberger during the course of the Bern conference. Pending publication of these objections, discussion is best limited here to the possibility of interpreting the evidence in differing ways, as illustrated by just one specific feature, the Pantheon's double pediment. The combination of a pediment for the portico and another applied higher up appears to me sufficiently odd in itself, besides being oddly handled, to raise doubts as to whether both elements were really originally intended. For Haselberger, though, the stacked roofs of the classical Propylaea of the Athenian Acropolis (Fig. 14) provides a precedent, the reprise of which could have been entirely deliberate. This is undoubtedly a very reasonable objection. It could be countered by noting that the Athenian double roof could only have been seen from very limited and distant vantage points, whereas the Roman version was more visible; yet this is hardly a decisive point. None the less in my reading the ‹ideal› project with a single grander portico remains a far more coherent solution. Therefore it is possible to imagine a scenario in which the Athenian Propylaea did indeed present itself as a precedent — but only once the ideal original design for the Pantheon portico had to be revised. Might we further imagine that, armed with his personal knowledge of Athens, it was the emperor Hadrian himself who promoted such a solution, in antagonism with Apollodorus, Trajan's master-architect and possible architect of the Pantheon?[43]

Naturally such musings remain speculative. We will never know exactly what happened to the design of the Pantheon, how decisions were made, nor how they were contested. To ignore the problem of design, however, would be to leave the analysis of the fabric of the building and its construction suspended in a vacuum. The present examination has served to document certain constructional characteristics which inform us about the sequencing of works on site — but while the reporting of these findings is a valid exercise in itself, it seems equally clear that they are sufficiently curious to warrant explanation. To date, the ‹compromise hypothesis› remains the best explanation on offer.

43 For a speculative scenario in which Hadrian and Apollodorus came into conflict over the Pantheon, see Wilson Jones 2000, 212.

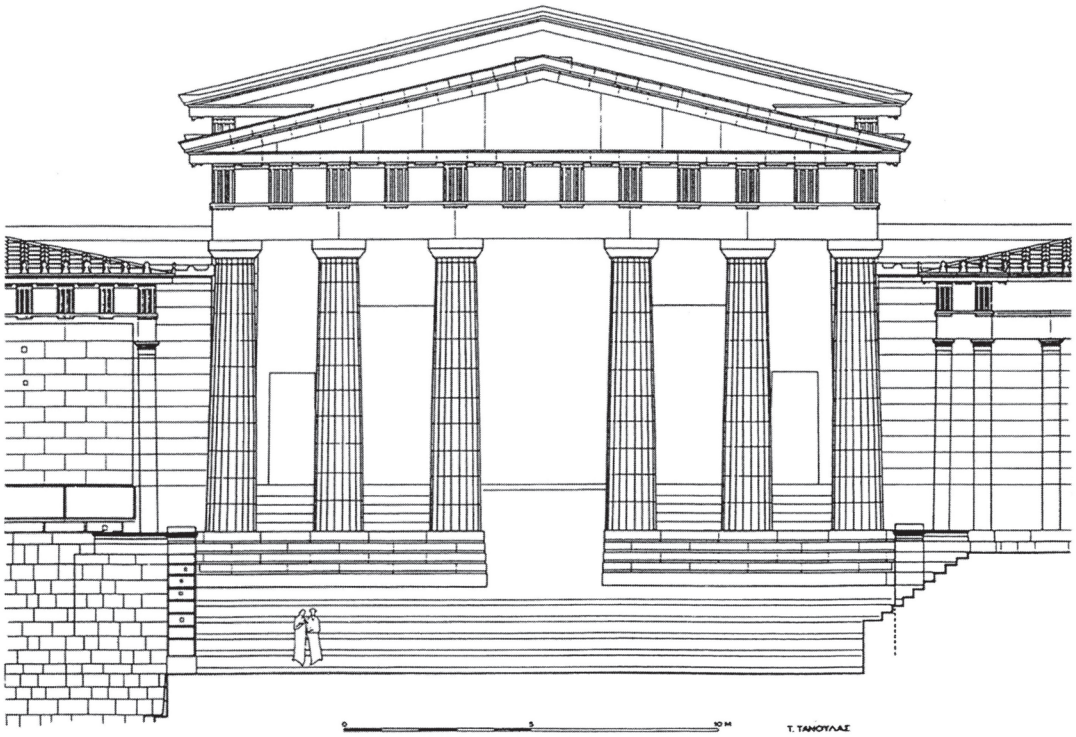


Fig. 14: The Propylaea of the Acropolis, Athens, west elevation (T. Tanoulas, in J. Niels, The Parthenon from Antiquity to the Present (Cambridge and New York 2005), fig. 44b).

Die Kompromisse in der Architektur — Anbau Nord / Anbau Süd: Wie kamen sie zustande?

Gerd Heene

Abstract[1]

Der so überwältigende, zentrale Raum des Pantheon ist über jener perfekten Grundrissgeometrie geplant worden, die bereits beim Vorgängerbau, dem Pantheon des Agrippa, zugrunde gelegen hat. Ebenso wurde die dritte Dimension des zylindrischen Zentralraums mit der 43,30 m weit gespannten Kuppel über dieser Grundrissgeometrie geplant und ausgeführt. Die Präzision der Ausführung ist hervorragend. Sie weist nur geringe Toleranzen zum geometrischen Idealmodell auf. Die Kuppel ist die eigentlich geniale Lösung dieses Bauwerks. Es gab damals bereits ein ausgeprägtes «Knowhow» bezüglich früher errichteter Kuppeln, doch war offensichtlich dem Planer das Risiko bei den erheblich grösseren Spannweiten, Abmessungen und damit den abzuführenden Lasten bewusst. Es war eine Herausforderung, die mit Bravour gelöst worden ist. Der Bau der Vorhalle (Pronaos) stellte im Grunde kein neues Motiv dar. Deren Grundriss ist geometrisch mit dem des Zentralraumes integriert, so dass es keine unlösbaren Schnitt- und Detailpunkte gegeben hat. Ganz anders verhält sich dies jedoch bei den Zwischenbauten Süd und Nord. Hier gibt es einige problematische Punkte und Überschneidungen sowie ungelöste Detailpunkte, deren Ausführung in negativem Kontrast zum Zentralbau und auch zur Ausführung anderer, etwa zeitgleicher, römischer Bauten, wie z. B. der des Kolosseums steht. Der Verfasser hat in einer wissenschaftlichen, mehrjährigen Studie die Herstellung des Pantheon (Bauzeit: 110 bis 125 n. Chr.) nachvollziehen können und damit auch die o. g. Probleme in konsequenter Weise integriert behandeln müssen. Dabei wurde in entscheidendem Masse darauf geachtet, dass weder neue Theorien noch Lehrmeinungen produziert werden, sondern Schlussfolgerungen nur aus Beweisen oder Fakten gezogen wurden. Das Ergebnis war verblüffend. Es lassen sich daraus auch Vermutungen ableiten, was damals an der Baustelle los gewesen sein muss und warum die alte Kontroverse zwischen Hadrian und Apollodorus letztendlich zum Eklat führen musste — wenn er denn der Architekt war, woran der Verfasser keine Zweifel hat. Im Referat werden die Problemstellungen und deren Resultate dargestellt.

1 Niederschrift des Vortrags. — Hinweis zum Verständnis: Der Vortrag beschränkte sich aus Zeitgründen lediglich auf die «Kompromisse» in der Architektur des Pantheon II. Da er nun veröffentlicht werden soll, wurde er um einen «Vorspann» und einen «Nachspann» ergänzt, damit dem Leser das Gesamtbild vermittelt wird. — Der hier wiedergegebene Vortrag stellt eine Vertiefung des Kap. 10 des Buches Heene 2005 dar.

Pantheon Rom

Idee — Planung — Kompromisse
Pantheon I des Agrippa Abb. 1, 2

Zeit: Kaiser Augustus 27 v. Chr.–14 n. Chr.
Agrippa baut auf dem Marsfeld das erste Pantheon: Pronaos, griechische Säulenvorhalle und eine kreisrunde Säulenkolonnade — Durchmesser außen 57,90 m. Einfache Grundrissgeometrie:

Gerade — Quadrat — Rechteck — Kreis.

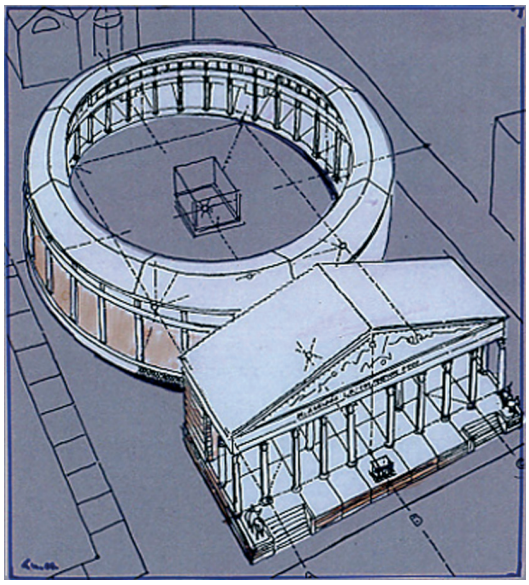


Abb. 1: Pantheon I des Agrippa. Rekonstruktion nach Gruben 1997 und Virgili 2006.

Pantheon II Abb. 2

Zeit: Kaiser Trajan 98–117 (fiktiver Rekonstruktionsversuch Planungs- und Bauphase).
Anno 110: Sommergewitter in Rom. Blitzeinschlag ins Pantheon des Agrippa, starke Zerstörung des Bauwerks. Es wird die Frage akut, was mit der Ruine auf diesem städtebaulich so interessanten Areal auf dem Marsfeld passieren soll. Da wir heute wissen, dass damals das Pantheon II gebaut wurde, geht daraus zwingend hervor, dass zum Zwecke der Begutachtung des ruinösen Baubestandes eine Inspektion stattgefunden haben muss. Zu diesem Zweck wurden zuerst die Schuttmassen beseitigt. Beweis: Beltrami wunderte sich, dass er bei Grabungen am Pantheon II keine Aschereste gefunden habe, was doch in Rom immer der Fall sei. Danach, so kann vermutet werden, berieten Senat und Kaiser; doch man benötigte zunächst einen Architekten, der das Metier kannte. Es gab damals in Rom keinen besseren als Apollodorus von Damaskus, der für den Kaiser einige hervorragende Komplexe baute und die Donaubrücke bei Drobeta konstruiert hatte. Er solle sich Gedanken machen, was zu tun sei. Auflage: Bei jedem neuen Bauvorhaben dürfe aber Holz nicht wiederverwendet werden, um in Zukunft weitere Brandkatastrophen zu vermeiden. Vortrag vor Kaiser und Senat.

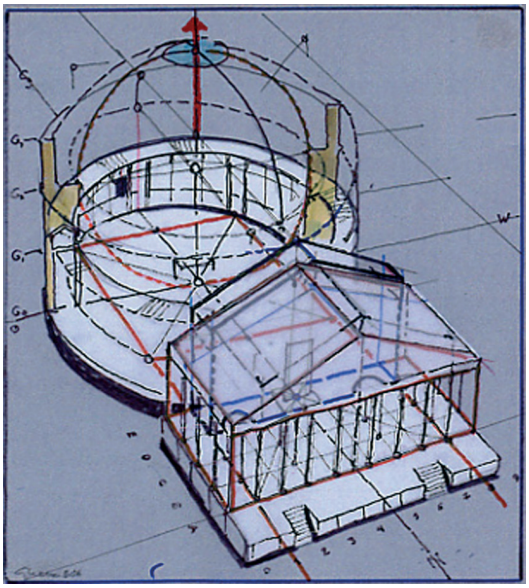


Abb. 2: Pantheon I, Pantheon II. Grundrissgeometrie und dritte Dimension.

Entwurf des Apollodorus für ein neues Pantheon II ca. 111–112 Abb. 5

Alle noch verwendbare Teile der Ruine werden nicht abgerissen, sondern in einen Neubau integriert: Umrisslinien und Geometrie des Altbaues werden übernommen.

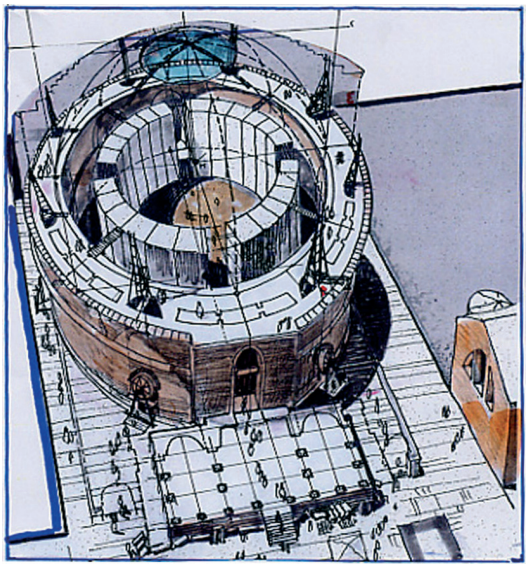


Abb. 3: Pantheon II. Die Baustelle etwa 117 (Tod Trajans).

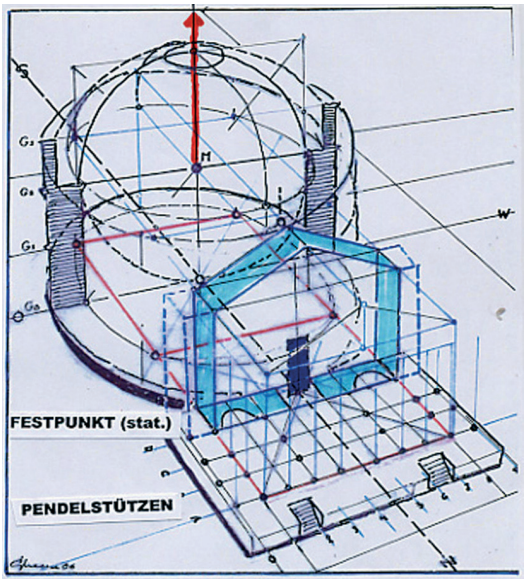


Abb. 4: Pantheon II. Grundrissgeometrie und dritte Dimension.

Der Pronaos kann nur auf den vorhandenen Fundamenten in ähnlicher Form wie bisher wiederaufgebaut werden, Säulenpositionen identisch mit denen des Pantheon I. Statt der offenen, kreisrunden Säulenkolonnade schlägt Apollodorus eine überkuppelte Rotunde in octogonaler Aufteilung vor, einen Raum von 43,30 m Durchmesser und Höhe. Umsetzung der zweidimensionalen Geometrie des Pantheon I in die dritte Dimension (Archimedes s. Sperling). Hervorragender Vorschlag für einen stützenfreien Raum zu imperialer Nutzung. Hohes konstruktives Risiko: Eine solche Dimension hat es in der damaligen Welt noch nicht gegeben.
Der Entwurf des Apollodorus ist eine konsequente, kompromisslose Gesamtform: Gebäudekomplex mit Pronaos und einer, nur durch Dehnfuge getrennten, überkuppelten Rotunde, aufbauend auf der Geometrie des Pantheon I des Agrippa.
Genehmigung durch Senat und Kaiser. Beginn der Ausführungsplanung und Baustelleneinrichtung.
Baubeginn ca. 113. Stand der Rohbauarbeiten bei Trajans Tod 117: ca. Gesims G2 / Kuppelansatz.

Zeit Kaiser Hadrian 117–138 Abb. 3, 15, 16

Als der Kaiser anno 118 in Rom einzieht, hat er zunächst andere Dinge zu tun, als sich um den Bau seines Vorgängers zu kümmern. Bauzustand 118: etwa Gesims G2. Beginn der Einschalungsarbeiten für die Kuppelkonstruktion.
Etwa gegen 121–123: Ende der Rohbauarbeiten und der Eindeckung der Kuppel. Nach deren Ausschalung entstehen in Kuppel und Rotunde Risse. Eklat an der Baustelle - was ist zu tun? Man beschuldigt Apollodorus. Es wird letztendlich beschlossen, die Kuppel mittels zusätzlicher, baulicher Maßnahmen abzustützen: den Zwischenbau Nord und dem Zwischenbau Süd. Apollodorus wird ausgeschaltet. Sein so klarer Entwurf erfährt starke Veränderungen, die als Kompromiss bezeichnet werden müssen und die die Architektur in ihrer städtebaulichen Wirkung stark beeinträchtigen. Die Maßnahmen im Einzelnen:

Die Kompromisse: Abb. 6

Es wird die konstruktiv richtige Entscheidung getroffen, die Rotunde von zwei Seiten her ab-

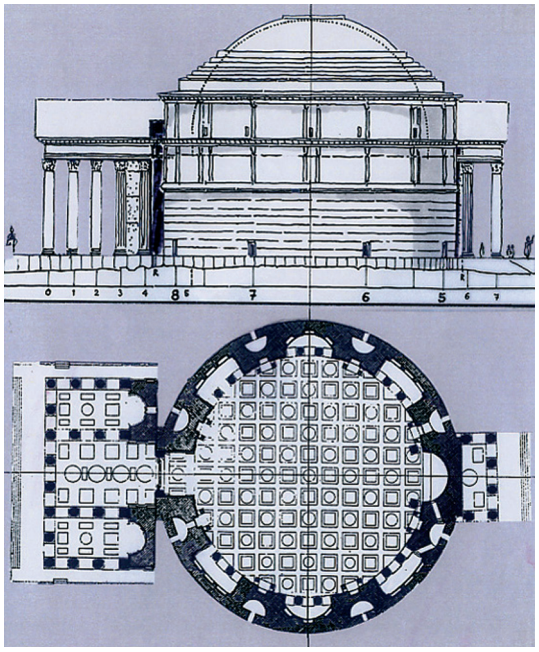


Abb. 5: Pantheon II: Nach dem Originalentwurf des Apollodorus. Trajanisch.

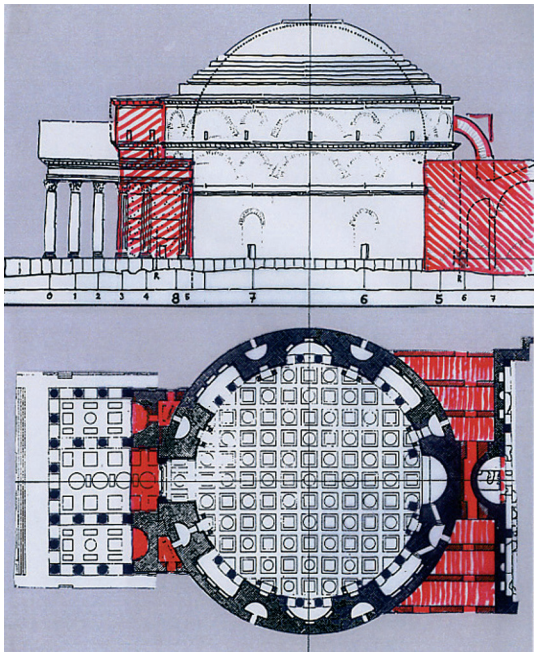


Abb. 6: Pantheon II: Ausgeführtes Projekt mit Abstützungsmassnahmen Nord und Süd.

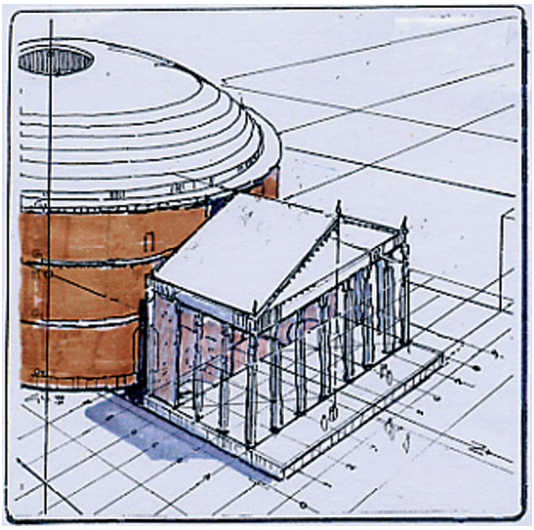


Abb. 7: Originalplanung des Apollodorus.
Geplant über der Geometrie des im Jahre 110 durch Blitzschlag zerstörten Pantheon I des Agrippa (Quadrat — Kreis — Dreieck — Rechteck) durch Umsetzung in die dritte Dimension (Kugel — Halbkugel — Zylinder — Kubus). In den Stadtraum erscheinen Rotunde und Pronaos als frei nebeneinander stehende Baukörper, die nur über ein Mittelrisalit (= Dehnfuge) miteinander verbunden sind .

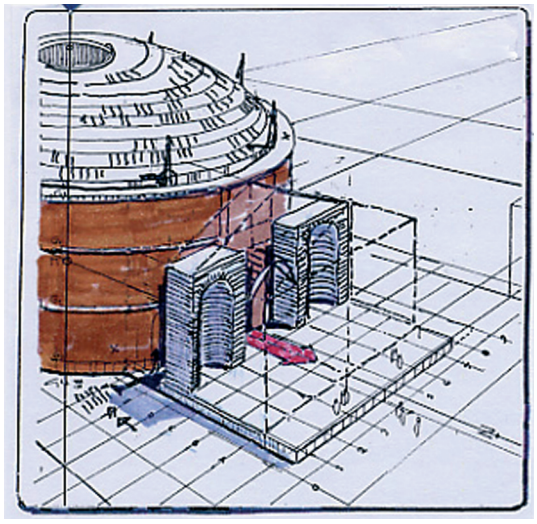


Abb. 8: Rotunde und Kuppel sind im Rohbau fertig gestellt.
Die Kuppelschale wird mit Bronzeplatten eingedeckt. Zu deren Förderung auf Dachebene werden die 8 Förderzeuge noch benötigt. Danach erfolgt deren Abbau. Erst jetzt kann mit dem Aufbau des Pronaos begonnen werden, und zwar zunächst mit dem, statisch als «FESTPUNKT» zu bezeichnenden, massiven Kern zwischen den Achsen D–E / 1–8. Der Haupteingang wird überwölbt und bleibt für alle Demontagearbeiten im Inneren offen (Schalungen / Gerüste).

zufangen, von Norden und von Süden. Doch heute weiss man: Es wäre nicht erforderlich gewesen, die Kuppel wäre nicht eingestürzt, aber man konnte das damals noch nicht berechnen.
(Verfasser sog. «Bookends»).

Zwischenbau Nord **Abb. 7–12, 17**

Einsetzung von Treppenhäusern in die engen Zwischenräume zwischen Rotunde und Pronaos-Rückwand, dreiseitig Wände bis zur Höhe G3. Massive Treppenläufe zur Querausteifung. Aussenwände werden nachträglich in die fertige Ringwand der Rotunde eingespitzt. Erhöhung des bis zum Gesims G2 geplanten «Festpunktes» bis auf Höhe des Gesimses G3. Damit Vergrösserung der sog. «Auflast» zur besseren Ableitung der Schubkräfte aus der Kuppel.

Zwischenbau Süd **Abb. 6, 14**

Wegen der hier sehr nahe stehenden Rückfassade des Neptuntempels war nur diese eine Lösung möglich: Einbau einer Art Strebepfeilerwand zwischen äusserer Ringwand und Basilika mittels 4 Abfangbögen. Diese sind auf einen großen Bogen abgelastet, der seinerseits die vorhandene Altar-nische des Neptuntempels überspannt. Da das gesamte Bauwerk ausserhalb des bereits gesetzten Baugrundes lag, rissen die Bauteile später ab und stürzten in den Zwischenraum. Zusätzliche Schotten werden direkt gegen die Rotunde zu deren Abstützung angemauert.

Architektur **Abb. 6, 13**

Die Architektur des Pantheon findet damit weder nach Osten noch nach Süden und Westen eine angemessene Bedeutung. Dies kann nie im Interesse des Apollodorus gewesen sein. Einziges Architekturmotiv also: Der Nordgiebel des Pronaos und dahinter, nur von entferntem Standort auszumachen, der obere Teil der Kuppel. In der damals noch niedriger bebauten Stadt war dieser Neubau eine befremdliche Erscheinung, die so niemand gewollt haben konnte.

Fakten und Beweise

Die Pantheon-Forschung ist bis heute fast ohne Ausnahme bei deskriptiven Interpretationen verblieben. Es wurde nicht registriert, dass die Grundrisse der Anbauten planerisch keinerlei Funktionen oder Nutzungen erkennen lassen. Dass die Gesimse und Anschlüsse nicht so perfekt sind, wie es damals von römischen Architekten eine conditio sine qua non war, ist weder herausgearbeitet noch hinterfragt worden. Dass die Syntax der Säulenstellung Ost und West des Pronaos nicht stimmig ist und ebenso nicht die Gesimshöhen und deren Anschlüsse — alles wurde so dargestellt, als seien es bewusst geplante Maßnahmen, um den Übergang vom Pronaos zur Rotunde planerisch in den Griff zu bekommen. Ein Motiv also, eine architektonische Finesse… Es entstand Pfusch, weil alle Massnahmen nicht im System der Konzeption des Apollodorus nahtlos einzubringen waren. Es entstanden Lehrmeinungen und Theorien, die nicht haltbar waren und verteidigt wurden. Andrea Palladio, der grosse Baumeister, der sich mit dem Pantheon intensiv beschäftigt hat, merkte es vermutlich auch nicht … Immerhin hat er den Doppelgiebel Nord des Pronaos zum neuen Architekturmotiv übernommen und weiterentwickelt (Il Redentore, Venedig).

Beweise Zwischenbau Nord **Abb. 7–12**

Die beiden Treppenhäuser stammen nachweislich aus Hadrianischer Zeit. Sie wurden als selbsttragende Elemente zwischen Pronaos und die trajanische Rotunde eingesetzt und stützten so Rotunde und Kuppel ab. Die im

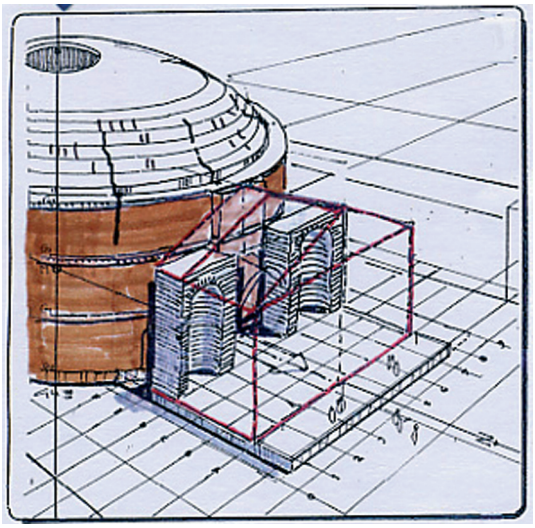


Abb. 9: Im Innern der Rotunde beginnt man mit der Ausschalung der Kuppel (Kassetten) von oben nach unten. Parallel dazu erfolgen Nachbesserungsarbeiten. Abtransport der Schalungskörper. Das Montagegerüst wird parallel zur Ausschalung ebenfalls abgebaut.
Die Kuppel verliert damit ihr Korsett: Es entstehen Risse! (Schubkräfte aus der Kuppel, Schwund- und Setzrisse). Nach unserem heutigen Wissensstand wäre die Kuppel nicht eingestürzt. Doch damals war man sich dessen nicht sicher. Chaos am Bau!
Einschaltung von Experten — was zu tun sei?
Apollodorus wird kalt gestellt. Man lastet ihm das Debakel an. Doch er allein weiss: die Kuppel hätte bestanden.

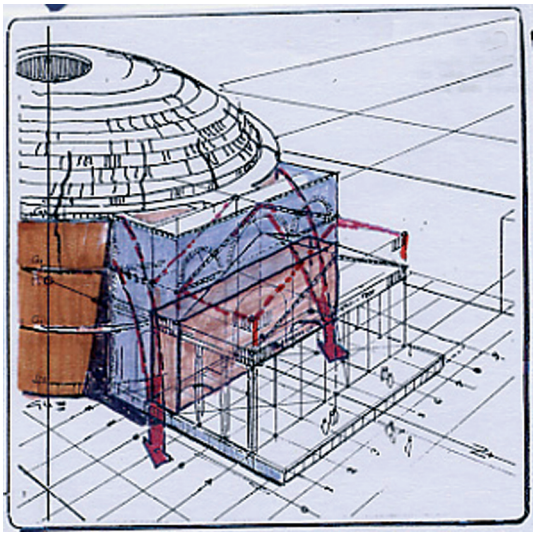


Abb. 10: Es wird beschlossen, Kuppel und Rotunde mittels zweier Anbauten abzustützen: dem Zwischenbau Nord und dem Zwischenbau Süd. Wir wissen heute, dass die nachfolgend dargestellten Maßnahmen (sog. «Bookends», Verf.) sinnlos waren, denn die Kuppel hätte ohne sie bestanden und wäre nicht eingestürzt. Einbau der Treppenhäuser Ost und West — Aufbau des Festpunktes bis auf volle Höhe Gesims G 3, als Auflast zur besseren Ableitung der Schubkräfte.
Noch steht die Originalplanung der Säulenhalle (rot). Der Anschlussgiebel für das Pronaos-Dach wird eingebaut. Ein Beweis: die noch heute im Mauerwerk sichtbaren Bögen, die vom Giebelprofil überschnitten sind (auch von Piranesi dargestellt).

Innern der Treppenhäuser heute noch zu sehende Ringwand der Rotunde ist ohne Zweifel ehedem als Aussenwand geplant gewesen. Ihr Bestand ist voll erhalten, während die aussen zugänglichen Ringwände bis in Leiterhöhe im Laufe der Zeit abgebaut, und später mittels Industrieziegeln wieder hergestellt wurden. Grabungen von Beltrami im Fundamentbereich lassen eine klare Bestätigung dieses Tatbestandes zu.
Da die drei Treppenhauswände bis zum Gesims G3 hoch geführt wurden, sind sie sehr schlank und bedurften somit einer Querausteifung, die wiederum der Aussteifung der Rotunde zugute kam. Daher sind die Treppenläufe massiv gemauert mit aufgesetzten Stufen. Die drei Läufe liegen nicht auf der trajanischen Ringwand auf, sondern nur auf den drei hadrianischen Wänden.
Die heute vorhandenen Treppenhäuser können auch deshalb nicht Gegenstand der Originalplanung gewesen sein, weil damit der Zugang zu den vertikalen Transportschächten nicht mehr gegeben gewesen wäre.
Die Aussenwände Ost und West der Treppenhäuser schliessen direkt an die Rotunde an, zu deren Abstützung kraftschlüssig mit ihr verbunden. Der Übergang der beiden Mauerwerkskörper zeigt sehr deutlich, wie in die fertige Ringwand der Rotunde nachträglich ein Schlitz eingespitzt worden ist, in den dann die Wand eingemauert worden ist — ein unsägliches Detail, das zudem wegen Setzungen bereits abgerissen ist.

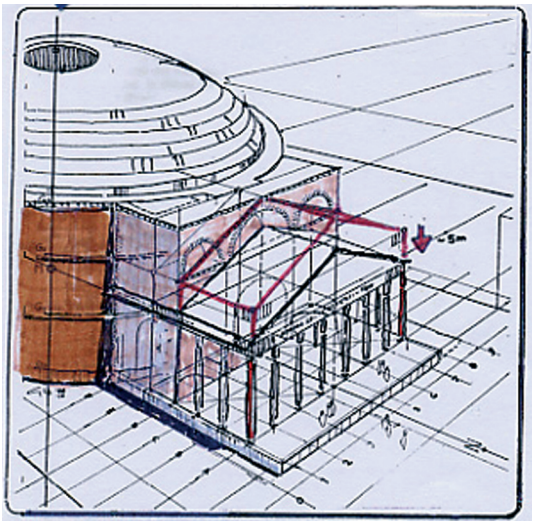


Abb. 11: Aus Ägypten kommt die Nachricht, dass die bestellten 16 monolithischen Säulen weder in der Anzahl , noch in der geforderten Länge geliefert werden können. Vermutlich gibt es auch logistische Probleme auf ca. 4000 km Transportweg. Grosse Verzögerungen an der Baustelle. Wer ist schuld, wer hat diese Bestellung veranlasst? Trajan, Apollodorus oder Hadrian? Wer hatte die Idee mit den monolithischen Säulen vom Mons Claudianus? Es bleibt kein anderer Weg mehr, als die Säulen einzubauen.
125: Apollodorus wird beseitigt! War es Hadrian?
Wer sonst? Eine finale Lösung!

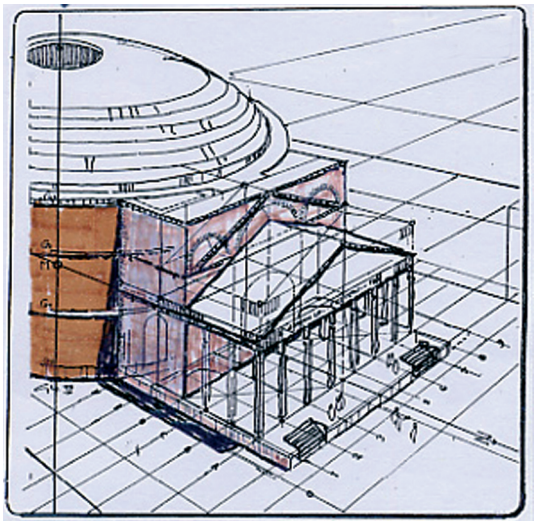


Abb. 12: Die endgültige Ausführung:
Rotunde, Zwischenbau und Pronaos. Ein Kompromiss, der jedoch später nicht selten zum Repertoire römischer Architektur stilisiert werden sollte.
Ausser der konstruktiven Funktion zur Abstützung der Rotunde sind keine anderen Zwecke/Funktionen erkennbar. Die Treppen wären spielend in einem der Vertikalschächte unterzubringen gewesen.
Beim Südanbau liegen die Probleme ähnlich.

Die Aufstockung des gesamten Zwischenbaus Nord bis auf Gesims G3 hat die Originalplanung ordentlich über den Haufen geworfen. Die Gesimse stimmen nicht überein, und man kann deutlich nachvollziehen, dass die Gesimse der Rotunde hinter die des Zwischenbaus hineinlaufen, anstatt auf Gehrung gearbeitet zu sein.
Der Rhythmus der Säulenordnung Ost und West des Pronaos ist stimmig bis auf die Linie der Rückwand des «Festpunktes». Der Zwischenraum bis zur Rotunde ist weder geometrisch noch praktisch gelöst. Auch die Verkleidung macht den Schaden nur noch schlimmer.

Die Säulen des Pronaos **Abb. 7–12**

Hierauf soll nur in Kürze eingegangen werden. Dass es vermutlich mit der Bestellung und der Lieferung erhebliche Probleme gegeben haben muss, kann lediglich ideell rekonstruiert werden. Vermutlich haben sich mit diesem Problem einige Leute beachtlich blamiert, weswegen man ungern darüber sprach. Dass die Säulen zu kurz geliefert wurden ist authentisch: Der gemäss Originalplanung angelegte Übergangsgiebel / Frontispiz ist der Beweis. Wer die Entscheidung für die monolithischen Säulen getroffen haben könnte — hierzu gibt es nur Vermutungen. Der Verfasser hat den Weg der Lieferung zu rekonstruieren versucht. Ein interessantes Thema.

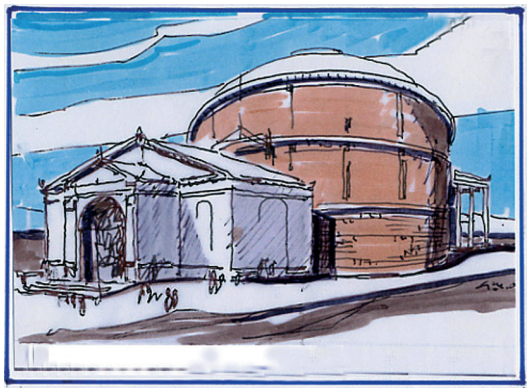


Abb. 13: Wie das Pantheon etwa ausgesehen hätte, wenn die Abstützungsmassnahmen nicht erforderlich gewesen wären.
Südostansicht mit dem Vorbau des Neptuntempels. Aus den heutigen Gebäuderesten kann nur vermutet werden, dass sie aus hadrianischer Zeit stammen müssen.
Der abgestürzte Zwischenbau Süd war genutzt und wieder aufgebaut worden. Es kann vermutet werden, dass sich an diesem Detailpunkt die Kontroverse Hadrian Apollodorus entfachte, die Hadrian als Anlass nutzte seinen Architekten los zu werden.

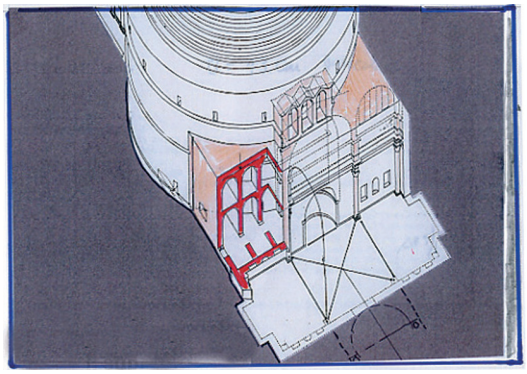


Abb. 14: Pantheon II Südbau. Nach Fine Licht 1968.

Zwischenbau Süd **Abb. 14**

Auch dieser Anbau lässt im Grundriss nicht erkennen, dass er zu einem anderen Zweck errichtet worden wäre als zur Abstützung der Rotunde und Kuppel. Dass hier später die Sakristeien und die Alexander-Bibliothek zeitweise untergebracht waren bzw. sind ist von keiner Relevanz. Die konstruktiven Probleme waren hier noch schwieriger zu lösen als beim Anbau Nord. Zur Abstützung der Rotunde musste auch noch die Altarnische des Neptuntempels überspannt werden. Seitlich des Mittelbaues sind reine Schottenbauten errichtet worden, die in die Rotunde zwischen G1 und G2 einbinden. Alles in allem eine plausible Lösung, doch in keiner Weise in das Originalkonzept passend.

2006

Der Bau des Pantheon und darin dieser unglaubliche Innenraum stehen noch immer. Heute, anno 2006. Die Renovierungen der letzten Jahrzehnte haben einiges an den Tag gebracht, das zur weiteren Klärung beitragen könnte.

Schlussbetrachtung

Der Verfasser bemerkt — nicht ohne Süffisanz — was wohl aus der Architektur dieser Welt geworden wäre, hätte der Blitz 110 nicht in das Pantheon I des Agrippa eingeschlagen …
Und warum steht es noch immer am Nord-Frontispiz: AGRIPPA FECIT?
Trajan und Apollodorus konnten kein Interesse daran gehabt haben, das Urheberrecht des Agrippa anzuzweifeln. Sie kannten den Wert der Architektur zu gut, um ihm seinen guten Teil daran streitig zu machen … Und Hadrian? Er muss daran interessiert gewesen sein, dass es ein anderer gewesen sein muss!
Der hier wiedergegebene Vortrag stellt eine Vertiefung des Kap. 10 des Buches Heene 2005 dar.
Weitere Grundlagen: Einschätzungen meteorologischer und pyrotechnischer Art, subjektive Einschätzung psychologischer Verhaltensweisen der in das Projekt involvierten Personenkonflikte, Charakteristika, zeitliche Zuordnung in das Geschehen zw. 110 und 125 n. Chr., Versuch einer ideologiefreien Interpretation des Geschehens.

Abb. 15: Baustelle Pantheon ca. 117 (Tod Trajans). Gesims G3 Kuppelansatz – von aussen …

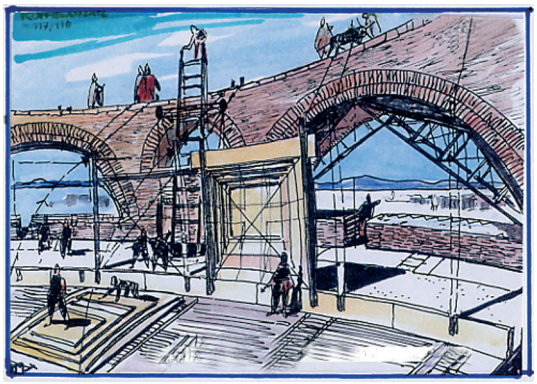


Abb. 16: … und von innen: Beginn der Montage Kuppelschalung.

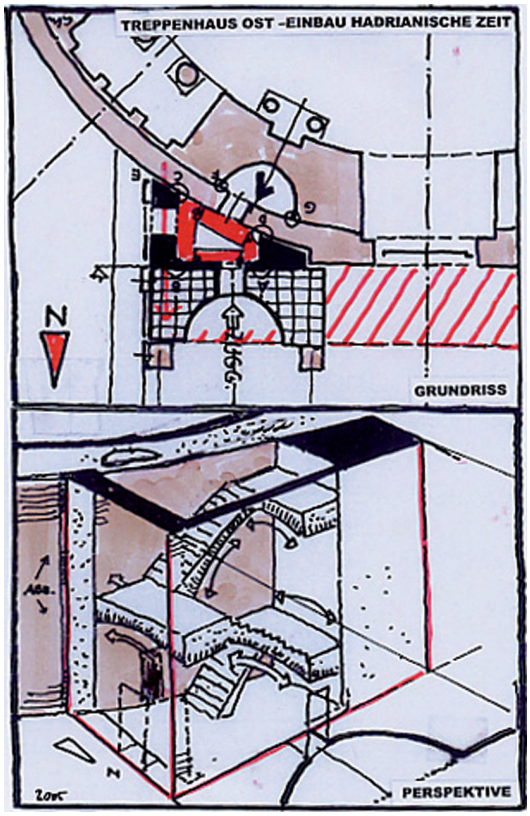


Abb. 17: Treppenhäuser in den engen Zwischenräume zwischen Rotunde und Pronaos-Rückwand.

Abbildungsverzeichnis:

Abb. 1–17: Zeichnungen Autor.

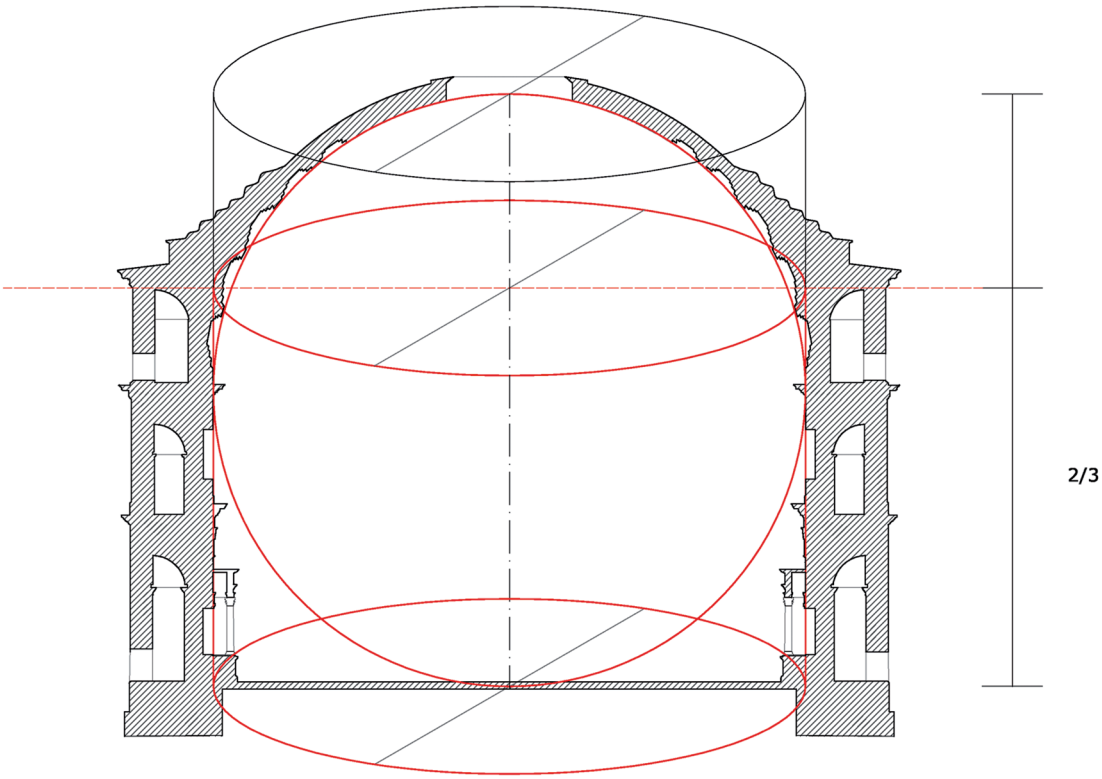


Fig. 1: Archimedes' Sphere and Cylinder inside the Pantheon.

The Structure of the Dome

Giangiacomo Martines[1]

Archimedes' *Sphere and Cylinder*

The geometrical figures that shape the Pantheon bring to mind a book by Archimedes, *Sphere and Cylinder*. There we find quoted for the first time a formula first learnt at primary school: «the volume of a sphere is $4/3\ \pi\ r^3$.» Archimedes' insight came to him by imagining a sphere inscribed in a cylinder of the same diameter: the volume of the sphere is simply two-thirds the volume of the cylinder.[2] Perhaps an ancient mathematician visiting the Pantheon would have spotted Archimedes' geometric figures architecturally transformed on a gigantic scale: the dome and the drum, the height of which is two-thirds the diameter of the dome (Fig. 1).[3]

The division of the dome into 28 coffers expresses perfection. In Hadrian's day, Nicomachus of Gerasa wrote the *Introduction to Arithmetic*. A perfect number, he says, is one that has the property that the sum of its factors equals the number itself. They are quite rare: one in the units, 6; one in the tens, 28; one in the hundreds, 496; one in the thousands, 8,128. Nichomachus ascribes beauty and harmony to these numbers, since they are not in excess and are free from defect.[4]
I have already discussed these mathematical aspects in a study published in 1991.[5]

Architectural tricks

How did the architect and his masons build the largest dome in the world? What technical criteria were used? The drum of the Pantheon is built in *opus testaceum* and extensive use is made of *bipedales*. Since 1981 I have been working on the restoration of Roman arches and vaults in the Palatine, in the *Horrea* of the Horologium Augusti (under the church of San Lorenzo in Lucina) and in the Colosseum, and I have conducted experiments on the property of *bipedales*, comparing them

1 This paper is a summary of a study which will be published in the forthcoming book *The Pantheon: From Antiquity to the Present*, edited by Tod A. Marder and Mark Wilson Jones for Cambridge University Press. I would like to thank the editors for including my paper, and I am most grateful to Wilson Jones for his comments and help. Many thanks are also due to Fred Moffa of the British Institute of Rome for his translation. In this paper I have undertaken a closer analysis of the links between the Pantheon and Archimedes' *Sphere and Cylinder*, and the way it relates to the standard size of Roman cupolas.

2 Archimedes: *Sph. Cyl.* I, 34 and corollary.

3 The sphere and the cylinder in Figure 1 have been drawn on K. de Fine Licht's section of the rotunda: Fine Licht 1968, fig. 99. A useful comparison with the outlines in Figure 1 can be found in «The front elevation of the Pantheon as originally intended», by Wilson Jones 2000, fig. 10.16.

4 Nicomachus, 1926, *Arith*. 1.16. Bertier 1978. On the 28-part division of the dome, see Wilson Jones 2000, 194.

5 Martines 1991.

Fig. 2: Rome, Domus Tiberiana: Master builder Dionysius and his workmen building a new arch in *bipedales*, 1986.

with common everyday bricks (Fig. 2): as the wall dries, *bipedales* gradually release water; this helps even out the curing process, preventing shrink cracks from occurring. When an arch is closed by the laying of the final key *bipedalis*, it immediately stiffens, even though it is still wet. As soon as the crown of the arch is in place, the weight on the props diminishes.[6] Arches built in *bipedales* stiffen quickly, reducing the amount of time that the centring needs to be in place as well as reducing the overall building time in general.

The drum of the Pantheon is a diaphragmatic structure that consists of a series of solids and voids (Fig. 3).[7] The solids form eight pilasters, which, in

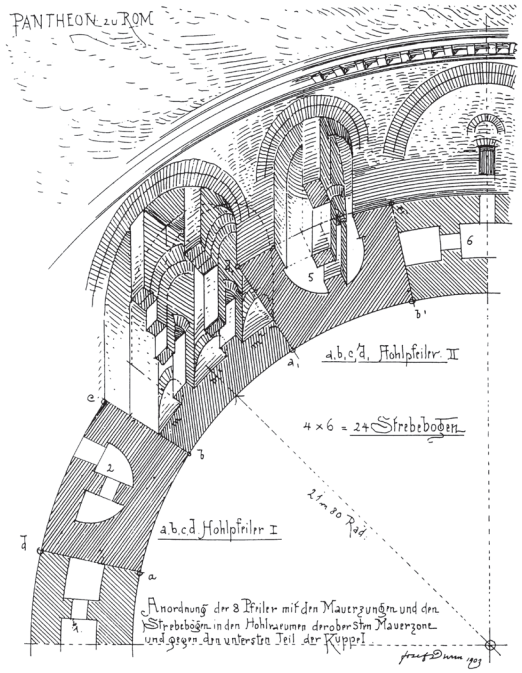


Fig. 3: Josef Durm, Pantheon: Perspective study of the drum's third storey, 1903, from Durm 1905.

turn, are hollow inside (Fig. 4b). The voids are overlain by either semi-domes or barrel vaults, which on the outside form a series of relieving arches of *bipedales* and *sesquipedales*.[8] The arches are built on three levels and follow a constant sequence in the diaphragmatic structure: arch — pilaster — arch, like the bridge of an aqueduct (Fig. 4a).[9] The voids

6 Martines 1996b. See also Lancaster 2005, 91–98.

7 The term ‹diaphragmatic structure› was suggested to me by Mark Wilson Jones after a reading of my work. The concept corresponds to the expression «honeycombing», which was coined by William L. MacDonald (MacDonald 1976, 33). Durm 1905, fig. 641.

8 Martines 2003. Lancaster 2005, 86–91. On the outer face of the drum, the huge arches of the second storey are laid in two rings of *bipedales* surmounted by another of *sesquipedales*; the other arches are laid in *bipedales* only. I am most grateful to the architects Benedetto Brattoli and Marco Brunori for having checked *bipedalis* and *sesquipedalis* sizes in the arches of the Pantheon's drum, using a laser system in 2005.

9 Figure 4a is from Fine Licht 1968, figs. 97 and 98. Figure 4b is a formulation made by the architect Roberta Zaccara for the author. She used drawings by Fosci-Pelletti and by Wilson Jones for the elevation of the rotunda projected flat (Pelletti 1989; Wilson Jones 2000, 191, 194). The source for the structure of arches and barrel vaults is: L. Beltrami 1898. I am most grateful to Roberta Zaccara. A question about Figure 4: Which parts of the Corinthian order work together with the drum? Certainly, I believe, the columns in front of the apses or in front of the trapezoidal exedrae and their entablature.

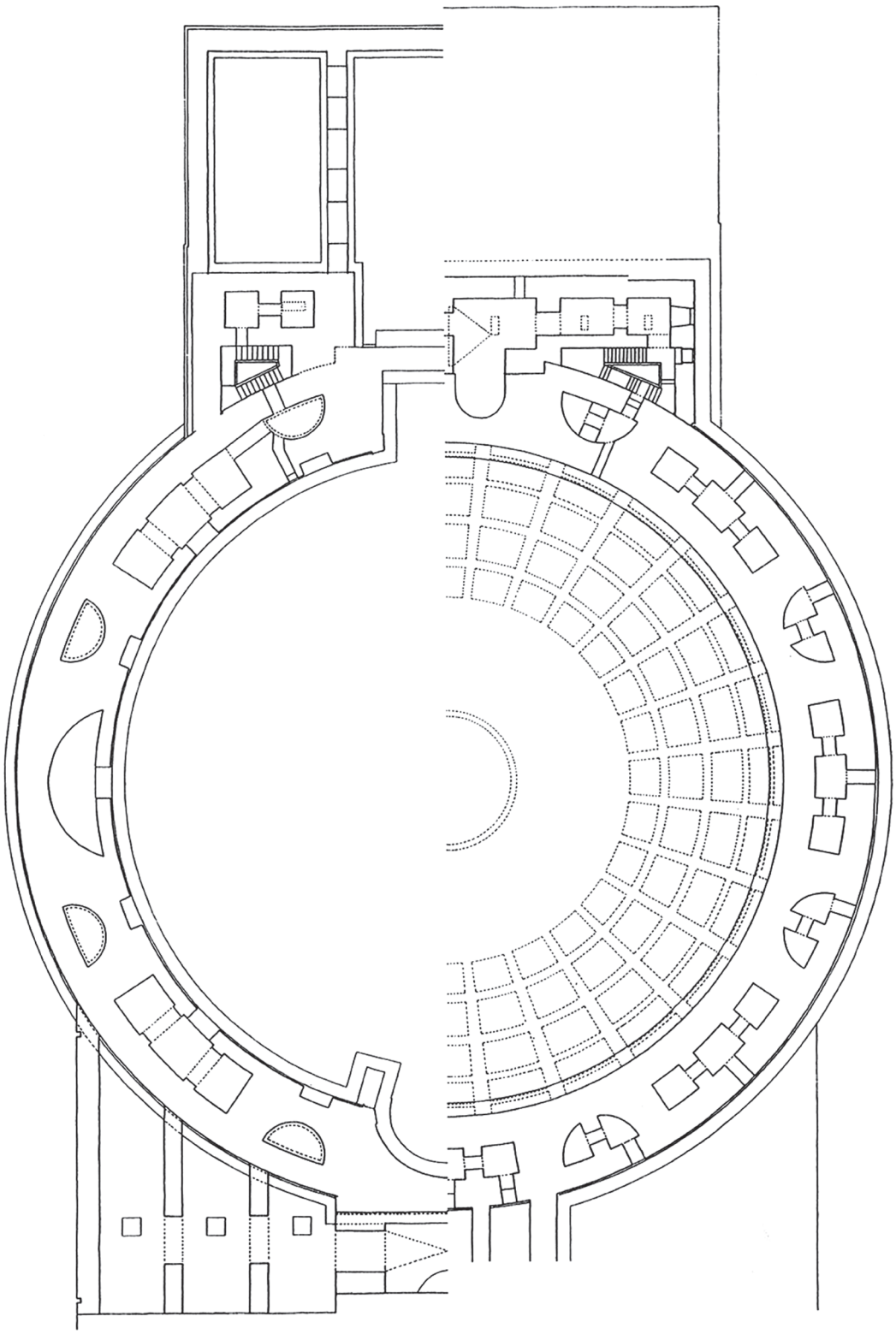


Fig. 4a: Pantheon, flat projection of half the rotunda showing two levels: left, upper ground level; right, attic level, drawn for the author by Roberta Zaccara, 2007.

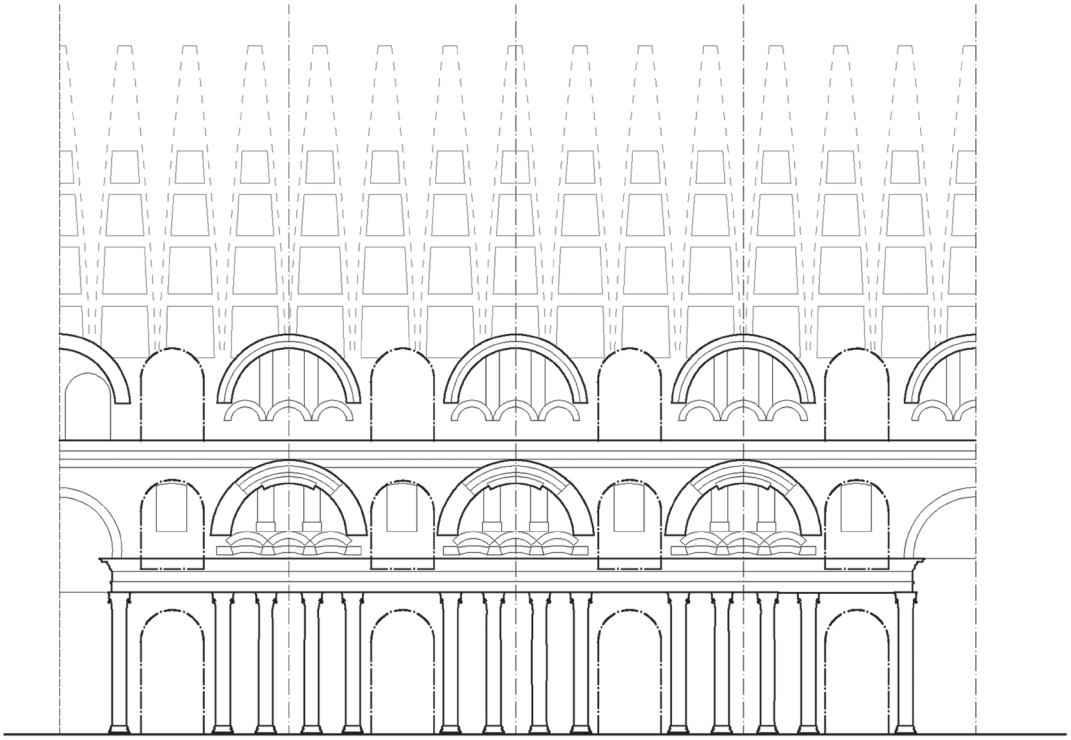


Fig. 4b: Pantheon, flat projection of half the rotunda showing two levels: left, upper ground level; right, attic level, drawn for the author by Roberta Zaccara, 2007.

give the structure lightness while the vaults in bipedales confer stiffness.

The third level of barrel vaults is embedded into the dome (Fig. 5), up to the height of 8.4 m from the springing. This system helped the builders as the concrete in the dome is harnessed in the structural network of the eight barrel vaults. This original idea evidently simplified the problem of the dome's centring. So nearly 40% of the height of the dome is embedded into the drum, taken from the springing to the *oculus*. In the Pantheon, Archimedes' geometric insight, «a sphere in a cylinder», became a structural idea.

The *oculus*, too, helped simplify construction. In fact, it replaces a stretch of vault 9.45 m wide; an extremely rigid ring of *bipedales* around the *oculus* performs the same function as the boss in a vault or the keystone in an arch.

Thus the lowest and highest parts of the dome were built using two architectural tricks: 1) a barrel vault system harnesses the concrete at the bottom; 2) an *oculus* or part of a missing vault at the top. The critical part of the dome is greatly reduced: a cross-section of the dome (Fig. 6)[10] reveals that it extends from the haunches to the crown and takes the form of two segmental semi-arches with a span of 15.50 m and a height of 12.8 m.

Building criteria

Roman concrete consists of strictly horizontal layers of small stones, *caementa*, sunk into mortar.[11] Each cast is about 20 cm thick. These layers can be easily seen, for example,

10 In Figure 6, the main measurements of the sphere inscribed in the dome are by Pelletti 1989. The intermediate measurements were made by the author on the basis of surveys conducted by Beltrami 1989, Terenzio 1949 and the descriptions of Fine Licht 1968.

11 Giovannoni 1925, 42; Lamprecht 1985; Lancaster 2005.

in the broken vaults of the Colosseum, which project well over the haunches. For us today this arrangement seems illogical because the caementa do not follow the curvature or the stress flow.

Similar layers of stones can be seen in the Mediterranean *casite*,[12] or beehive houses, ‹built of rough stones set in projecting courses to form a corbel dome›,[13] but without mortar (Fig. 7). Stability comes from the massive thick walls and the regular layering of small stones. Each stone is kept in position by the others and no mortar is required. So the vault is a false dome, built without centring.

The stone layers of Roman buildings are complemented by the addition of pozzolana mortar,[14] which gives tensile strength to the concrete masonry.[15] The pozzolana enables the mortar to set and cure without air, in the presence of water, and when walls and casts are of great length. In Roman domes, successive concrete casts formed overhanging rings, which became self-supporting after the concrete had set. In the Pantheon, this procedure further simplified the problem of the centring, at least until the third ring of coffers.

Above the third ring of coffers, at a height of 14 m from the springing, there is a change in the make-up of the concrete: the aggregate includes light tufa and volcanic slag.[16] This part of the dome certainly required strong centring[17] for a long period, until the concrete was completely cured. The width of this part is 33.5 m (Fig. 6), which is reduced to 24 m if we take away the empty space of the *oculus*. This measurement corresponds to the standard used in all great Roman cupolas, from the age of Augustus (Temple of Mercury in Baiae, diameter 21.4 m) to the fourth century AD (Temple of Minerva Medica in Rome, diameter 24.80 m).

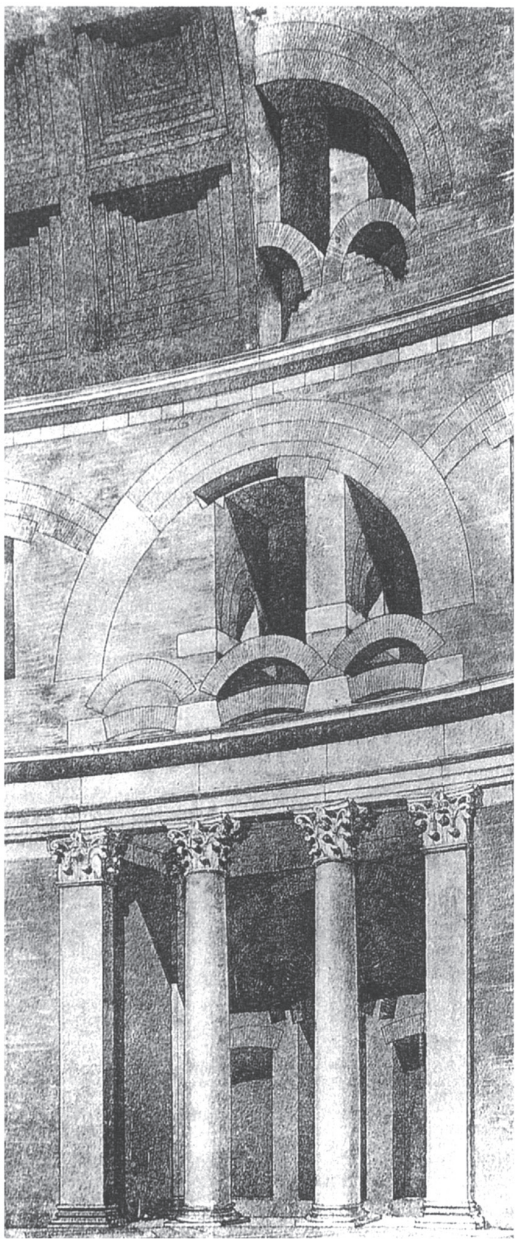


Fig. 5: Pier Olinto Armanini, Pantheon: perspective study of the framework on an *exedra*, 1892 (from Beltrami 1898).

12 Rohlfs 1957, Italian trans. Florence 1963; Ambrosi et al. 1990; Vernacular Architecture 1997, II: 1527, 1545, 1574.

13 Fleming et al. 1999, 47.

14 Vitruvius 1999, 37; Moore 1995; Lancaster 2005, 54–58.

15 Opus Caementicium 1997.

16 Angelis d'Ossat 1930; Terenzio 1949; Lamprecht 1985, 174.

17 According to Angelis d'Ossat 1940 (reprint in Angelis d'Ossat 1982, I: 53–77). Also Fine Licht 1968, 141. Finally Heene 2005. See also: Lancaster 2005, 44–46.

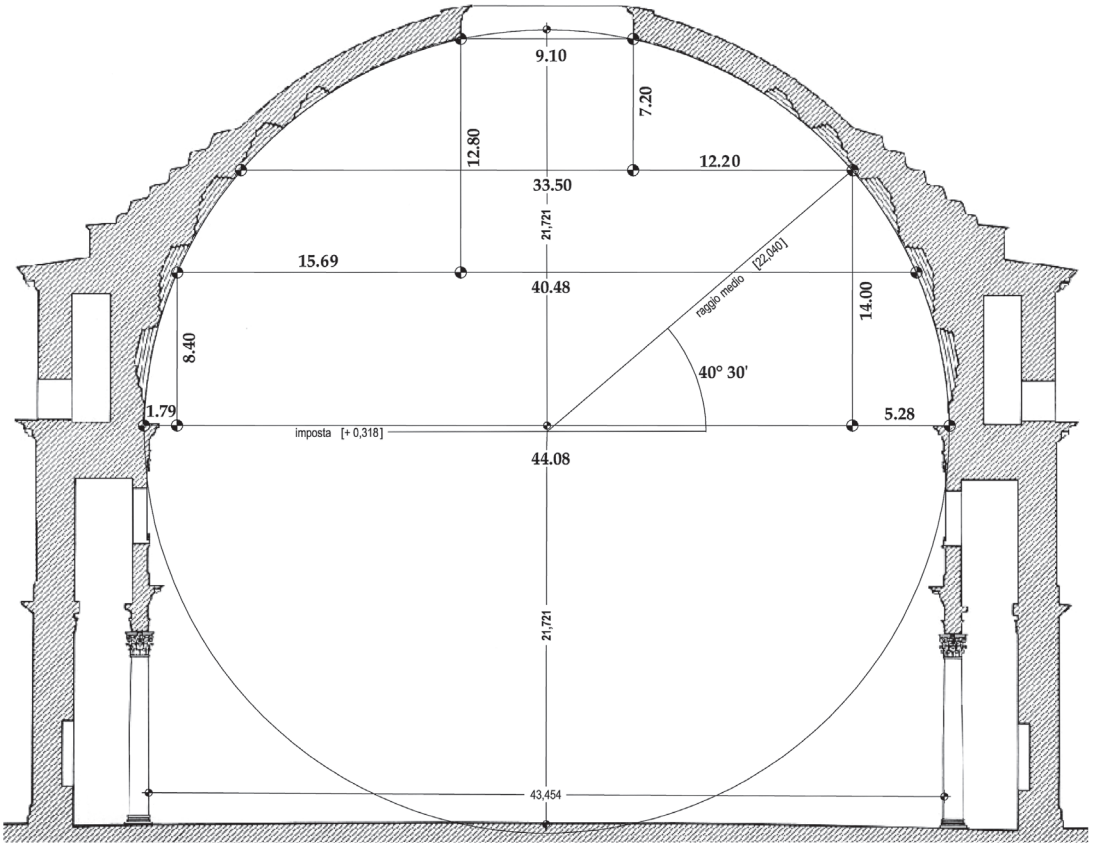


Fig. 6: Pantheon: Pelletti's measurements of the dome (1989), with additions by the author.

Comparisons

A similar structural design to that of the Pantheon can be found in the Octagonal Hall of the Domus Aurea.[18] There is no comparison in size because the latter has a diameter of only 13.35 m; the *oculus* is 5.6 m wide.[19] Despite these differences, some structural elements of the Octagonal Hall are similar to those of the Pantheon (Fig. 8): diaphragmatic vertical walls around eight pilasters; a system of flat arches in bipedales on the pilasters; a vault formed by two different, superimposed geometrical figures, a *calotte* on top of a domical vault.[20] Nero's Octagonal Hall and the Pantheon both share the following static concept: dome equilibrium is produced by a system of barrel vaults and abutments.

When the Pantheon was built, the Domus Aurea was no longer visible. However, before the Baths of Trajan were built on top of Nero's Domus, there was one architect who had seen the bare structure of the Octagonal Hall: Apollodorus of Damascus, together with his master builders. Apollodorus had already produced large-scale architectural projects: Trajan's Column and Trajan's Bridge over the Danube, two record-breaking constructions in terms of height and length.[21] The bearing structure of the Column is diaphragmatic, like the drum of the Pantheon. And, like the Pantheon, the Column has a diaphragmatic structure inside a cylinder and is not visible from the outside.

18 Martines 2003, 13–15.

19 Ball 2003.

20 The 3D-model in Figure 8 was made for the author in 2006 by Filippo M. Martines, from an original survey.

21 Martines 2000b, especially: 34–36.

It was Professor Heilmeyer who, in 1975, originally attributed the design of the Pantheon to Apollodorus, a theory credited by many but which still awaits definitive proof.[22]

22 Heilmeyer 1975; Lamprecht 1985, 175; Martines 2003; Wilson Jones 2000, 92–193; Viscogliosi 2001.

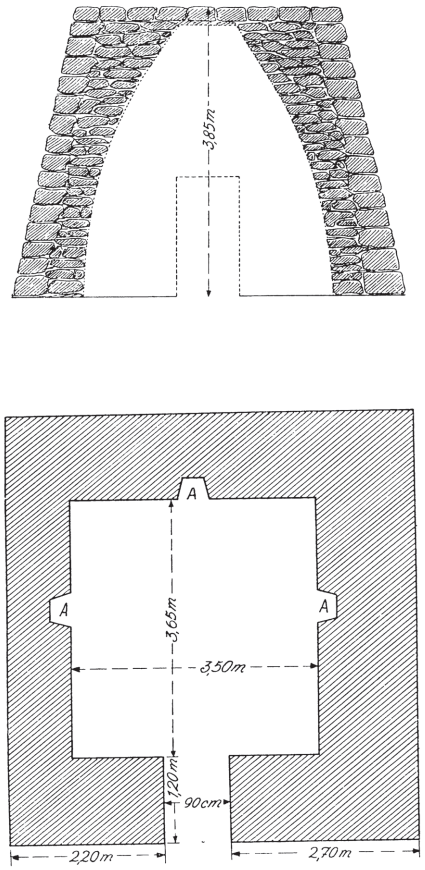


Fig. 7: Apulia, a *casiddu* near Santa Cesarea Terme (Rohlfs, Italian trans. 1963).

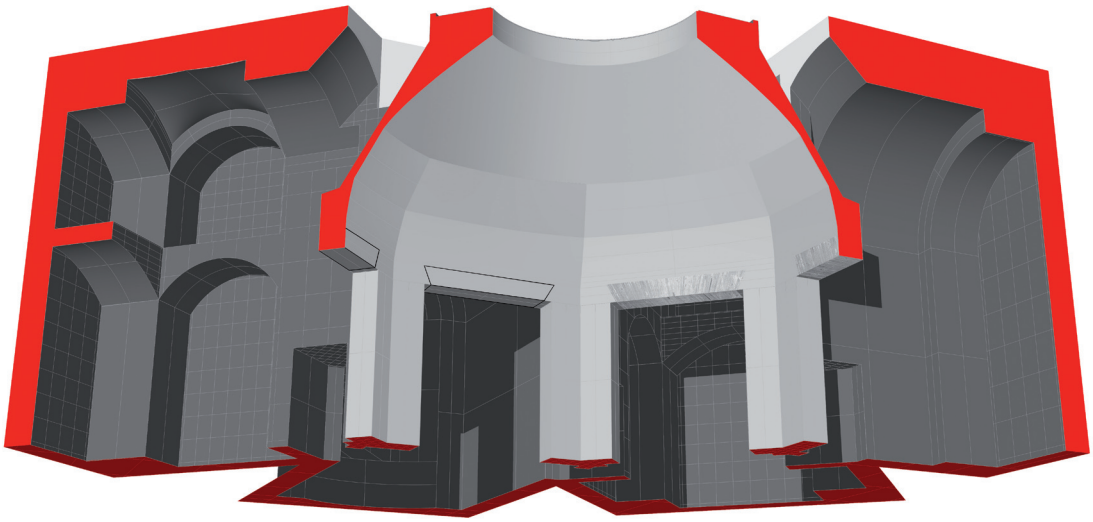


Fig. 8: Domus Aurea, Octagonal Hall: 3D-model made by Filippo M. Martines for the author, 2006.

Zur Datierung des Pantheon

Lise M. Hetland

> In the body of the Pantheon there is a preponderance of brick-stamps of the early 120's, and it is upon this fact, more than any other, that the dating of the building is based. (MacDonald 1976, 13)

Einleitung[1]

Diese Feststellung MacDonalds aus dem Jahre 1976 kann noch immer herangezogen werden, um den gegenwärtigen Konsens über die Datierung des Pantheon zusammenzufassen. Es gibt überraschend wenige Beschreibungen des Pantheon in der antiken Literatur, und sowohl der Baubeginn als auch die Fertigstellung wurden dort vollständig ignoriert. Auch gibt es keine Inschriften, die für eine Datierung hilfreich sein könnten. Keine der alten Quellen behauptet, dass Hadrian hinter dem aktuell erhaltenen Bauwerk stünde. Es war das Studium der Ziegelstempel, die man am Bauwerk in situ und in seiner nächsten Umgebung fand, welches für eine Datierung in hadrianische Zeit genutzt wurde — und es ist genau diese Grundlage, welche mit diesem Beitrag in Frage gestellt wird.

Der Grund für die Annahme der meisten Forscher, die Datierung des Pantheons als hadrianisches Bauwerk sei wissenschaftlich abgesichert, liegt in Herbert Blochs 1937/38 publizierter und bis heute unverzichtbarer Studie über römische Ziegelstempel.[2] 1959 befasste sich Bloch nochmals mit diesem Thema in einem weiteren Artikel.[3] Seine Schlussfolgerung, das Pantheon wäre hadrianisch, ist seitdem von nahezu allen Wissenschaftlern wiederholt worden. Tatsache ist jedoch, dass Bloch selbst wegen einiger Ziegelstempel Probleme mit der hadrianischen Datierung hatte, und es ist seine Annahme, das Pantheon sei hadrianisch, welche die Datierung der Ziegelstempel begründet — nicht umgekehrt.

Blochs Theorien und Annahmen

Bloch fand insgesamt 184 Ziegelstempel im Gebäude und seiner näheren Umgebung.[4] Für die Datierung des Pantheon können jedoch alle jene Ziegelstempel ausgeschlossen werden, die in der sogenannten Ostmauer, in der Basilica Neptuni sowie nicht am Bauwerk in situ gefunden wurden. Damit bleiben noch 70 Ziegelstempel, welche in situ im Pantheon gefunden wurden. Selbst Bloch schlussfolgerte, dass einige von diesen jedoch einer früheren Periode angehörten. Die folgenden Ziegelstempel wurden aufgrund der Konsulardaten in trajanische Zeit datiert und stellen daher ein Problem für Blochs Datierung des Pantheon selbst in hadrianische Zeit dar:

1 Dieser Beitrag ist eine gekürzte Übersetzung des Artikels, welcher zuerst im Journal of Roman Archaeology 20 (2007) erschienen ist.

2 Bloch 1937.

3 Bloch 1959.

4 Bloch 1937, 102–117.

Tabelle 1: Datierte trajanische Ziegelstempel (Konsulardaten) aus dem Pantheon:[5]

CIL xv	Datierung	Äussere Rotunde	Zwischenblock	gesamt
19a	114	1		1
20b	115	2		2
23	116		1	1

Bloch folgerte, dass einige der Ziegel aus der Gruppe der undatierten Stempel (ohne Konsulardaten) offensichtlich in eine frühere Zeit gehörten. Zusätzlich zu den 4 datierten Stempeln in Tabelle 1, die aus der Zeit zwischen 114 und 116 stammen, definierte Bloch die folgenden Ziegelstempel als trajanisch und daher als problematisch für seine hadrianische Datierung des Pantheon:

Tabelle 2: Trajanische Ziegelstempel (prosopographische Datierung) in situ im Pantheon:

CIL xv	Blochs Nr.	Anzahl *in situ*
314, 315	10, 14, 15, 23, 30, 38, 58, 65	8
377	24	1
693	62–64	3
811 d–f	16 a, 18, 32	3
1008	55	1
gesamt		**16**

Zusätzlich zu den oben aufgelisteten 16 Ziegelstempeln und den 4 datierten Stempeln aus den Jahren 114–116 gibt es 3 weitere Stempel des Typs CIL xv 276, die von Bloch ebenfalls als trajanisch charakterisiert wurden, so dass sich eine Gesamtzahl von 23 Ziegelstempeln ergibt.[6] Bloch konstatiert, diese Ziegelstempel sollten alle als «vecchie rimanenze dal periodo anteriore» — also als «alte Überreste der vorangegangenen Periode» — verstanden werden.[7] Wenn er sich auf «alte Überreste» bezieht, meint er de facto Ziegel, die seiner eigenen Definition nach als trajanisch anzusehen seien. Er erklärt, dass die Ursache für das Vorhandensein trajanischer Ziegelstempel in einem — wie er es sieht — hadrianischen Bauwerk ein Überschuss an Baumaterial aus den älteren trajanischen Bauprojekten in Rom sei. Diese umfassten u. a. die Trajans-Thermen, das Trajans-Forum und die Trajans-Märkte.[8] Grosse Mengen an Ziegeln aus diesen Projekten seien Bloch zufolge zum Bauplatz des heutigen Pantheon transferiert worden. Seit 1937/38 wurde diese Erklärung für das Vorhandensein trajanischer Ziegelstempel im Pantheon akzeptiert.

Probleme der Datierung Blochs

Obwohl es scheint, als sei das Pantheon nach den Ziegelstempeln datiert worden, ist es im Gegenteil tatsächlich das Bauwerk, welches die Grundlage für die Datierung der Ziegel liefert. Es ist Blochs Definition des Pantheon als hadrianisches Bauwerk, aus welcher die Datierung der Mehrzahl der in situ gefundenen Ziegelstempel in hadrianische Zeit folgt. Denn wenn man 3 severische und 23 problematische trajanische Ziegelstempel ausklammert, so bleiben noch 44 undatierte Stempel, welche innerhalb des Bauwerks gefunden wurden.[9]
Undatierte Ziegelstempel sind solche, welche nicht die Namen von Konsuln tragen. Bloch und später auch Margareta Steinby, die die ausführlichsten Studien zu Ziegelstempeln durchgeführt hatten, orientierten sich beide wiederum an prosopographischen Studien zu Leben und Karrieren der Ziegelfabrikanten, indem sie deren sich wandelndem Status vom Sklaven

5 Ziegelstempel wurden erstmals in das Corpus Inscriptionum Latinarum xv (im Folgenden abgekürzt als CIL) aufgenommen und später von Bloch ergänzt Bloch 1947, Supplement zu Band vi,1 des CIL; Reprint in den Harvard Studies in Classical Philology lvi–lvii, 1947, and lviii–lix, 1948.

6 Für die Datierung von CIL xv 276 (Blochs Nummern 28, 29 und 54) vgl. Steinby 1977, 55.

7 Bloch 1937, 112–117.

8 Bloch 1937, 112–117.

9 Bloch 1937: CIL xv 155, 157 und 602 wurden von Steinby (Steinby 1977, insbes. 37–38 und 92) in die Jahre 193–211 und 198–211 (CIL xv 602) datiert.

über Arbeiter, Vorarbeiter bis schliesslich zu — gelegentlich — Besitzern von Ziegelbrennereien folgten. Die Inschriften auf den Stempeln änderten sich kontinuierlich mit dem gesellschaftlichen Status dieser Personen. Entsprechend wurde jeder einzelne Ziegelstempel nur über eine bestimmte Zeitspanne benutzt. Indem sie diesen Veränderungen nachgehen und die Informationen mit den Daten der jeweiligen Herkunft der verschiedenen Ziegelstempel abgleichen, ergibt die von Bloch und Steinby erstellte Chronologie eine überzeugende Datierung auch für die undatierten Stempel. Soweit es jedoch das Pantheon betrifft, wird der Schwachpunkt dieser Methode evident.

Überprüfung der Hypothesen Blochs am Beispiel des M. Rutilius Lupus

Um an der hadrianischen Datierung des Pantheon festzuhalten, musste Bloch eine Gruppe von Bauwerken finden, von denen er behaupten konnte, sie stammten aus den ersten Jahren der Herrschaft Hadrians. Offensichtlich war diese Gruppe sehr speziell, und der Grund dafür lag darin, dass alle dazugehörigen Bauten in ihrer Substanz datierte Ziegelstempel aus den Jahren 114–117 enthalten, die von M. Rutilius Lupus hergestellt wurden.
Datierte Ziegelstempel, also solche, die die Namen der jährlich zwei Konsuln erwähnen, sind seit 76 v. Chr. aus einer Serie von Stempeln aus Velia bekannt.[10] Dies war kein geographisch isolierter Fall. Datierte Ziegelstempel wurden ebenfalls in anderen Gebieten der italienischen Halbinsel gefunden, von Bologna im Norden bis Vibia Valentia im Süden; die spätesten, nicht-urbanen Ziegelstempel wurden in Todi im Jahre 93 gefertigt.[11] Die ersten Ziegel mit datierten Stempeln aus Rom (CIL xv 18) wuden im Jahr 110 von der Figliniae Brutaniae gefertigt, die einem gewissen M. Rutilius Lupus gehörte.[12] Von 114 bis 117 lieferte diese Brennerei Ziegel für verschiedene Bauten, welche Bloch in früh-hadrianische Zeit datiert. Diese Gebäude bilden, neben dem Pantheon, eine Gruppe, die Bloch «Les Quartier des Docks» nennt, besser bekannt als Portico di Pio, ein Teil der Kapitolinischen Gebäudegruppe (der Piccolo Mercato, die Insula della Casa del Moggio und die Casa dei Triclinii, Insula I.IX neben der Curia, alle in Ostia), sowie der Portico di Claudio und der sogenannte Palazzo Imperiale in Portus.[13] Alle diese Bauten wurden mit Ziegeln errichtet, zu denen auch solche mit datierten Stempeln gehören, welche von der Ziegelei des M. Rutilius Lupus in den Jahren 114 bis 117 hergestellt wurden. Natürlich stellten diese datierten Stempel ein Problem dar, wenn man ihre Datierung ernst nimmt und zugleich unterstellt, dass sie kurz nach der Herstellung verwendet wurden.
Die Identität des römischen Ziegeleibesitzers M. Rutilius Lupus mit dem praefecti Aegypti der Jahre 113–117 wurde — ausser von Bloch — bereits von anderen bekräftigt.[14] Es ist jedoch Blochs Idee, dass seine Ziegelei während der Abwesenheit des Besitzers in Ägypten weiterhin über den gesamten Zeitraum produzierte, jedoch keine dieser Ziegel tatsächlich verkauft worden seien.[15] Die Brennerei hätte also Ziegel auf Lager produziert. Tatsächlich nimmt Bloch an, die Praxis, Ziegel mit Stempeln zu versehen, welche die Namen der jeweiligen Konsuln tragen, hätte während der Abwesenheit des Besitzers zur Kontrolle der jährlichen Produktion gedient.[16] Während die Identität des M. Rutilius Lupus mit dem in den Stempeln erwähnten M.R.L. als gesichert erscheint, wurde der zweite Teil der Blochschen Hypothese — dass sein Aufenthalt in Ägypten ihn vom Verkauf der Ziegel über einen Zeitraum

10 Manacorda 2002.
11 Manacorda 2002.
12 Der erste bekannte datierte Ziegelstempel aus Rom wurde im Jahre 110 gefertigt. Er ist im CIL als xv 18 gelistet.
13 Bloch 1937, 87–117.
14 Hermann Dessau schlug dies bereit 1898 vor (vgl. PIR 1897, Bd. III), kommentiert in Bloch 1937, 317.
15 Bloch 1937, bes. 113–114 und 316–320.
16 Bloch 1937, 225–239.

von vier Jahren abgehalten haben soll — niemals bewiesen. Unter einem ökonomischen Blickwinkel erscheint dieses Verhalten zumindest nicht sinnvoll.

Bloch nahm ausserdem an, dass ein weiterer Grund für M. Rutilius Lupus, die Namen der Konsuln in den Stempeln festzuhalten, Spekulation gewesen sei.[17] Der Grund läge darin, dass ältere Ziegel als wertvoller eingeschätzt worden seien und er daher für diese später einen höheren Preis hätte verlangen können.[18] Die Frage jedoch, ob ein solcher höherer Preis die Kosten für die längere Lagerung sowie das Spekulationsrisiko aufgewogen hätten, bleibt unbeantwortet. Selbst wenn dies der Fall gewesen sein sollte: Warum wurde es dann nicht von anderen Ziegelherstellern ebenso praktiziert? Keine dieser Fragen wird von Bloch diskutiert.

Bloch nimmt an, dass die Abwesenheit Trajans während des Krieges gegen die Parther eine Reduktion der Bautätigkeit in der Hauptstadt zur Folge gehabt hätte.[19] Bloch zufolge könnte Rutilius Lupus erwartet haben, die Ziegel bei grösserer Nachfrage später zu höheren Preisen zu verkaufen.[20]

Darüber hinaus scheinen Blochs Informationen hinsichtlich des Verkaufs der Ziegel unbefriedigend und von den Umständen abhängig, selbst wenn Bloch gewichtige Argumente für die Möglichkeit eines Ägyptenaufenthalts von M. Ruitilius Lupus ins Feld führen kann. Trotzdem diskutiert er nicht die Mechanismen von Angebot an und Nachfrage nach Ziegeln oder die Marktposition von M. Rutilius Lupus, welche jedoch von grundlegender Bedeutung für die Stützung seiner Hypothese sind. Tatsächlich scheint der Hauptgrund für Blochs Hypothese das Bestreben gewesen zu sein, das Vorhandensein von Ziegelstempeln aus den Jahren 114–117 in situ im Pantheon zu rechtfertigen. Denn offensichtlich passt das Auftreten datierter trajanischer Ziegelstempel im Pantheon nicht in Blochs Theorie, dass dessen Errichtung erst nach 118 oder 119 begann.

Vitruv und das «Reifen» der Ziegel

Blochs Theorie zur Frage, warum die datierten Ziegelstempel aus den Jahren 114–117 als Quellen für die Datierung jener Gruppe früh-hadrianischer Bauten ignoriert werden sollten, wird von Axel Boëthius in einem Artikel von 1941 unterstützt.[21] Der schwedische Archäologe behauptet, dass abgelagerte Ziegelsteine höhere Preise erzielt haben könnten, und führt als Begründung für diese Annahme Vitruvs Traktat über die Architektur an.[22] Vitruv empfiehlt eine verlängerte Lagerung von sonnengetrockneten Lehmziegeln (er nennt sie later) in einem Kapitel des zweiten Buchs über «Baumaterialien».[23] Seine Empfehlung einer zweijährigen Lagerungszeit vor der eigentlichen Verwendung der Ziegel wurde seitdem immer wieder als Unterstützung für Blochs Hypothese herangezogen.[24] Vitruv schreibt, dass die Einwohner von Utica nur Lehmziegel benutzen würden, die sie zuvor fünf Jahre gelagert hätten, wie Bloch zitiert.[25]

Es ist verständlich, dass sonnengetrocknete Lehmziegel von einer solchen Lagerung profitieren dürften, aber es ist wichtig darauf hinzuweisen, dass sie sich strukturell und chemisch grundlegend von gebrannten Tonziegeln unterscheiden, welche Vitruv later

17 Bloch 1937, 225–239.

18 Bloch 1937, 225–239.

19 Bloch 1959, 225–239, bes.: 236: «It must have been obvious that the war and the absence of the emperor would result in a slackening of the building activity in Rome.»

20 Bloch 1959, 225-239, bes. 236 «Bricks would be in greater demand, and he, Lupus himself, could make use of his connections to secure advantageous contracts for the sale of bricks.»

21 Boëthius 1941.

22 Boëthius 1941, kommentiert bei Bloch 1959, 225–239, bes. 236.

23 Vitruv 2.3.

24 Vitruv 2.3.1–4. Vitruvs Empfehlung hat seit Boëthius' Hinweis immer als Unterstützung vor Blochs Hypothese gedient, vgl.: Boëthius 1941, Smith 1978, Loerke 1990.

25 Vitruv 2.3.2.

coctum nennt. Sobald die Tonziegel gebrannt und abgekühlt sind, hat eine verlängerte Lagerung keinerlei Einfluss auf das Material.
Darüber hinaus gibt es zumindest ein dokumentiertes Beispiel für die Verwendung gebrannter Ziegel innerhalb einer sehr kurzen Frist — von wenigen Monaten, nicht Jahren — nach ihrer Herstellung. Durch die Inschrift am Serapeum von Ostia wissen wir, dass dieses Bauwerk im Januar des Jahres 127 geweiht wurde.[26] Ziegelstempel mit den Namen der Konsuln des Jahres 126 wurden in diesem Bau gefunden. Tatsächlich wurden 15 der insgesamt 36 in situ am Serapeum aufgefunden Ziegelstempel — also 41% — in den Jahren 125 und 126 hergestellt. Von diesen wurden 9 — also 25% — erst im Jahre 126 hergestellt, d. h. wenige Monate vor der Einweihung des Bauwerks im Januar 127.[27] Trotzdem beharrt Bloch auf der Ansicht, dass Ziegel nie kurz nach ihrer Herstellung verwendet wurden. Er behauptet statt dessen, sie wären längere Zeit gelagert worden, nach seiner Auffassung über Jahre.[28] Offenbar hätten sich anderenfalls Probleme für die Grundlage seiner Theorie über die Gruppe der früh-hadrianischen Bauten, einschliesslich des Pantheon, ergeben. Hätte er die Konsequenzen aus diesem Befund gezogen, so hätte er die eigene Datierung der gesamten Gruppe als «früh-hadrianisch» revidieren müssen — etwas, zu dem er nicht bereit war. Statt dessen spielt er den Fakt herunter und behauptet, das Serapeum sei ein aussergewöhnlicher Fall.[29]

Ein weiterer Sonderfall: Anteros Severianus

Bloch behauptet, dass die Serie der Ziegelstempel CIL xv Nr. 811 a–f, welche den Namen des Anteros Severianus tragen, eine spezielle Gruppe darstellt.[30] Er schlägt vor, dass dieser Name eine Referenz auf einen Hersteller/Ziegeleibesitzer sei. Diese stellt bei weitem die grösste Gruppe unter den Ziegelstempeln dar, die im Pantheon gefunden wurden. Ziegelstempel der Typen 811 d–g erscheinen regelmässig in trajanischen Bauten.
Bloch nimmt an, dass 811 d und 811 f aus dem zweiten Jahrzehnt des zweiten Jahrhunderts stammen. Seiner Auffassung nach begann Anteros Severianus in den letzten Jahren der Herrschaft Trajans, eine neue Ziegelform zu benutzen, welche den Stempeln 811 a–c entspricht. Hiervon wurden 18 Beispiele in situ am Pantheon selbst gefunden. Doch Bloch betont, dass es nicht möglich sei, eine unverzügliche und vollständige Veränderung in der Produktion festzustellen. Statt dessen nimmt er an, dass es einige Zeit dauerte, bis die neue Ziegelform von allen Arbeitern des Anteros Severianus ausschliesslich benutzt wurde.[31] Es ist jedoch keinesfalls auszuschliessen, dass einige dieser Stempeltypen zeitgleich verwendet wurden. In dieser Studie werden die Ziegelstempel der Typen CIL xv 811 a–c daher, um grösste Vorsicht zu wahren, in die Gruppe der spät-trajanischen und früh-hadrianischen Ziegel eingeordnet.

Tabelle 3: Ziegelstempel CIL xv 811 a–g in trajanischen Bauten und dem Pantheon:

CIL xv	Thermen	Märkte	Basilica Ulpia	Atrium Vestae	Pantheon
811 a–c					18
811 d	1	12	3		2
811 e			3	1	
811 f	1		5	10	1
811 g (e oder f)		2	1		
gesamt	**2**	**14**	**12**	**11**	**21**

Die Stempel 811 d–g repräsentieren eine weitere Gruppe «problematischer Ziegelstempel» für Blochs Datierung des Pantheons in die

26 Bloch 1959, 225–239, bes. 226, Fussnote 5.
27 Bloch 1959, 225–239, bes. 226 und 234.
28 Bloch 1937, bes. 316–320.
29 Bloch 1937 und Bloch 1959, 225–239, bes. 234.
30 Bloch 1937, 14–19 und 112–113.
31 Bloch 1937, 112–113.

Zeit Hadrians, welche er wiederum als «alte Überreste» erklärt.[32]

Trotzdem ist es — folgt man Blochs eigener Argumentation — bemerkenswert, dass der älteste Typ, 811 d–g (zusammen mit den Typen 811 a–c) nur in den unteren Teilen des Pantheons gefunden wurde, welche notwendigerweise früher errichtet worden sein müssen, während dieser Typ andererseits in den höhergelegenen Bereichen, die später errichtet wurden — wie bspw. der Kuppel —, nicht präsent ist. In der Kuppel überwiegt der Typ 811 a–c: Von 21 Stempeln, die hier gefunden wurden, sind 12 vom Typ 811 a–c. Wiederum scheint es aber eine gewisse chronologische Verteilung sogar dieses Typs zu geben, welche gegen Blochs Hypothese der längerfristigen Lagerung und der Verwendung «alter Überreste» spräche, weil sie auf eine fortschreitende, progressive Lieferung der Ziegel an den Markt hinweist.

Synopsis der Ziegelstempel aus dem Pantheon

Tabelle 4: Ziegelstempel aus dem Pantheon (Rotunde, Kuppel, Zwischenbau):

Datierung	**Anzahl *in situ***	**% *in situ***
trajanisch	23	32,9
spät-trajanisch / früh hadrianisch	39	55,7
hadrianisch	1	1,4
antoninisch / nach-hadrianisch	3	4,3
undatiert	4	5,7
Anzahl insgesamt	70	100,0

32 Bloch 1937, 112 «Tuttovia egli disponeva ancora, quando il Pantheon fu construito, di vecchie rimanenze munite dei timbri 811 d e f: 4 es. (3 in situ 1). 811 d, f appartengono, come abbiamo dimostrato, al primo e al principio del secondo decennio del secondo secolo d. Cr.» Übersetzung: «Nach allem lieferte er Anteros Severianus beim Bau des Pantheons insgesamt Ziegel mit den alten Stempeln 811 d, e und f: 3 in situ 1.[?] 811 d und f gehören, wie wir gezeigt haben, in das erste und vor allem in das zweite Jahrzehnt des zweiten Jahrhunderts.»

Die vorstehende Tabelle suggeriert eher ein gegenteiliges Szenario als jenes, welches Bloch vorschlägt. Anstelle von 23 trajanischen, für eine hadrianische Datierung des Bauwerks jedoch problematischen Ziegelstempeln, bleibt eigentlich nur 1 hadrianischer Stempel, der für eine trajanische Datierung problematisch wäre: CIL XC 549 wird durch die Konsulardaten in das Jahr 123 datiert. Eine neuere Erklärung, die von Janet DeLaine und Mark Wilson Jones vorgebracht wurde, interpretiert den betreffenden Ziegel als Teil der Fertigstellung der Porticus, nachdem die Errichtung der Rotunde abgeschlossen war.[33]

Neudatierung der Bauten von Ostia

Bloch geht sogar noch weiter, um die Datierung der Ziegelstempel aus den Jahren 114–117 nicht direkt für die Datierung des Bauwerks übernehmen und also ihre Datierung nicht als der Bauzeit entsprechend annehmen zu müssen. Bloch leugnet eine chronologische Verteilung der Ziegelstempel, die in den Bauten der früh-hadrianischen Gruppe gefunden wurden.[34] Kürzlich hat jedoch Janet DeLaine in einem Artikel über die Bauaktivitäten in Ostia im zweiten Jahrhundert gezeigt, dass es tatsächlich eine chronologische Verteilung der Ziegelstempel in diesem Gebiet gibt und — was noch darüber hinaus weist —, dass Bloch sich dieser Tatsache anscheinend vollkommen bewusst war — trotz seiner vehementen Behauptung des Gegenteils.[35]

DeLaine entdeckte, dass einige Bauten in Ostia nahe der sogenannten Curia westlich des Kapitols in chronologischer Abfolge errichtet wurden: Während die Curia selbst ungefähr um das Jahr 100 vollendet wurde, verweisen Baumaterialien, Ziegelstempel und Bautechniken der anderen drei Bauten auf drei verschiedene Bauphasen. DeLaine stellte fest, dass das zuerst vollendete Bauwerk der Wirtschaftsbau I.IX.2 im

33 Vgl. Wilson Jones in diesem Band.

34 Bloch 1937, 113.

35 DeLaine 2002, bes. 93–94.

nordwestlichen Teil der Insula war. In diesem Bau stammen alle in situ gefundenen Ziegel aus dem Jahr 114, jedoch keiner aus einem späteren Jahr, was darauf hinweist, dass er in den Jahren 114–115 errichtet wurde. Ein Bauwerk an der südwestlichen Seite der Insula, I.IX.3, das Caseggiato del Larario, weist in situ nur Ziegelstempel aus den Jahren 114 und 115 auf, jedoch keine aus den Jahren davor oder danach — was bedeutet, dass dieser Bau nicht später als im Jahr 116 vollendet worden sein dürfte. Er ist zudem in der Bauabfolge erkennbar im Anschluss an das zuvor erwähnte I.IX.2 errichtet worden. Im dritten Bauwerk, I.ix.1, der Casa Basilicale im nordöstlichen Teil der Insula, wurden zwar keine datierten Ziegel in situ gefunden, aber die Tatsache, dass dieser Bau wiederum in Anschluss an I.IX.3 errichtet wurde, führt DeLaine zu dem Schluss, dass seine Errichtung in den Jahren 117–118 erfolgte.[36] Basierend auf diesen Befunden verwirft sie Blochs Behauptung, alle diese Bauten — I.IX.1 bis 3 — wären ungefähr im Jahre 120 errichtet worden. Darüber hinaus haben DeLaines Forschungen gezeigt, dass eine Gruppe von Bauten in Ostia, die allgemein als Portico di Pio bezeichnet wird und die Bloch als homogenen Teil innerhalb derselben Gruppe früh-hadrianischer Bauten in die Jahre nach 120 datiert, tatsächlich aus verschiedenen, deutlich voneinander unterschiedenen Bauten besteht, die in chronologischer Abfolge seit 114 errichtet wurden.[37]

Zu den Studien DeLaines kann ein weiteres Bauwerk hinzugefügt werden, welches von Bloch ebenfalls zur Gruppe früh-hadrianischer Bauten gezählt wurde: der sogenannte Palazzo Imperiale in Portus.[38] Er vermerkt hier 21 Ziegelstempel in situ, von welchen 11 aus der Fabrik des M. Rutilius Lupus stammen und durch die Konsulardaten in das Jahr 115 datiert werden können, während zwei weitere aus derselben Ziegelei in die Jahre 114 und 116 zu datieren sind.[39] Daher scheinen die in situ gefundenen Ziegelstempel eindeutig darauf hinzuweisen, dass die Datierung dieses Baus einer Überprüfung unterzogen werden sollte. Es ist wahrscheinlich, dass die Errichtung des Palazzo Imperiale um 117 abgeschlossen war. Daher wäre der Bau also trajanisch und nicht früh-hadrianisch. Dies erhöht die Wahrscheinlichkeit, dass Blochs «früh-hadrianische Bauten» allesamt in den letzten Jahren der Herrschaft Trajans errichtet oder begonnen wurden und wesentlich fortgeschritten waren.

DeLaines Studie hat gezeigt, dass die Bauten in Ostia vor 118 beendet wurden, als Hadrian nach Rom zurückkehrte — und zwar als Kaiser erst im Juli 118. Dies bedeutet eine Neubewertung, welche im Fall der Datierung des Pantheon ebenfalls für eine Überprüfung spricht. Es gibt jedoch zumindest einen Aspekt in Blochs Theorie, welcher korrekt zu sein scheint, nämlich dass das Pantheon zeitgleich mit jener Gruppe der «früh-hadrianischen» Bauten errichtet wurde, welche Ziegelstempel aus den Brennereien des Rutilius Lupus enthalten.[40] Die Tatsache jedoch, dass diese Gruppe früher errichtet worden sein muss, bedeutet zugleich, dass die Er-

36 DeLaine 2002, 42–43, 78. Die im Umkreis dieses Baus gefundenen Ziegelstempel stammen aus den Jahren 114–117, was ebenfalls als ein Hinweis darauf gesehen werden kann, dass die Arbeiten in den Jahren 117–118 abgeschlossen wurden.

37 DeLaine 2002, 41–102.

38 Bloch 1937, 100–102.

39 Bloch 1937, 100–102. Von den verbleibenden 8 Ziegelstempeln haben 7 keine Konsulardaten. Bloch schreibt einen Ziegelstempel mit Konsulardaten des Jahre 123, CIL XV 531, 1 einem späteren Eingriff zu: «lavori poco posteriori» Bloch 1937, 101. Die 4 folgenden wurden in trajanische Zeit datiert: CIL XV 85,1 (trajanisch 112–115 Steinby 1977, 31); 441 b 8 (trajanisch, Steinby 1977, 81); 1013,3 (trajanisch 110–115, Steinby 1977, 53); 1106, b (spät-trajanisch; Steinby 1977, 55). Der Typ CIL XV 115,8 wurde in spät-trajanische/früh-hadrianische Zeit datiert: Steinby 1977, 34. Der Typ CIL XV 2197,1 wird in hadrianische Zeit datiert: Lanciani 1870, 25 und Bloch 1937, 101, während der Typ CIL XV 1382, 3 bisher nicht datiert wurde.

40 Bloch 1937, 114: «Con ciò è accertata la contemporaneitá del Pantheon e delle costruzioni trattate sopra [d.h. das «Quartier des Docks» (Ostia), die Casa dei Triclinii (Ostia), der Portico des Claudius (Portus) und der Palazzo Imperiale (Portus)].» Übersetzung: «Damit ist die Gleichzeitigkeit des Pantheon und der oben behandelten Bauten akzeptiert.»

richtung des Pantheon ebenfalls zu einer Zeit begonnen wurde, die vor derjenigen liegt, welche Bloch annahm.

Eine problematische Lücke

Verlassen wir die Frage der Evidenz auf der Basis der Ziegelstempel und betrachten wir noch ein weiteres, für Bloch verwirrendes Detail: die zeitliche Lücke zwischen der partiellen oder sogar vollständigen Zerstörung des zweiten, domitianischen Pantheon durch Blitzschlag im Jahre 110 und der vermeintlichen Aufnahme der Bautätigkeit im Jahre 118 oder 119.[41] Indem er ältere Quellen zitiert, datiert Hieronymus das Ereignis in das Jahr 110. Bloch hält es für sonderbar, dass das Monument für acht bis neun Jahre nach seiner Beschädigung bzw. Zerstörung unverändert gelassen worden sei. Er erwähnt jedoch nicht, dass diese Periode von acht bis neun Jahren, in welcher seiner Auffassung nach nichts geschah, nur ein Resultat seiner eigenen Datierung der vermeintlichen Gruppe früh-hadrianischer Bauten ist.

Bloch liefert keine Erklärung dafür, warum die Bautätigkeit am neuen Pantheon bis zum Jahr 118 oder 119 aufgeschoben worden sein soll. Im Jahre 110 waren grosse Projekte, die Trajan begonnen hatte, abgeschlossen oder standen kurz vor ihrer Fertigstellung: Das traditionelle Datum für die Eröffnung der Trajans-Thermen ist 109; die Trajans-Märkte waren vermutlich um 110 vollendet; die Basilica Ulpia und das Trajans-Forum um 112, und das Atrium Vestae um 113.[42] Warum sollte Kaiser Trajan warten — und worauf? Er verliess die Hauptstadt nicht vor September oder Oktober 113, um gegen die Parther Krieg zu führen.

Tatsache ist, dass eine hadrianische Datierung des Pantheon eine Lücke hinterlässt: Wie wurden die Aufgaben des Pantheon, die es vor dem Feuer von 110 innehatte — welche immer dies auch im Einzelnen gewesen sein mögen —, in der Periode zwischen 110 und 125/128, als der Neubau angeblich eingeweiht wurde, realisiert? Wenn die Römer seit 110 ohne das Pantheon auskamen, warum sollten sie um 118/119 beschliessen, es wieder neu zu errichten? Worauf haben sie in der Zwischenzeit gewartet? Warum wurden die Arbeiten zum Wiederaufbau des Pantheon nicht direkt nach seiner Zerstörung um 110 begonnen?

Zusammenfassung

In dieser Revision der Interpretation der Ziegelstempel aus dem Pantheon wurden Blochs Gründe für die Datierung des Bauwerks in die Jahre nach 118 oder 119 neu analysiert. Blochs grundlegende Studie von 1937/38 und sein 1959 publizierter Artikel wurden später ergänzt durch die Arbeit von Steinby auf der Grundlage derselben Methode. Beider Datierungsmethode wurde für die Überprüfung der Ziegelstempel am Pantheon herangezogen. Konsequenterweise ist der einzige Weg zu einer Datierung des Pantheon die Hinzuziehung aller Ziegelstempel, welche in situ gefunden wurden. 23 der 70 Ziegelstempel können klar in die Zeit Trajans datiert werden. Viele der Stempeltypen, die am Pantheon gefunden wurden, treten ebenso in anderen trajanischen Bauten auf wie z. B. an Teilen des sogenannten Portico di Pio u. a. DeLaines neueste Datierung der Bauten in Ostia in trajanische Zeit hat direkte Konsequenzen für die Datierung des Pantheon. In Übereinstimmung mit DeLaines Datierung dieser Bauten, von denen einige ebenfalls Ziegelstempel aufweisen, welche exakt dieselben sind wie jene, die sich in die Jahre 114–117 datieren lassen, ist es wahrscheinlich, dass die Errichtung des Pantheon in spät-trajanischer Zeit begann.

Auf der Basis der Analyse der Ziegelstempel aus dem Pantheon scheint es klar zu sein, dass die Datierung des Bauwerks überdacht werden

41 Hieronymus, chron. 195 e. Helm. Für vollständige Quellenangaben vgl. Bloch 1937, 116.

42 Für die Datierung der Trajans–Thermen vgl. Anderson 1985, der für einen früheren Baubeginn unter Dominitian argumentiert, sowie: Caruso/Volpe 1995. Für die Trajans-Märkte vgl. Lancaster 1995 und Bianchi 2003. Für das Trajans-Forum Packer 1999 und Bianchi 2001. Zum Atrium Vestae Scott 1995.

muss. Selbst wenn es wahrscheinlich erscheinen mag, dass die Konstruktion des Pantheon erst unter Trajans Nachfolger vollendet wurde, ergibt sich aus der vorstehenden Diskussion eine Wahrscheinlichkeit, dass zumindest Teile des Baus bereits während der Herrschaft Trajans begonnen wurden. Letztendlich mag dies zu einer ausgewogeneren Sicht auf die Frage führen, ob die zeitlichen Grenzen der architektonischen Stile den Herrschaftszeiten der Kaiser Trajan und Hadrian so eng folgten, wie die meisten Forscher bis heute zu glauben scheinen.

Tatsächlich ist Blochs kategorische Behauptung, es gebe keinen Beweis dafür, dass die Errichtung des Pantheon vor Hadrians Machtantritt erfolgt sei, eher verwirrend. Konsequenterweise sollten wir alle Hypothesen Blochs überprüfen, die davon ausgehen, dass die Ziegelstempel der Jahre 114–117 als Quellen für eine Datierung nicht herangezogen werden können. Dies sind die Schlüsselelemente von Blochs 1959 publizierter, elaborierter Theorie, warum die Arbeiten am Pantheon erst lange Zeit — vier oder fünf Jahre, um exakt zu sein — nach der Herstellung der ältesten Ziegel begannen, die vor Ort gefunden wurden. Einige der in situ am Pantheon verwendeten Ziegel finden sich auch in anderen Bauten, welche den literarischen Nachweisen und Inschriften zufolge in frühere, nämlich trajanische Zeit zu datieren sind.

Dies zeigt, dass die datierten, am Pantheon in situ gefundenen Ziegelstempel ernst genommen werden können. Wir wissen, dass das heute erhaltene Pantheon in seiner Gesamtheit — von den Fundamenten bis zur Kuppel — irgendwann nach der Zerstörung im Jahre 110 errichtet wurde. Möglicherweise startete die Planung für den Wiederaufbau direkt nach dem Feuer. Das Areal wurde von den Überresten gereinigt, Materialien mussten bestellt werden, und die Aufbauarbeiten scheinen sogar vor dem Jahr 114 begonnen worden zu sein. Der älteste am Bau gefundene und datierte Ziegelstempel trägt die Namen der Konsuln des Jahres 114. Konsequenterweise kann der Einfluss, den Hadrian — wenn überhaupt — auf den Entwurf des Neubaus genommen hat, nur sehr begrenzt gewesen sein.

Einige Wissenschaftler glauben, dass die Ziegelstempel nicht die einzige Quelle für die Datierung des Pantheon sind: In einem 1975 publizierten Artikel schlussfolgerte Wolf-Dieter Heilmeyer, dass das Pantheon zur Zeit Trajans errichtet worden und dass der Architekt derselbe gewesen sein könnte, der auch für andere trajanische Bauten zuständig war, nämlich Apollodorus von Damaskus.[43] Seine Schlussfolgerung basierte auf stilistischen Indizien. Einige der architektonischen Elemente, die in Trajans Zeit entwickelt wurden, zeigen grosse Nähe zum Pantheon. So weisen die Halbkuppeln in den Trajans-Thermen Ähnlichkeiten mit der Kuppel des Pantheon auf. Sowohl in ihrer architektonischen Auffassung als Ganzes als auch der Befolgung einer strikten Ordnung in der Dekoration. Die Kassetten der noch vorhandenen Halbkuppeln sind quadratisch oder hexagonal. Die Durchmesser der grössten Halbkuppeln betragen zwischen 30 und 40 Metern. Es bedarf nur geringer Vorstellungskraft, zwei solcher Halbkuppeln zusammenzufügen: Das Resultat dürfte dem Inneren des Pantheon überraschend ähnlich gesehen haben.

Diese Studie konzentrierte sich auf die archäologischen Grundlagen für die Datierung des Pantheon und vernachlässigte die Diskussion stilistischer Indizien. Es ist vermutlich eine Herausforderung, den Schöpfer bzw. Auftraggeber des Pantheon namhaft zu machen, aber basierend auf dieser Studie der in situ gefundenen Ziegelstempel scheint es keine Grundlage für die Behauptung zu geben, Hadrian wäre dieser Auftraggeber gewesen. Es erscheint plausibler, dass bereits unter der Herrschaft Trajans der Entwurf beschlossen und grosse Teile der Rotunda vollendet worden sind. Letztendlich mag dies zu einer ausgewogeneren Sicht auf die Veränderungen architektonischer Stile führen, die noch heute aus der Sicht der meisten Wissenschaftler eng mit den Regierungsdaten der Kaiser Trajan und Hadrian verknüpft sind.

43 Heilmeyer 1975.

Materials and Construction of the Pantheon in Relation to the Developments in Vaulting in Antiquity

Lynne C. Lancaster

In this paper I discuss the Pantheon in relation to earlier development in vaulted structures in Imperial Rome. I focus on those constructional elements that have traditionally been considered most critical in the success of the monument: the relieving arches, the lightweight caementa, and the step-rings.

I begin at the Theater of Marcellus (17 BC), where there occurs one of the earliest examples of the combination of relieving arches and concrete vaults into a coherent structural system. The design of the theater required that the seating of the cavea be elevated on vaults while also providing a corridor to access the lower rows of seating, where the most prestigious spectators were seated. This configuration resulted in floors at different levels in which the walls did not always align. The builders' solution was to insert relieving arches into the curving wall of the Passaggio dei Cavalieri in places where there was no support directly underneath it (fig. 1). These arches protected the vaults that run below by directing the load of the wall to the underlying radial walls.

By the time the Colosseum was dedicated in AD 80, theaters and amphitheaters were becoming evermore complex, and the builders were adding to their repertoire of structural elements. At the Colosseum they employed the same type of brick relieving arch as the ones at the Theater of Marcellus, but in this case the ends of the arches were positioned above travertine vaulting ribs built into the underlying vaults

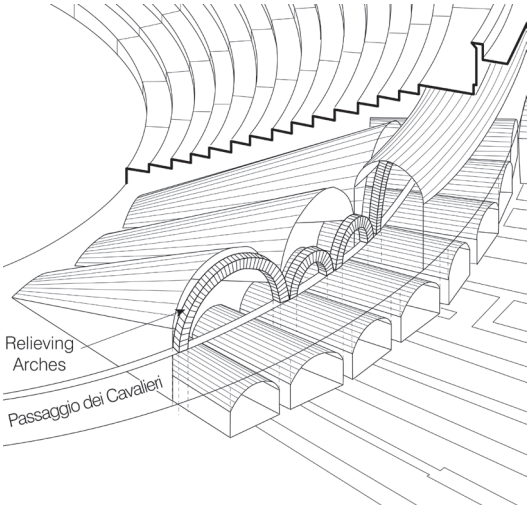


Fig. 1: Theater of Marcellus. Detail of relieving arches in wall spanning underlying substructure vaults.

(fig. 2). These sections of the vaults supported significantly increased loads, so the builders reverted to the use of the travertine voussoir arch as reinforcement. Conceptually, they intended to divert loads away from vaults and also to reinforce the vault to compensate for the added loads. The combination of relieving arches and vaulting ribs worked together to create a three-dimensional system for controlling the forces within the structure in a more complex manner than had hitherto occurred.

In the following decade in the Domitianic Vestibule (AD 81–92) at the base of the Palatine, the builders created a whole series of relieving arches within the walls (fig. 3). Here double relieving arches (semicircular over flat) occur

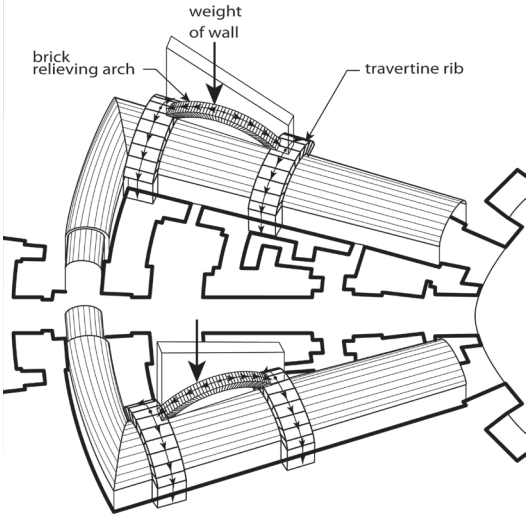


Fig. 2: Colosseum. Detail of relationship between relieving arches in ground level walls and vaulting ribs in hypogea vaults.

Fig. 3: Domitianic Vestibule, Palatine. Series of relieving arches in walls.

in three tiers in all three of the standing walls of the largest hall. They are aligned one above the other and correspond to niches at ground level in each wall, so in effect each niche has three vertical tiers of double relieving arches above it. However, the arches are not always aligned horizontally from one wall to the next. The fact that the putlog holes for the scaffolding often align with the bottom or top of the arches suggests that the arches were strictly integrated into the construction process. The purpose of the arches here is less obvious than at the Colosseum, but they were probably used in this very tall (c. 28 m) and thick (2.4–2.9 m) wall as means of consolidating the fabric of the wall and controlling settlement as the mortar cured so that the construction could proceed upward quickly without a great lag time between layers of walling. Since both ancient and modern concrete gain strength slowly over a period of time, each demonstrates the phenomenon known as «creep», which is the slow deformation of the material over time. It is most pronounced in the first six months as the mortar gains its strength.[1] The relieving arches, therefore, would provide a structural component to the wall to help prevent excessive creep or settlement in any one place within the wall and to direct the loads to the thicker parts of the wall between the niches.

One piece of evidence in favor of this proposal is the relieving arch found in the cryptoporticus under the Baths of Trajan, which has painted inscriptions on it. Rita Volpe[2] has shown that the inscriptions refer to dates that appear to mark the completion of various phases of construction (fig. 4). These dates are interesting because they show us that the arch was built in stages along with the infill underneath the intrados. As there is only one day between the top of the infill (April 16) and the walling at the extrados (April 17), the crown of the arch must have been completed between April 12 and April 16, when the infill under the crown of the arch was added. This sequence would allow the crown of the arch time to settle into place and the mortar to gain its strength so that the arch would be more effective in transferring the load. Janet DeLaine has argued for a similar process based on constructional evidence in a relieving arch at the Baths of Caracalla.[3]

1 Darwin/Nilson 1997, 33–52.

2 Volpe 2002, 384–390.

3 DeLaine 1997, 152.

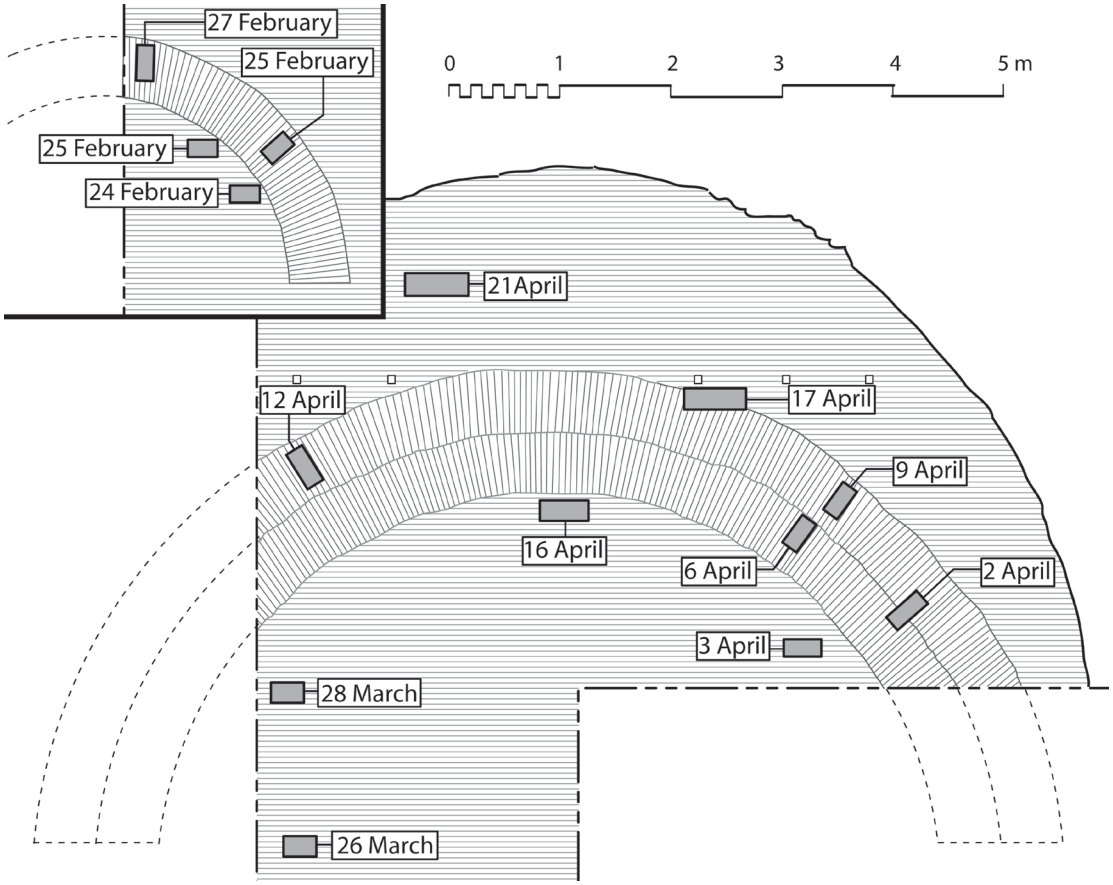


Fig. 4: Relieving arches from the cryptoporticus under Trajan's Baths (author's drawing based on Volpe 2002: figs. 3, 6, 10).

I now turn to another Trajanic structure, the latrine at the Forum of Caesar, which was added during the renovations that accompanied the construction of Trajan's Forum. It is very unusual in that it was built above earlier rooms rather than at ground level. The drainage, therefore, had to be incorporated between the vaults of the earlier rooms and the new latrine above. Moreover, the new latrine was built into a semi elliptical shape so that the walls did not align with the earlier parallel walls below it. To compensate for the lack of correspondence between the walls at the two levels the builders demolished the vaults of the earlier rooms and rebuilt them with a complex system of brick ribs, which corresponded to the ends of relieving arches in the new walls above (fig. 5). To help guide the loads to particular points within the structure the builders used travertine springer blocks so that the relieving arches directed the loads onto the reinforced, ribbed sections of the barrel vaults (fig. 6). This is one of the most sophisticated surviving structures built before the Pantheon, and given the chronological proximity, the same people, both designers and builders, could have conceivably worked on both projects.

The structure of the Pantheon draws upon these earlier structural developments. The wall of the rotunda contains series of relieving arches at three levels. The lowest arches consist of only a single ring of bipedales whereas the upper ones are more substantial and consist of two or three rings of brick (either bipedales or sequipedales). The drawing in figure 7 shows a transparent view of the structure of this wall with the two upper series of brick relieving arches extending throughout the thickness of

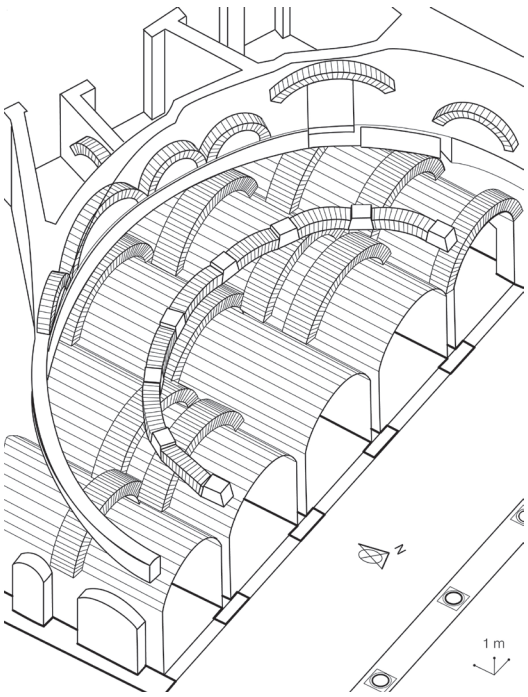


Fig. 5: Trajanic Latrine at the Forum of Caesar. Drawing of structural system comprising relieving arches and vaulting ribs.

the wall. Only the barrel vault over the entryway has a visible intrados revealing that it is built entirely of bipedales, thereby suggesting that the other barrel vaults in corresponding positions are constructed similarly. The nature of the relieving arches corresponding to the semidomes is less clear. Nevertheless, these arches were intended to direct the loads from the massive dome to the sides of the eight piers between the large interior niches. This is a much grander use of the brick ribs than at the latrine, but the latrine was clearly the practice ground for what was to come at the Pantheon.

The relieving arches in the Pantheon represent both of the intentions observed at the Domitianic Vestibule and at the Trajanic Latrine. An element common to the Trajanic Latrine and the Pantheon is the use of stone springer blocks to concentrate loads at particular points. At the Pantheon the springer blocks are used in conjunction with brick relieving arches to direct the load away from the architraves over the columns of the niches (fig. 8). The use of the springer blocks at both monuments suggests that the intention was to channel point loads through the structure, whereas the large arches at the Pantheon (M on fig. 7) would have served both to direct loads to the eight piers and to consolidate the walls and protect against creep in the same way as those at the Domitianic Vestibule. In this sense, the Pantheon does represent the most advanced and sophisticated application of such arches.

I turn now to the use of lightweight caementa in the Pantheon dome. The use of concrete provided the builders a means of controlling the mass of a structure by using stones of different weights as camenta in different parts of the building. The section of the Pantheon in figure 8 shows the distribution of the different types of caementa used: from the heaviest (travertine) at the bottom to the lightest (volcanic scoria and yellow tuff) at the top. Notice, however, that the whole dome is not made as light as possible. Only the crown has the lightweight scoria and yellow tuff. This combination of stones was first used at the Baths of Trajan and at the Basilica Ulpia. Mineralogical analysis shows that the scoria in the Pantheon and that of the earlier Trajanic buildings all are products of Mount Vesuvius. It was evidently imported by ship because it has been found in one building at Ostia as well.[4] This is one of the only non-decorative stones imported into Rome, and it only occurs in imperially sponsored buildings.

The Pantheon was obviously built after the great AD 79 explosion that destroyed Pompeii, but the scoria seems to have been an export item from Pompeii before the explosion. Vitruvius (*de Arch*. 2.6.2–3), writing towards the end of the first century BC, notes the existence of a sponge-like stone from Vesuvius that he calls *pumex pompeianus,* and this Vesuvian scoria must be the material to which he refers. In fact, it occurs used alone as caementa as early as the mid first century BC in vaults at the Fo-

4 Lancaster 2005, 66, 222–224.

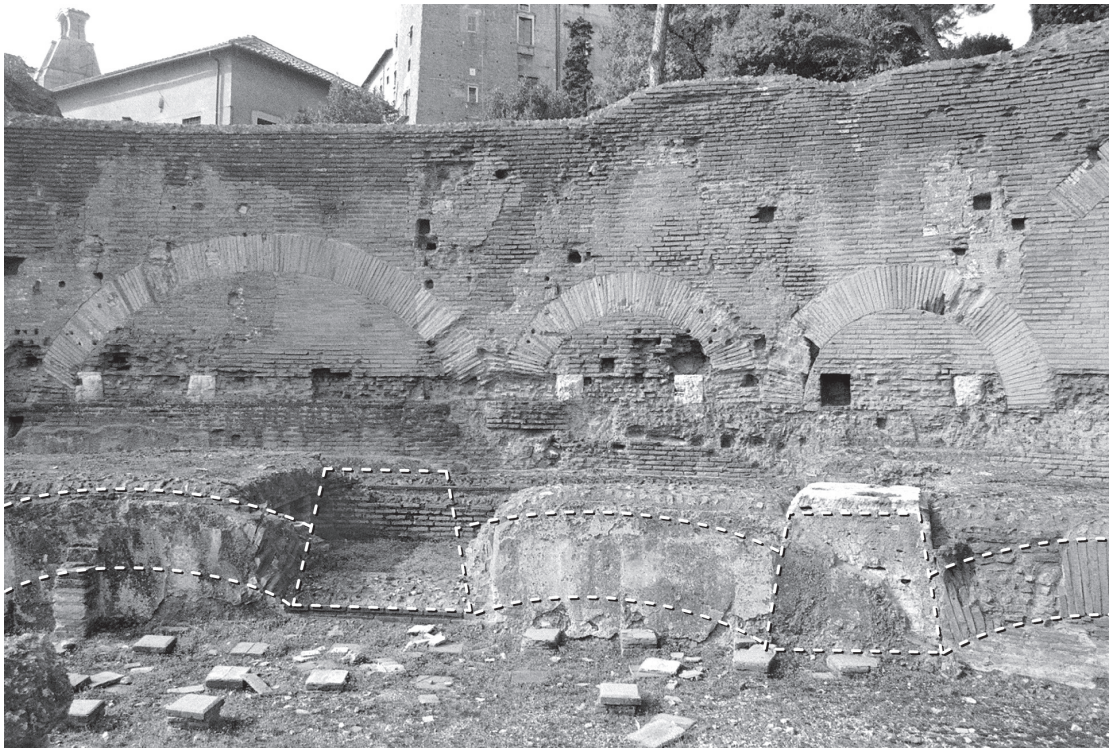


Fig. 6: Trajanic Latrine at the Forum of Caesar. Photo of springer blocks directing loads to underlying vaulting ribs.

rum of Caesar.[5] The scoria found in Pompeii was produced in a small explosion dating from around the 10th–9th century BC and underlies the city itself.[6] The AD 79 explosion was much larger and covered much of the area where the scoria would have been quarried. Therefore, the scoria for the Trajanic buildings that use it and for the Pantheon had to be excavated from underneath the 79 deposits. The most accessible places would have been in the areas away from the coast where the 79 deposits were not so deep, but this would have been more expensive due to the cost of transport to the sea and to the fact that the port at Pompeii had been destroyed (fig. 9).

A comparison with the Mount St. Helens explosion in 1980 is enlightening because the event there was very similar, albeit smaller, to the 79 explosion of Vesuvius. At Mount St. Helens, the event destroyed an old growth forest, unlike the area around Vesuvius which was largely tilled fields for vegetables and fruit trees. The rate of the recovery of the landscape around Mount St. Helens provides us with comparanda for the damage inflicted by pyroclastic flows: even twenty years later the recovery of the landscape is only minimal. Excavations and finds around Vesuvius confirm a similar situation for the area around Vesuvius. Hadrianic milestones indicate that the roads were only being rebuilt some 40 years later, and the 2nd-century burials found in the area tend to be low status, suggesting that this once fertile region took generations to recover economically.[7] The Vesuvian scoria began to appear in imperial vaulted structures in Rome 20–25 years after the explosion, and I wonder if the idea to quarry the scoria for the vaults could have been part of an imperial initiative under Trajan to use the natural resources still available under the ground since the topsoil was not yet

5 Amici 1991, 52, 162.

6 Ranieri 1998, 135–141; Ranieri/Yokoyama 1997, 33–50; Kawamoto/Tatsumi 1992, 92–97.

7 Pagano 1995–1996, 35–39, fig. 1.

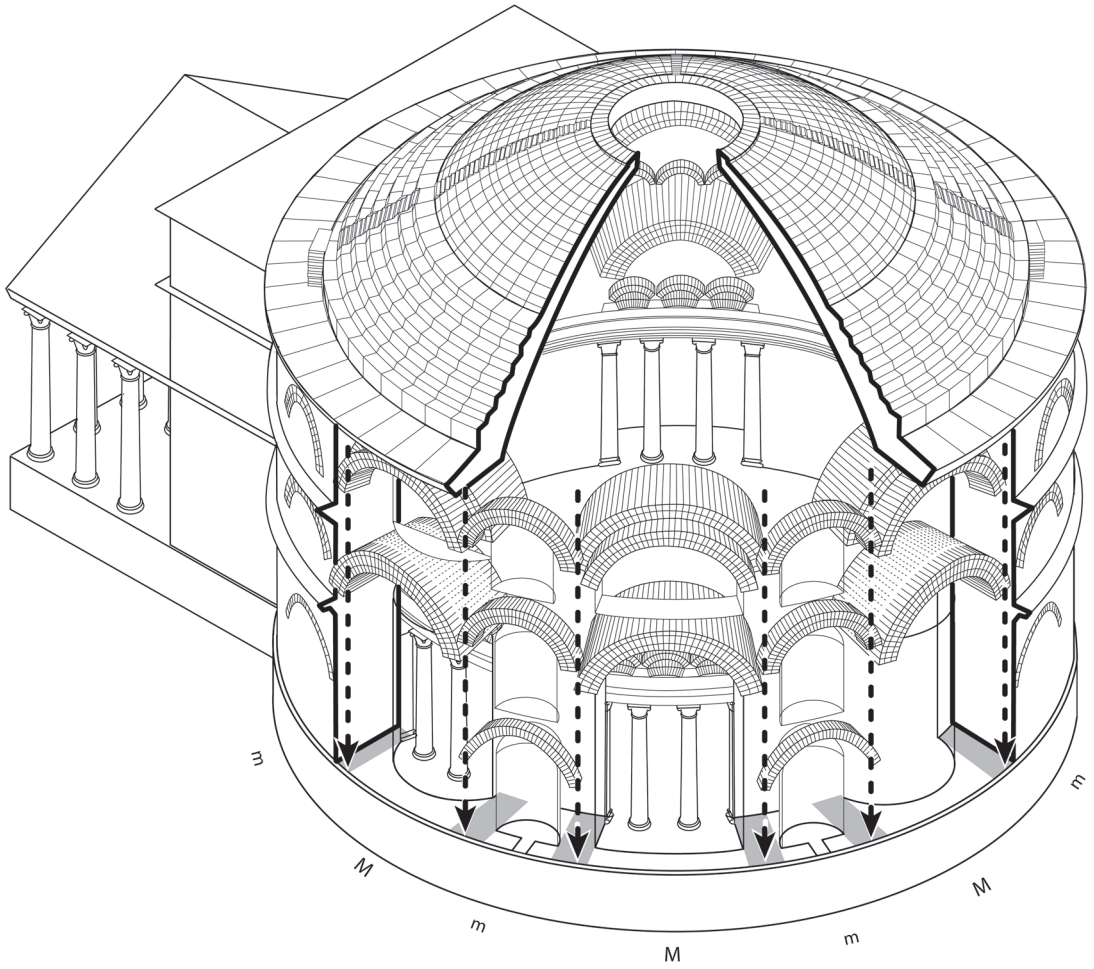


Fig. 7: Pantheon. Drawing of structural system of arches/ ribs in rotunda wall.

developed enough to sustain large-scale agriculture. In any case, the scoria was not a common phenomenon in Rome and clearly some effort by the imperial administration was put into excavating and shipping the material to Rome.

Given the evident effort to acquire the scoria, one wonders whether its structural efficacy was worth it. To answer this question, I applied a thrust line analysis to a series of Pantheon models in which I substituted various weights of caementa in different parts of the dome (fig. 10). All the models are based on the assumption that the primary relieving arches/ ribs do in fact concentrate the load onto the eight piers between the niches and that there is no hoop tension due to the cracks in the dome; therefore each model assumes that one pier is carrying a 45° wedge of the dome, which is one eighth of the entire dome.

To test the effectiveness of the lightweight caementa in the crown of the vault, I manipulate the weight of the materials. Model P3 was created by taking the existing vault as built (P1) and substituting the heavier brick and tuff caementa used in the haunches with the lightweight caementa used in the crown to create an overall lighter dome. P3 shows that making the whole dome lighter actually *increases* the lateral thrust slightly, though not significantly. In Model P4, I make the entire dome heavier with the haunch material at the crown. This has a more significant effect on the thrust line, though it still does not cause failure. These tests show that the builders understood the importance of making

the crown as light as possible while keeping the haunch heavier in order to counteract the lateral thrusts. Simply making the whole dome light was not the best solution. However, the tests also suggest that the use of the Vesuvian scoria in the dome was not in fact a critical element in the stability of the structure in spite of the effort required to import it.

The final structural element I examine is the series of step-rings on the exterior of the dome. In the past, there have been two proposals for their purpose. One is that they were added to make the construction of the dome easier to build so that the exterior could be built in steps thus avoiding forming the curved extrados in the lower parts of the dome. The second is that they were intended to act as surcharge or extra weight over the haunch of the vault.[8] In fact, some evidence from Trajan's Markets suggests that this second reason is more likely.

At the north end of Trajan's Markets are two semidomed rooms, the larger of which has an internal diameter of 17 m. On the exterior it was surrounded by a c. 1.3 m high step-ring, which is often cited as the precursor to the Pantheon step-rings. One side of the dome has been cut away revealing a section through the semidome that shows that the step-ring was added after the semidome was completed and cannot have been used to aid in its construction (fig. 11). A 15 cm layer of cocciopesto was applied to the extrados of the semidome before the step-ring was added. However, the step-ring itself has Trajanic brick stamps in the facing, so it was apparently built fairly soon after the semidome was finished.[9] This example implies that the step-ring was added as a structural precaution and was not conceived as a constructional aid.

Finally, given this information I end with a thrust line analysis of the Pantheon dome comparing the effect of the step-rings to the use of lightweight caementa in the dome. The results of Model P5 in figure 10 show that the

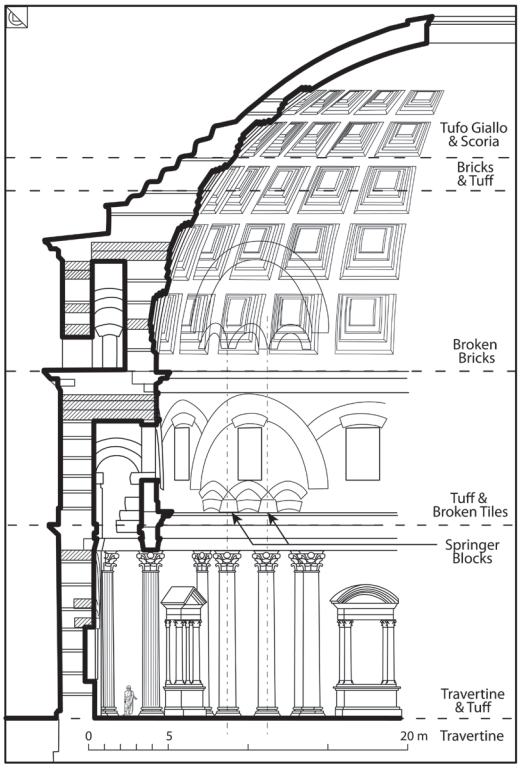


Fig. 8: Pantheon. Section showing distribution of caementa types and location of springer blocks.

elimination of the step-rings has a much more substantial effect on the thrust line, pushing it further outwards, though again not so far as to cause the structure to fail.

These thrust line models were inspired by the article of Robert Mark and Paul Hutchinson[10] who used finite element modeling to calculate the stress levels in their various models. Thrust line analysis is somewhat different from finite element modeling in that it does not measure stress, which ultimately must be compared to known stresses of particular materials (which we often do not know); rather it provides a visual measure of stability based on the relationship between form and mass.[11] It is a method that comes closer to the way that the Roman builders were thinking, that is, in terms of «pushing out» or in Vitruvius's words «*extruderent*» (*de Arch*. 6.8.4).

8 MacDonald 1982, 110.

9 Lancaster 2000, 766–767.

10 Hutchinson/Mark 1986.

11 For further explanation, see Lancaster 2005, 158–161.

My intention in conducting the thrust line analyses was not to test the stability of the structure (as it still stands), but rather to test the *relative* effect of the weight distribution through the use of different weights of stone and added mass in the form of step-rings. The analyses ultimately demonstrate that the Roman builders had a very highly developed intuitive sense for the structural behavior of their buildings without any concept of internal stresses within material or any means of calculating thrust lines.

The Pantheon is indeed a marvel of constructional ingenuity, but it is the result of a century of experimentation with the use of advanced building elements such as the relieving arch, vaulting rib, lightweight caementa, and step-rings. Unique, however, is the way in which these pre-existing elements were combined into a structural system that has allowed the largest unreinforced concrete dome ever built to stand for almost two millennia.

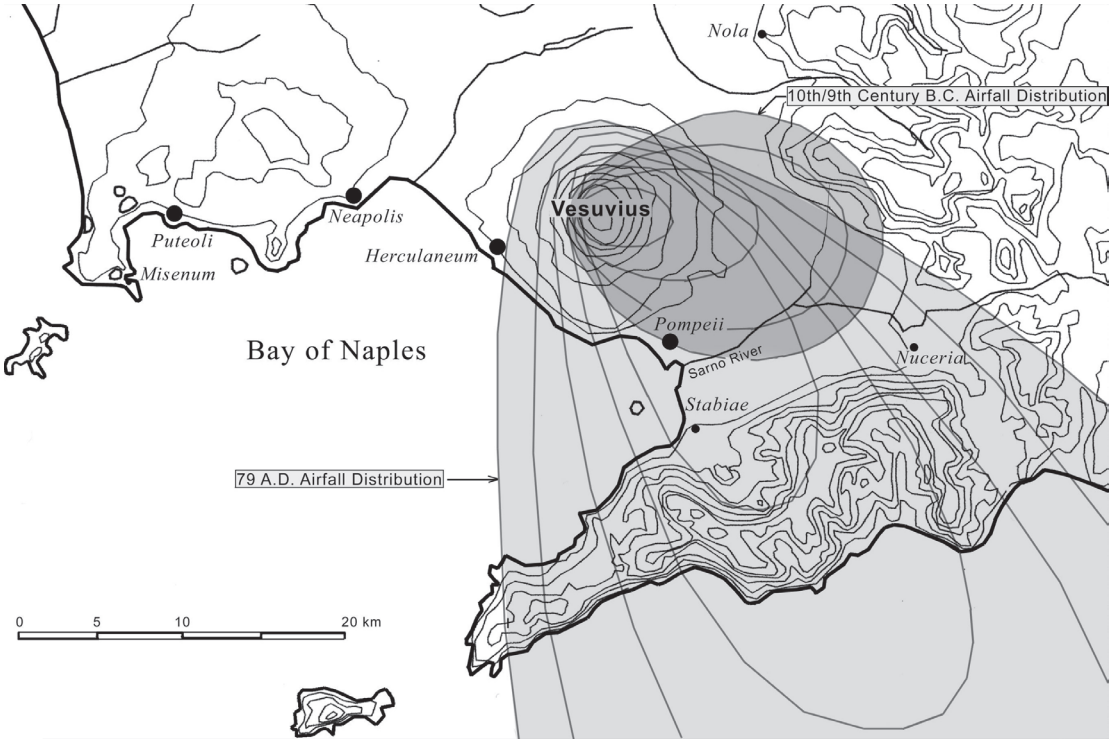


Fig. 9: Map of Bay of Naples showing the distribution of fallout from the 10th-9th century BC eruption compared to that of the AD 79 eruption.

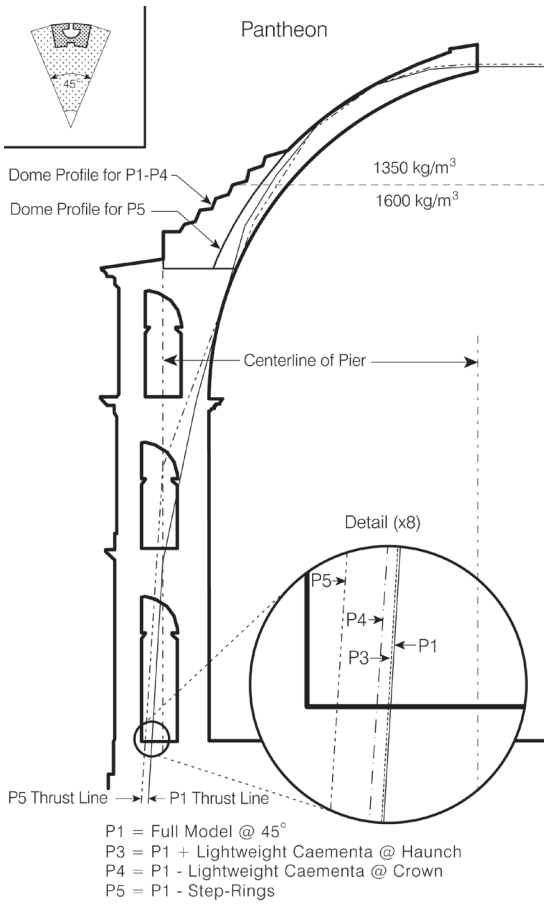


Fig. 10: Pantheon. Results of thrust line analysis.

Fig. 11: Trajan's Markets. Step-ring on extrados of the semidome at the north end of hemicycle.

The Urban Setting of the Pantheon

Allan Ceen

As an urbanist, I can make deductions that archaeologists dare not risk.

Urban analysis has to distinguish between *predetermined* planning and *developmental planning*. In Roman antiquity, predetermined planning is typified by the numerous Roman new-towns with their regular grid based on two perpendicular main streets. In Rome the city, this kind of planning did not exist. Rather, here we find developmental planning, as seen in the Campus Martius in Scagnetti's 1985 plan (fig. 1),[1] where different systems of orthogonals evolved sequentially over time, resulting in some perpendicularity but not in regularity. Perhaps this type of planning is best seen in the complex of the Imperial Forums, but it was preceded in time by the development of the central Campus Martius in the area around the Pantheon.

Any attempt to reconstruct the urban setting of the Pantheon has to be based largely on the street pattern of that area. Even more than monuments, streets reveal urban morphology. Streets are too often considered a negative element: that is, leftover space between buildings. Quite the contrary, it is often the street that chronologically precedes the building, and determines its alignment, its position and its limits. Therefore what follows is an attempt to discuss the urban setting of the Pantheon based on the ancient street system which encompassed it, much of which survives in the modern street net, as we shall see. Since streets and buildings are complementary, we will use that reciprocity to search for the lesser streets, and try to examine the interactions between streets and buildings in an effort to throw some light on the urban setting of the Pantheon.

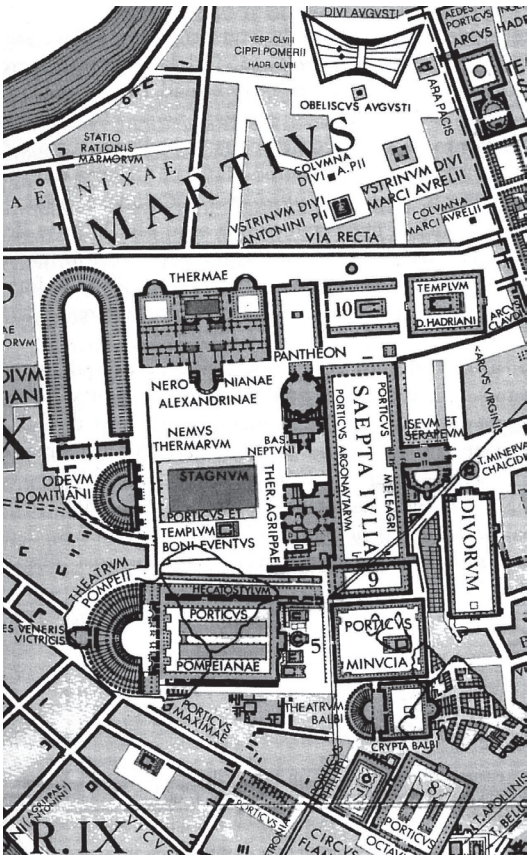


Fig. 1: Campus Martius detail from Scagnetti 1985 plan.

The main obstacle I found to this approach was the lack of a reliable, accurate plan representing

1 Scagnetti 1985.

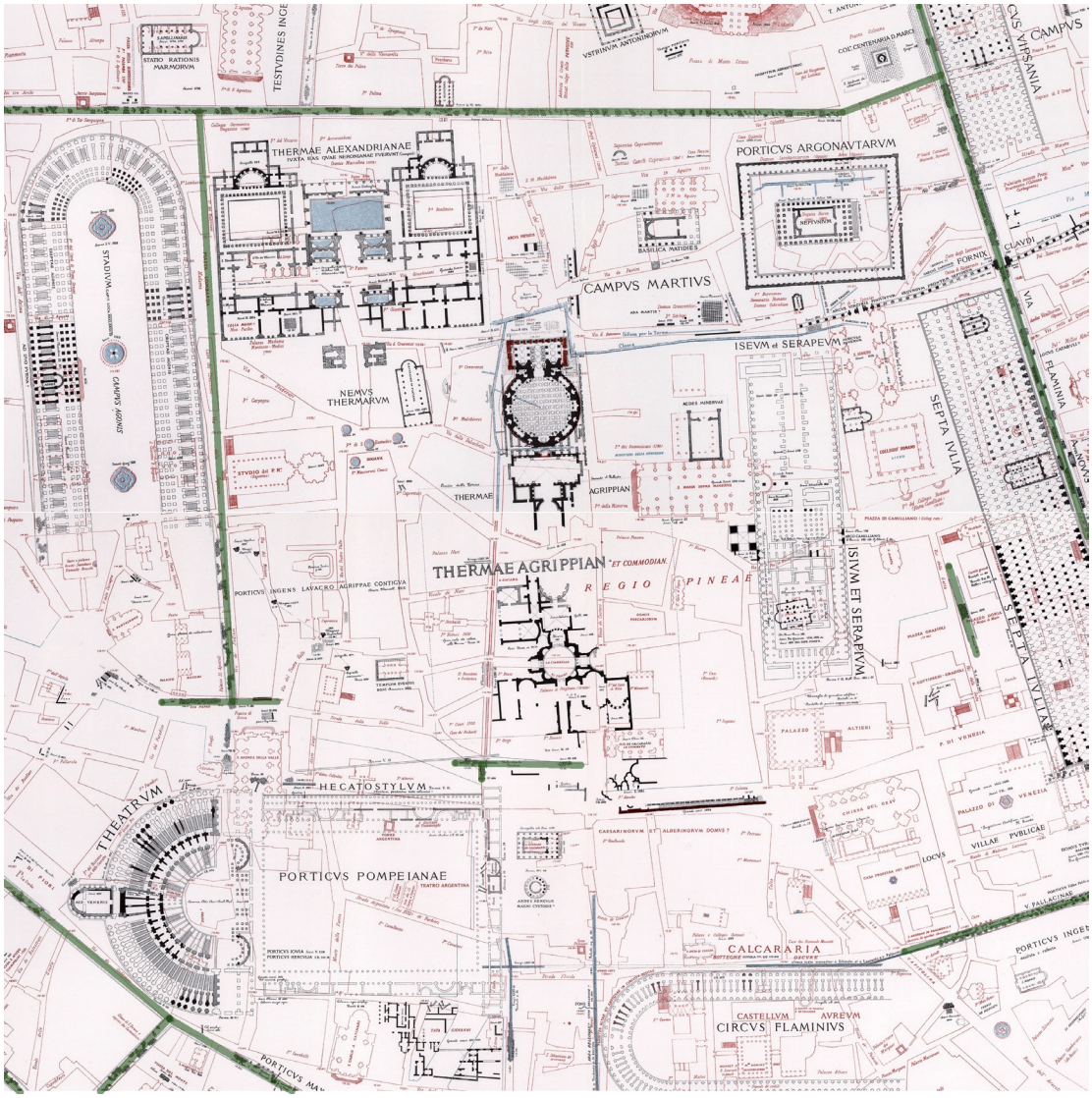


Fig. 2: Campus Martius detail from Lanciani 1893–1901.

the Campus Martius in antiquity. Lanciani's *Forma Urbis Romae* (fig. 2)[2] is over a century out of date, but is often used as the starting point for analyses of this type. As far as I know, no consistent attempt has been made to update Lanciani, though this is a consummation devoutly to be wished. Consequently, a small-scale map by M. Sediari and G. Pala, published in 1998 (fig. 3),[3] augmented by information from other sources, will have to serve as the basis of our discussion.

That this is not an ideal plan in terms of accuracy is indicated by the fact that, like all the other plans, it shows the Porticus Minucia to be exactly parallel to the Crypta Balbi enclosure. This was clearly disproven by the late 20th-century excavations at that site and the resulting Manacorda plan of the Crypta Balbi (fig. 4)[4] which shows them to be clearly convergent, and actually tangent at one point. The latter fact points to the possibility that the southern portico of the Porticus Minucia was the appro-

2 Lanciani 1893–1901.

3 Cimino/Nota Santi 1998, plan on 114–115.

4 Manacorda 2001; plan on 14.

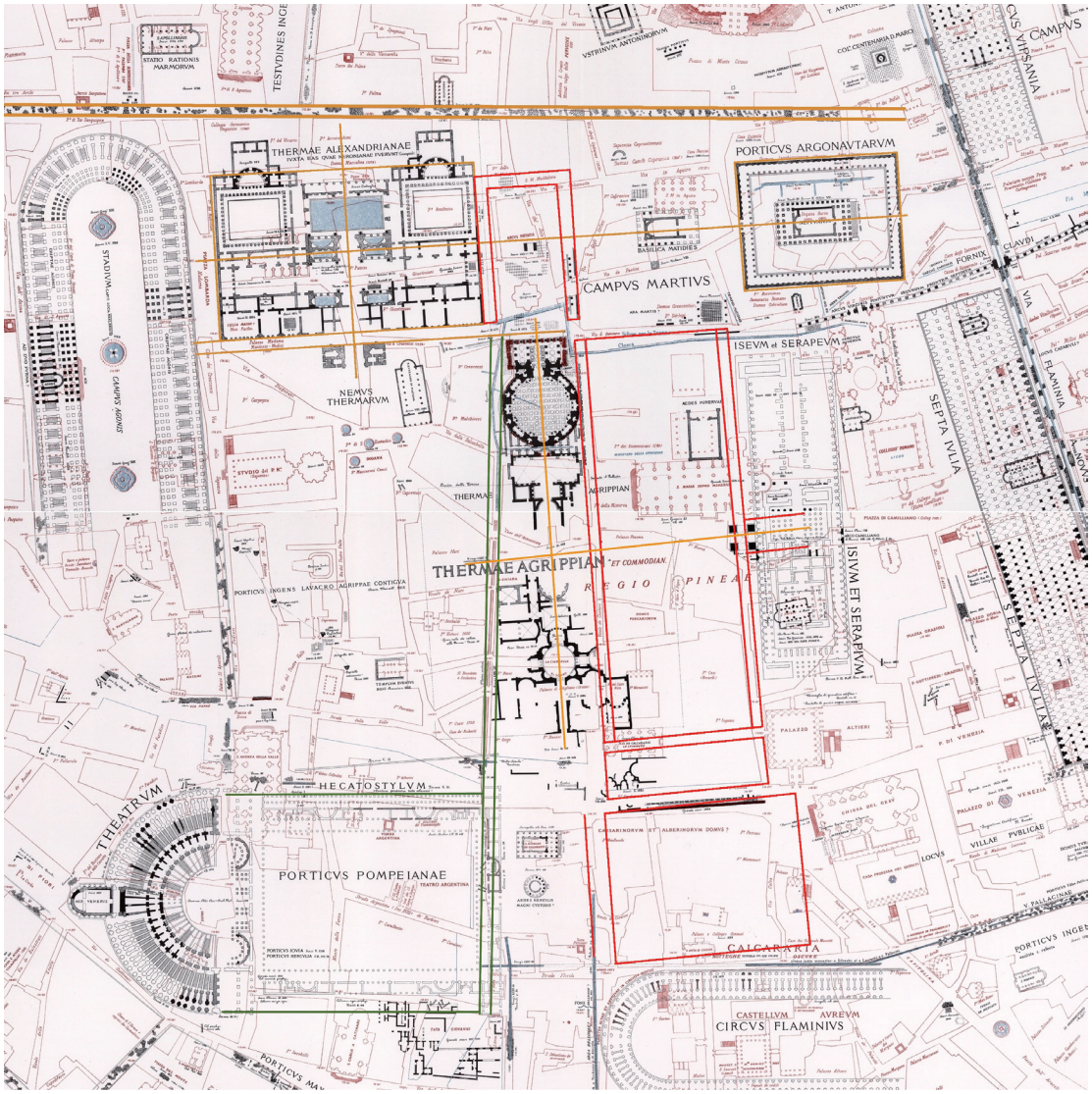


Fig. 3: Three axial systems on Sediari/Pala detail (after Cimino/Nota Santi 1998, 114–115).

priation of a street separating the two monuments. We will shortly note other instances of this kind of urban transformation.

The area under discussion is what is referred to as the central Campus Martius. A brief glance at a chronological diagram of the area should serve to illustrate this section of Rome consisting of numerous public monuments referred to by one author as «a center of popular entertainment and relaxation» (fig. 5). On this plan,[5] the yellow color indicates the earlier Republican developments including the *area sacra* of Largo Argentina. Red is the mid-first-century BC Theater of Pompey complex. The brown color indicates the Augustan projects including the completion of the Saepta, or voting grounds, planned by Caesar; Agrippa's Pantheon, baths and Stagnum; the Theaters of Balbus and Marcellus, and the Porticus of Octavia, though the latter two are outside of the area under discussion. Green refers to the site of the Baths of Nero, rebuilt by Alexander Severus; and grey denotes the two Hadrianic temples.

5 Cimino/Nota Santi 1998, plan on 79.

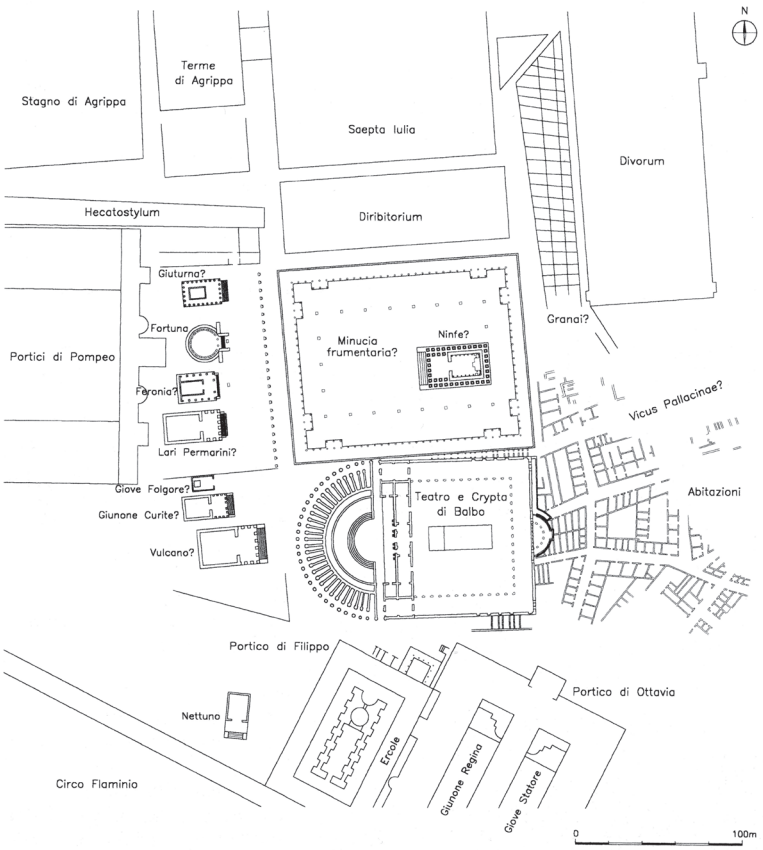


Fig. 4: Detail from 2001 Manacorda plan of Crypta Balbi area (Manacorda 2001).

Over various millennia before Rome appeared, the successive meanders of the Tiber caused residual, low, wet areas to remain in the gradually forming plain which the Romans called the Campus Martius (fig. 6).[6] Campus Martius may well have started out as a great open field, as its name implies, but it must soon have developed a series of paths crisscrossing it, if only for the purpose of keeping its users out of the wet areas which occupied much of its surface, until these were drained. Early paths in Rome had a habit of becoming the streets along which the developing city grew. This is especially true in the city within the Republican walls, but it must also apply, at least partially, to the Campus Martius. It is hard to think of the whole area in the same way that Piranesi did: a huge, open, forum-type space containing numerous monuments, but not a single street except for the Via Lata (fig. 7).[7] Piranesi's imaginative plan presents us with what the great 18th-century printmaker, archaeologist and architect thought the ancient city should have looked like rather than what it actually did look like.

And yet, Piranesi's fascinating but fanciful image seems to have affected modern plans of the ancient Campus Martius, most of which concentrate on the monuments and make no attempt to illustrate a street system in its central area. The boundary streets of Via Flaminia/Lata and Via Recta are certainly drawn in all the modern plans. Most of these plans also show two streets paralleling the river, south of the central area. But none of these plans, including those of Lanciani and Scagnetti, show

6 Cimino/Nota Santi 1998, plan on 76.

7 Piranesi 1762.

Fig. 5: Chronological diagram of the major monuments in the Campus Martius (after Cimino/Nota Santi 1998).

any streets passing *through* the central area. It is difficult to believe that there were none, as also to be seen in two other examples: Bacon's 1974 plan,[8] and Haselberger's 2002 plan (fig. 8).[9] For the purpose of this discussion we will assume that streets, paths, passages, call them what you will, did indeed exist in the central area of the Campus Martius, though some of these were absorbed into the porticoes of major buildings, as we shall see.

Let us discuss streets (fig. 9). The Via Flaminia is generally considered to have been «built» in the late 3rd century BC. However, as the major ex-urban path heading toward the Forum from the north, it must have existed in some form long before that time. Avoiding the wet part of the Campus Martius, the path which was to become Via Flaminia traveled along the extreme lower slopes of the Pincian and Quirinal hills where these merged with the plain. Before the development of the central area of this plain then, there were two main axes bounding it: the Via Flaminia on the east (1), and the so-called Via Tecta or Triumphalis (2), leading to a ford in the bend of the Tiber, on the south side.[10]

It seems reasonable to posit another north-south path along the very edge of the wetlands on the side toward the hills. This suggestion is based on the parallelism of that same axis with the eastern edge of the *area sacra* of Largo Argentina, an early Republican site which *must* have affected the local street system. That

8 Bacon 1976; plan on 84.

9 Haselberger 2002; map enclosure, Central Area, Scale 1:3000.

10 Cimino/Nota Santi 1998, author's elaboration of the plan on 80.

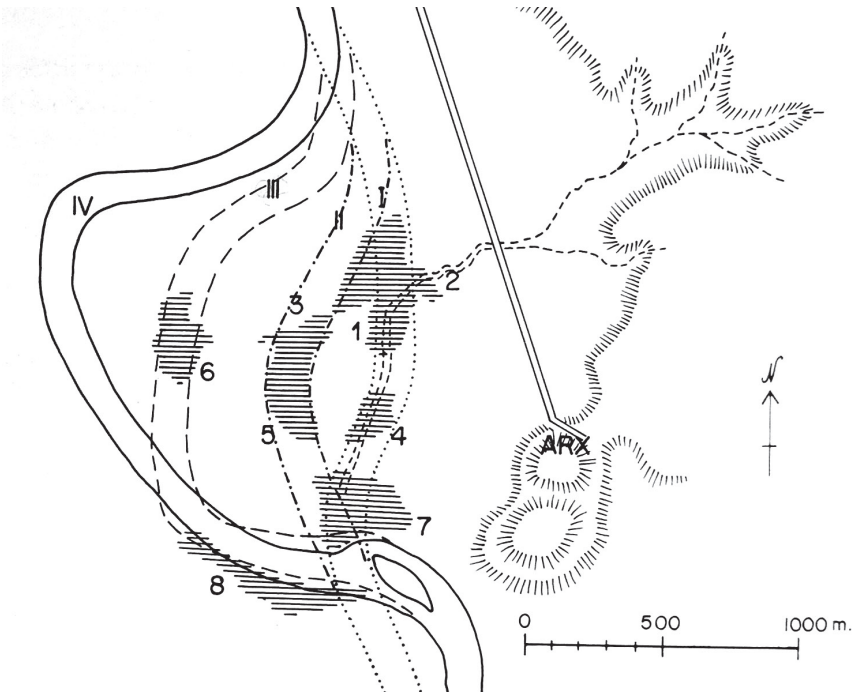


Fig. 6: Prehistoric successive meanders of the Tiber River (after Cimino/Nota Santi 1998).

path became the western edge of the voting grounds which were to be formalized into the rectangular precinct known as the Saepta Julia in the late 1st century BC. For lack of an ancient name, I shall refer to this axis as the East Street (3). A fourth axis is suggested by the eastern edge of the Porticus of Pompey's theater. Let us call this the West Street (4). A fifth urban axis was the Via Recta (5), the city's outer limit at the time of Augustus. I am always tempted to think of this one as the City-Line Avenue of Augustan Rome, a reference to the name of an urban edge-street in Philadelphia, Pennsylvania. These five axes, which were here listed in approximate chronological sequence, constitute the principal street system affecting the Pantheon.

The western portico of the Saepta appears to be an enclosed version of part of the third of these ancient paths, that is: the East Street. Converting an existing street into a covered portico or via tecta in this manner was fairly common in the ancient city. A good example partially survives to this day in the Via del Portico d'Ottavia: the entrance portico of that great temple-precinct incorporated a section of a long existing street. The wide side arches of the large entrance gate spanned across that street, allowing continued passage in the east-west direction, a trimillenial urban connection, still clearly visible on the Nolli map, which was shut down only in the late 20th century. The street-first, Porticus-second situation of this monument illustrates the point with which we started: streets generally precede buildings.

Returning to the Saepta, the primitive north-south East Street must similarly have become its western portico, because there is no room at all for a street or passage between the western edge of the Saepta and the Pantheon, and surely there had to be some sort of passage separating the two. Consequently, the Saepta must have incorporated a section of that street into its western portico which then served as such a passage (fig. 10). That vanished portico is now a street once more (Via dei Cestari/Via della Minerva). This is one aspect of a phenomenon which I like to call the *persistence* of the street. Unless they are blocked outright, streets tend to remain exactly where they are over time:

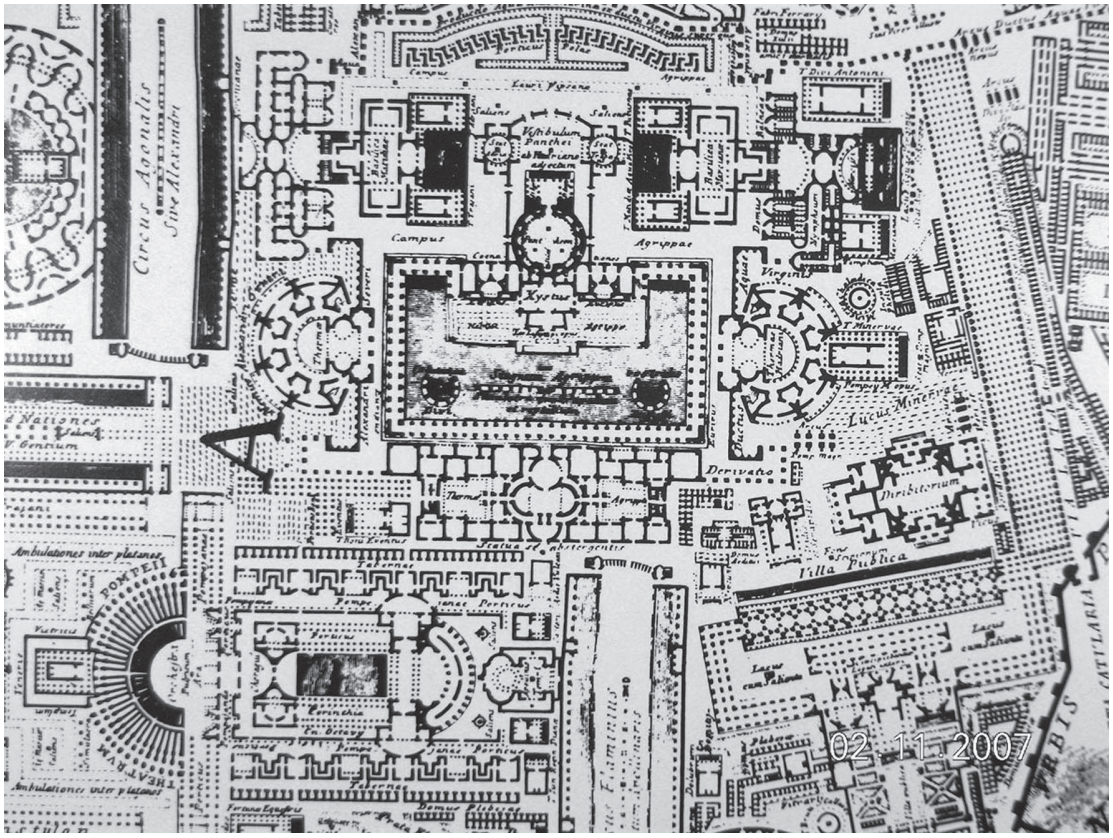


Fig. 7: Pantheon area detail from Piranesi 1762.

only rarely do we find a reason for them to be actually moved laterally. Urban connectivity is one obvious reason for streets remaining in place. In this case the street became part of a building, but significantly a major circulation element within that building, that is: a long portico.

This strong north-south axis became the determinant for the fairly formal street layout of one part of the Campus Martius. Parallels and perpendiculars to the East Street axis define the alignment and edges of a number of later monuments: the eastern edges of the Pantheon itself and the Baths of Agrippa; the western edges of the Diribitorium, and the Porticus Minucia. If we wish to find formal urban planning anywhere in Republican and early Imperial Rome, it is here. However it is sequential, additive planning, and it produces perpendicularity, but not regularity, as we said before. The result is not a predetermined, single grid as some authors still claim for most of the Campus Martius.[11] It is the *non*-perpendicularity and *non*-parallelism of much of the rest of the area that provide clues to how the Campus Martius street net developed in the area around the Pantheon.

This is best seen in the streets flanking the Pantheon on either side, the third and fourth of the five axes noted earlier, that is: East Street and West Street. We have already mentioned the eastern one as the determinant for what orthogonality there is in this area. The western one however is distinctly *not* parallel to the eastern one. Instead, it is perpendicular to the axis of the Theater of Pompey, which has its own system of parallels and perpendiculars, differing in alignment from the other system by five and a half degrees. The Pantheon and the Baths of Agrippa lie in the area where these two distinct axial systems meet. This could well explain why the baths, being closer to

11 Cimino/Nota Santi 1998, 93.

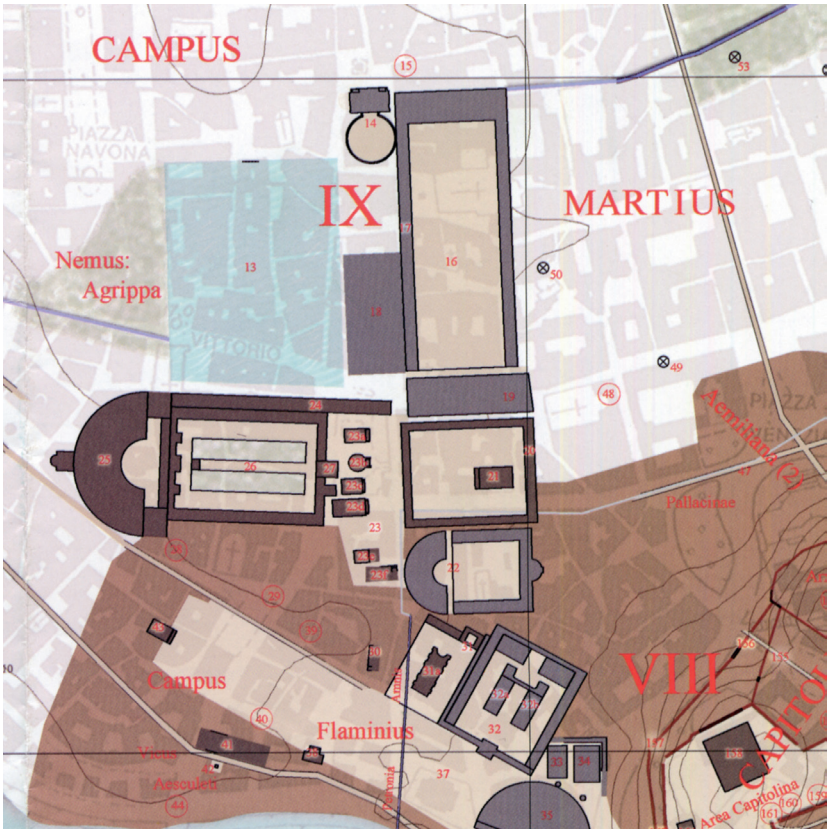


Fig. 8: Campus Martius detail from Haselberger 2002 plan.

the Theater of Pompey, are wider than the Pantheon, which lies further along the narrowing wedge between the two streets.

The perpendicularity of the West Street (now Via di Torre Argentina/Via della Rotonda) to the axis of the Theater of Pompey argues for its having been laid out before the Pantheon of Agrippa was built, because of the earlier date of the theater. This is further substantiated by the fact that the street coincides with the eastern edge of the great Porticus of Pompey's theater. Indeed, it is also aligned with the western edge of the *area sacra* of Largo Argentina, whose much earlier date suggests that this axis may even precede the theater complex and might well have determined its particular alignment.

Thus Agrippa's structures were confined between, and partly determined by, two existing streets, which again returns us to the premise with which we started: streets usually determine building alignments and limits, and not vice-versa. The same rule cannot be said to apply to *piazze* in front of major buildings like the one before the Pantheon. The creation of a formal space, or the formalization of an existing irregular space in front of a major monument, is a common feature of urban planning. The large porticoed space before the Pantheon seems to have been determined by the geometry of the building: its eastern edge is aligned upon East Street, but its western edge does not follow the axis of West Street. In order to provide a formal rectangular space in front of the Pantheon, surrounded on three sides by porticoes, the western edge was made parallel to the eastern one. This deviation from the West Street axis by the western portico survives in the present Via della Rosetta, which links Piazza della Rotonda to Piazza della Maddalena.

It is tempting to read the Baths of Alexander Severus and the two Hadrianic temples as also being aligned with the axial system of the Saepta.

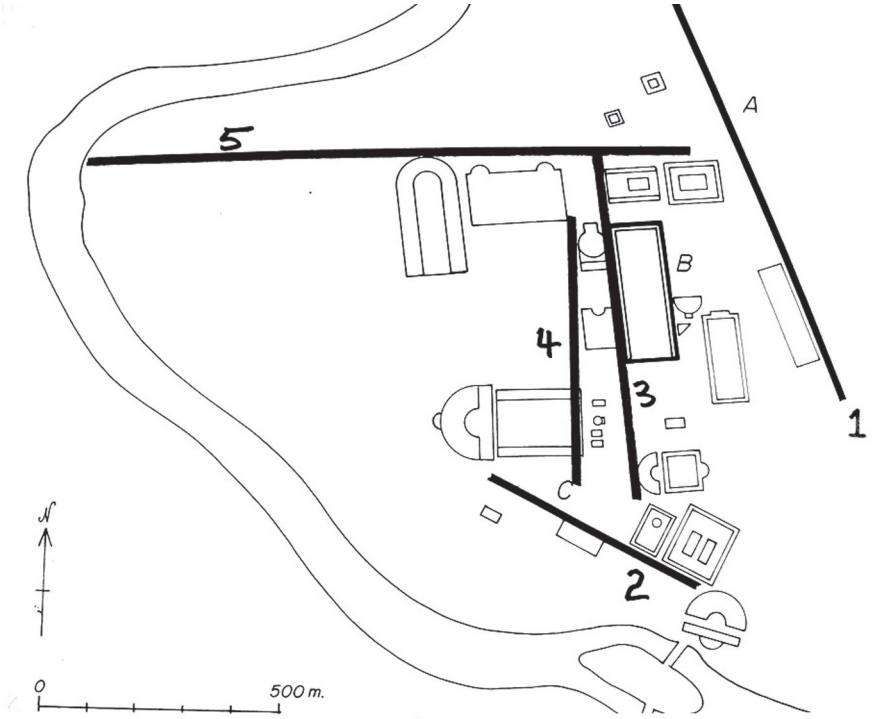


Fig. 9: Five major streets in the central Campus Martius (elaboration after Cimino/Nota Santi 1998).

In fact the Sediari/Pala plan shows that they are not. They are *almost* parallel and perpendicular to the East Street axis, but not quite. The Baths of Alexander and the two temples of Hadrian and Matidia form a coherent third set of axes varying by a degree and a half from the other set. The internal relationship of this third group is evidenced by the central axis of the two temples coinciding with the cross axis of the Baths of Alexander. Since the 3rd-century Baths of Alexander replaced the mid-first-century Baths of Nero on the same site, it must have been the latter that set the axial system for the other buildings of that set.

A cross street in front of the Pantheon is suggested by the edge of the entrance porch of the Pantheon itself, as well as by the long southern edge of the Baths of Alexander, and by the location of the main entrance to the eastern side of the Stadium of Domitian, all three of which are in alignment. This street does not line up with the cross street on the eastern side of the Pantheon, which is determined by the northern edge of the Saepta. That a street existed here is clear, because we know that the arches of the Virgo aqueduct reached at least as far as the corner of the Saepta. Since aqueducts always paralleled a street for purposes of access for maintenance, it is safe to place an ancient street at this location, corresponding to the current Via del Seminario. Further study might prove that this street, like the East Street, was absorbed into a portico of the Saepta, this time the northern one. If so, then the same might be true of the Saepta's southern portico too, allowing the location of another east-west street perpendicular to the East Street. It should be noted that doubt has been cast on the very existence of a southern portico on the Saepta, which however does not preclude the presence of a street on that site. In fact the Pala map shows a street space between the Saepta and the Diribitorium, and a parallel one between the Diribitorium and the Porticus Minucia.

To complete the orthogonal system determined by the East Street, an extension of the northern portico of the piazza in front of the Pantheon aligns with the northern edge of the area around the later temple of Hadrian, suggesting the exist-

Fig. 10: Pantheon and Saepta Julia detail from the model of Rome in the Museo della Civiltà Romana, Rome.

ence of an ancient street corresponding almost exactly to the current Via delle Colonelle/Via in Aquiro axis. Finally, the axis of the Stadium of Domitian is parallel to the East Street, revealing that the road along the east side of the stadium is part of the East Street system.

The chronologically earlier West Street grid is more easily and briefly summarized. The double portico known as the Hecatostylum, running along the north edge of the Porticus of Pompey's Theater, may be another covered street, and is certainly perpendicular to the West Street. The location of the Hecatostylum coincides with the current Via del Sudario. Finally, Lanciani shows a short street discovered by late 19th-century excavations in Largo dei Chiavari, parallel to the West Street and connecting the Theater of Pompey to the street flanking the Stadium of Domitian.

In the late antique and early medieval period the extensive grouping of monumental public buildings in the Campus Martius was largely abandoned as the city population decreased drastically. Later, the ancient structures were whittled away and replaced by modest dwellings, workshops, churches and monastaries, many of these built with materials taken from the ancient buildings. Only one medieval baronial stronghold was established in this area, that of the Capranica, who calmly built across the ancient Via Recta thereby forcing movement along this major surviving artery to detour through Piazza Capranica to get to the Via Lata/Corso.

Fig. 11: Pantheon from Falda 1665, Primo Libro.

In the late Middle Ages and Renaissance the urban texture intensified and encroached upon the space around the Pantheon, but still developed on the system of streets surviving from antiquity. The chapter house of the canons of S.M. ad Martyres, whose façade had been level with the front columns of the Pantheon's portico, was cut back to the drum in the mid-1660s under Alexander VII Chigi, as shown in the Falda print (fig. 11).[12] At the same time low market buildings were built on the north side of Della Porta's off-center fountain, in order to replace the stalls crowding the front of the Pantheon. These buildings were demolished in the 1820s.

Successive census maps of 1829 and 1866 illustrate the gradual demolition of the buildings attached to the Pantheon itself (fig. 12). Between 1881 and 1883 the last of these was demolished, and the 17th-century Palazzo Crescenzi/Bonelli was cut back so as to widen Via della Rotonda, as seen in the 1885 Spinetti map. By 1890 the tip of the building edging into the southeast corner of the piazza was demolished and rebuilt as the Albergo del Senato, with its façade realigned on Via della Minerva so as to give greater breathing space to the piazza. All these demolitions are summarized on the Nolli detail (fig. 13) where orange indicates the 19th-century *area di rispetto* cleared around the Pantheon.

Throughout this discussion we have been noting the survival of a significant number of ancient streets in the contemporary street net. This aspect is best summarized by superimposing the set of ancient streets discussed above over the Nolli map of 1748 (fig. 14). Most of this set of ancient streets can be seen to have survived to the present day. The ancient structures related to these streets have affected the alignment and shape of later buildings, as can be seen in the example of the church of S.M. sopra Minerva, whose axis is exactly perpendicular to the East Street axis. Even more striking is the coincidence of the eastern portico of the Saepta aligning with the edges of the two courts in the Dominican monastery block next to the same church.

But the ancient monument that seems to have anchored the pattern of urban regeneration from the Renaissance to the late 19th century is the Pantheon itself. It is still the focal point of modern Campo Marzio.

12 Falda 1665.

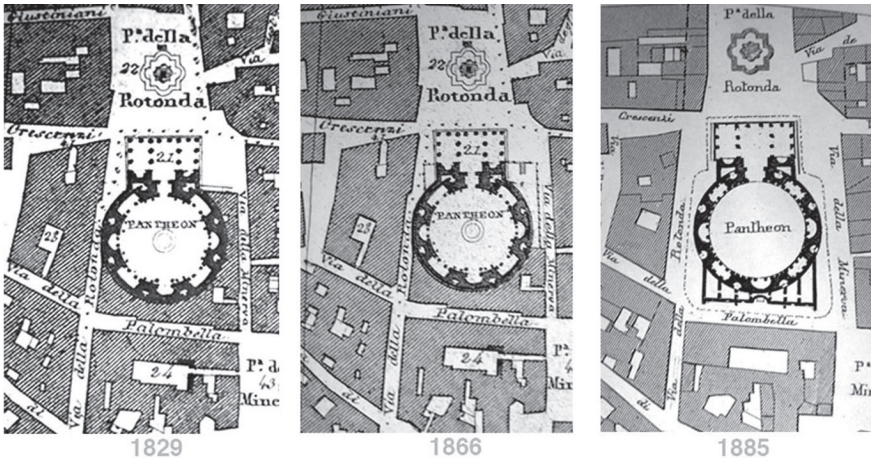


Fig. 12: Three 19th-century map details of the Pantheon area: 1829 and 1866 census maps and 1885 Spinetti map.

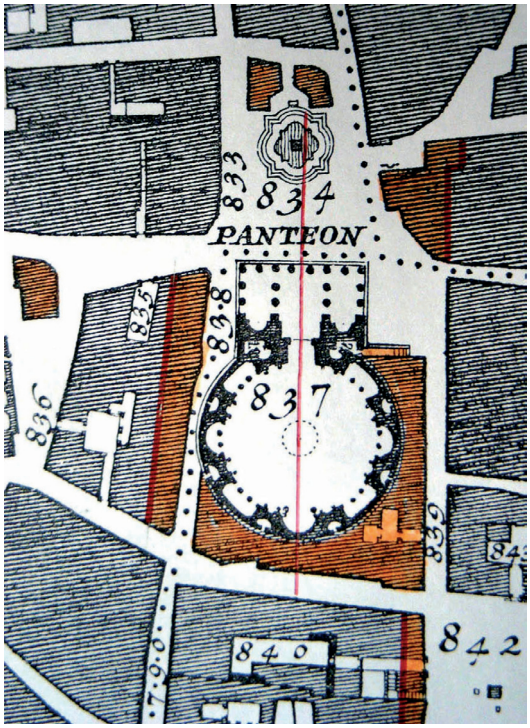


Fig. 13: 1748 Nolli map detail of Pantheon area showing 19th-century demolitions (in orange).

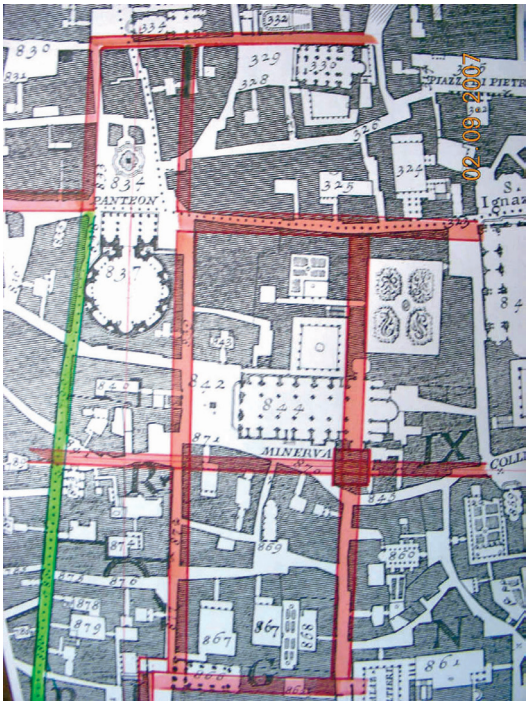


Fig. 14: Ancient streets and the Saepta Julia superimposed over a detail of the 1748 Nolli map.

Das Pantheon Hadrians?

Wolfram Martini

Das Referat von Lise Hetland mit der Datierung der Mehrzahl der Ziegelstempel des Pantheons in die Jahre 114 bis 116 erlaubt es nicht, meinen Beitrag in einer Zusammenfassung kommentarlos zu wiederholen. Vielmehr zwingen ihre prägnanten Aussagen zu einer Auseinandersetzung mit dieser wissenschaftlichen Erkenntnis, die weder vorschnell relativiert noch übergangen werden sollte, sondern als neue wissenschaftliche Erkenntnis mit den bisherigen Forschungsergebnissen — hier mit meinen Überlegungen zur Bedeutung des Pantheons[1] — in Beziehung gesetzt werden muss.

Zwar hat schon Heilmeyer 1975 — ebenfalls ausgehend von den trajanischen Ziegelstempeln — das erhaltene Pantheon in die Zeit Trajans datiert und Apollodorus als den Architekten der Rotunde benannt,[2] doch blieb die internationale Forschung seinen Argumenten gegenüber skeptisch und bevorzugte – auch angesichts des Zeugnisses der Historia Augusta — die traditionelle Zuweisung an Hadrian.[3] Vor allem aber vertraute man auf die Autorität von H. Bloch,[4] der bei seiner methodisch wegweisenden Analyse der Ziegelstempel zwar durchaus einige als trajanisch erkannt hatte, aber die Mehrzahl der Stempel als Grundlage für seine Datierung des Pantheons in hadrianische Zeit in Anspruch nahm.

Hetland hat in ihrem Beitrag ausgeführt, dass ihre Revision von Blochs Datierungen der Ziegelstempel jetzt jedoch gezeigt habe, dass von den lediglich 70 sicher datierbaren Ziegelstempeln 69 in die Jahre 114 bis 116 gehören und in der Rotunde im gesamten Wandbereich gewissermassen sukzessive verbaut worden sind,[5] während der eine hadrianische Ziegelstempel des Jahres 123 von dem Pronaos stamme. Da z.B. das 127 geweihte Serapeum in Ostia nur Ziegelstempel der Jahre 123, 124 und 125 aufweise und beim Pantheon die älteren Ziegel im unteren und die jüngeren im oberen Bereich verwendet worden seien, müsse in Analogie angenommen werden, dass die Rotunde 114 oder spätestens 115 begonnen worden sei und spätestens 117, als Hadrian die Regierung antrat, der Mauerring (mit Ziegeln von 116) annähernd seine endgültige Höhe erreicht habe.[6]

Das würde bedeuten, dass die Rotunde unter Trajan begonnen und weitgehend fertig gestellt worden ist und dass die Planung des Wiederaufbaus des 110 durch Blitzschlag beschädigten oder zerstörten Pantheons bereits unter Trajan

1 Martini 2006.

2 Heilmeyer 1975, bes. 327f.; Ziolokowski 1999.

3 Vgl. P. Kranz 1990, 126 Anm. 4; Gros 1996, 174f.; zuletzt Wilson Jones 2000, 202.

4 Bloch 1947, 98–113.

5 Anders Heilmeyer (1975, 328), der offenbar auch sonst zu anderen Daten gelangt ist (327 f.).

6 Nach Blochs Untersuchungen (Bloch 1959, 234–238) wurden am Serapeum im Mauerwerk mit Ziegeln von 126 bis zu drei Jahre alte Ziegel verwendet. Daraus könnte man durchaus schliessen, dass Ziegel gelagert wurden.

erfolgt ist. Dem scheint das antike Zeugnis der Historia Augusta zu widersprechen, nach dem Hadrian gleich nach Regierungsantritt (Aug. 117), d.h. frühestens nach seiner Rückkehr nach Rom im Juli 118 die Restaurierung des Pantheons und anderer umliegender Bauten vorgenommen hat.[7]

Wie können diese Widersprüche aufgelöst werden bzw. welche Konsequenzen ergeben sich für meine Gesamtdeutung des Bauwerks? Nach Hetlands Auswertung der Ziegelstempel wäre also eine Bauzeit von 114/115 bis 123/124 anzunehmen, deren Anfang in die letzten Jahre Trajans bis zu seinem Tod im August 117 in Kilikien und deren wesentliche Ausführung und Vollendung in die frühe Regierungszeit Hadrians fallen würde. Das würde neben der langen Bauzeit von zehn Jahren bedeuten, dass Trajan sich erst mit einer Verzögerung von 4 Jahren dem seit 110 ruinösen Ehrenbau für Augustus zugewandt hat, nachdem zuerst sein Forum und die zugehörigen Märkte (eingeweiht 112/113), seine Thermen (eingeweiht 109) errichtet waren, die Renovierung des Caesarforums (eingeweiht Mai 113) vorgenommen worden war und nachdem er gegen die Parther (Okt. 113) aufgebrochen war. Offenbar besass das Pantheon samt dem umliegenden augusteischen Gebäudekomplex (Thermen des Agrippa, Neptunsbasilika und Saepta Iulia) für Trajan keine Priorität im Gegensatz zu seinem Nachfolger Hadrian, der nach der Historia Augusta sofort diesen gesamten Bereich wiederherstellte.[8]

Da Wilson Jones festgestellt hat,[9] dass zwischen Rotunde und dem «Zwischenblock» mit seinen Treppenhäusern bis weit nach oben eine Baunaht verläuft, die bautechnisch sehr problematisch erscheint, zumal die Rotunde offenbar ein eigenes neues Fundament erhielt, während für den Pronaos das augusteische Fundament wiederverwendet wurde, dann aber ab dem oberen Bereich beide Bauteile verzahnt, d. h. offenbar gemeinsam weiter gebaut worden sind, könnte eine Planänderung vermutet werden. Die Verbauung der späten trajanischen Ziegel (116) in dem oberen Wandbereich würde daher einen entsprechenden Bauzustand zum Zeitpunkt des Todes von Trajan nahelegen, während der eine hadrianische Ziegelstempel von 123 am Pronaos diesen Bereich in Entsprechung zu den Untersuchungen von Wilson Jones als nachfolgende Baumassnahme kennzeichnen würde. Erst nach dieser mutmasslichen Planänderung und nach Abschluss der Rohbaumassnahmen an Rotunde und «Zwischenblock» wäre der Pronaos aus den gleichen Baumaterialien wie die den Platz begrenzenden Portiken angefügt worden. Demnach wäre der «Zwischenblock» als vom augusteischen Grundriss abweichende Baumassnahme erst unter Hadrian begonnen worden.[10]

Geplant war der Pronaos sicherlich von Anfang an, denn die genaue Orientierung der Rotunde an dem kreisrunden Temenos des augusteischen Vorgängerbaus dokumentiert, dass an dem bisherigen Grundriss festgehalten wurde. Die Ausgrabung von 1995–1997 durch Virgili[11] vor der Front des Pronaos und die daraus resultierende Bestätigung der Gra-

7 SHA Hadr. 19,9.

8 Für die These von Heilmeyer (Heilmeyer 1975, 330 mit Verweis u.a. auf Bloch 1947, 116?), dass der gesamte Baukomplex bereits in trajanischer Zeit begonnen sei, sehe ich keine tragfähigen Argumente. Vielmehr weist die allerdings spärliche Evidenz der Ziegelstempel auf eine hadrianische Renovierung (Bloch 1947, 103 Nr. 115, von 123).

9 Referat von M. Wilson Jones bei der Pantheon-Konferenz am 10. 11. 2006 (vgl. seinen Beitrag in diesem Band).

10 Vgl. auch die bei Wilson Jones 2000, 199–202 skizzierte Geschichte der formalästhetischen Kritik seit dem 15. Jh. an der «missglückten» Verbindung von Rotunde und Pronaos, die Wilson Jones (Wilson Jones 2000, 204–211) in einer für mich allerdings nicht überzeugenden Weise mit dem Mangel geeignet grosser Säulen erklärt hat. M. E. war diese «Missproportionierung» (ohnehin eine Bewertung aus späterer Perspektive!) in der Antike aufgrund der Platzanlage nicht sichtbar (Martini 2006, 22–24); sie könnte aber auch auf die von mir vermutete Planänderung zurück gehen.

11 Virgili 1999.

Abb. 1: Entwurf: W. Martini; Ausführung: K. Wolter

bungsbefunde von Beltrami[12] haben gezeigt,[13] dass die Orientierung des Pantheons nach Norden und vor allem die Verbindung eines kreisrunden Elements mit einem nördlich vorgelagerten rechteckigen Bauteil bereits in augusteischer Zeit erfolgt war. Die exakte Einpassung der Rotunde in die Einfassungsmauer des augusteischen Temenos lässt vermuten, dass auch die Wiederherstellung der im Fundament erhaltenen zehnsäuligen Nordfront des rechteckigen «Propylons» vorgesehen war. Die immer wieder gerühmte Verbindung von Pronaos in griechischer Bautradition und Rundbau in römischer Bautradition durch Trajan oder Hadrian relativiert sich daher beträchtlich. Neu war allerdings die Rotunde, die als monumentaler Kuppelsaal nach den Ziegelstempeln bereits unter Trajan geplant worden sein müsste und als konsequente zeitgemässe bauliche Umsetzung des vorgegebenen Grundrisses z.B. nach dem Vorbild der runden Exedra in den Trajansthermen zu verstehen wäre.[14] Somit bedürfte der überkuppelte Zentralraum als solcher auch keiner besonderen bedeutungshaltigen Begründung.
Ob in dem noch baulich unstrukturierten Areal nördlich der Rotunde bereits unter Trajan eine Platzanlage vorgesehen war, kann nicht beantwortet werden. Die Ausführung aber dürfte wie die des Pronaos und Zwischenblocks schon aus logistischen Gründen erst unter Hadrian erfolgt sein. Da aber der Vorplatz aufgrund der Saepta Julia in seiner verfügbaren Breite eingeschränkt war und die Breite des augusteischen «Pronaos» unproportional gross gewesen wäre, halte ich es im Rahmen dieser Hypothese für wahrscheinlich, dass auch die Planänderung am Pronaos, die Verkürzung der zehnsäuligen Nordfront auf die acht ausgeführten Säulen bei gleichbleibender Achsweite, die auch die Breite des «Zwischenblocks» bestimmte, erst unter Hadrian vorgenommen worden wäre. Denn angesichts der Einzigartigkeit einer zehnsäuligen Zugangsfront eines sakralen Bauwerks in Rom, die vorher nur vielleicht den monumen-

12 Beltrami 1898.
13 Anders Ziolkowski 1999, 54–61.
14 Z. B. Heilmeyer.

talen augusteischen Quirinustempel[15] als Heiligtum des Gründers von Rom hervorhob und dann erst wieder unter Hadrian als bewusstes Zitat am Venus Roma Tempel[16] verwirklicht worden ist, war dies ein schwerer, die auctoritas des Augusteums mindernder Eingriff, der eines gewichtigen Grundes bedurfte. Dieser lag neben dem Bedürfnis nach formal-ästhetischer Wahrung der Proportionen des Platzgefüges m. E. vor allem in der von Hadrian beabsichtigten Angleichung an das Augustusforum mit dem damit verknüpften Bedeutungsgehalt;[17] für diese Angleichung war es ja auch erforderlich, durch die Einfügung des «Zwischenblocks» die Kuppel zu verdecken (Abb. 1). Jedenfalls kennzeichnen die exakte Einpassung des Pronaos mit seinen seitlichen Brunnenbecken bis an die Stufen der Portiken und ihre Ausführung aus den jeweils gleichen Materialien für die Treppen, die Säulen und das Gebälk die gesamte Platzanlage einschliesslich der Front des Pronaos als eine einheitliche Baumassnahme (Abb. 2).

Auch wenn Hadrian den trajanischen Rohbau der Rotunde nur weitergeführt hätte, aber als eigene Massnahmen die gewaltige Platzanlage dem abgewandelten Pronaos mit der an Agrippa erinnernden Bauinschrift vorlegte, die Ausstattung des gesamten Pantheum aussen unter dem Leitgedanken von pax et pietas und innen als Abbild des machtvollen römischen Kosmos ausführen liess und zusätzlich den umgebenden augusteischen Freizeit- und Geschäftskomplex erneuerte, wäre er als Erneuerer des augusteischen Zeitalter im Sinne seiner Friedensprogrammatik und als erster von Juppiter eingesetzter Kaiser zum prägenden Bauherren des Pantheons geworden, als der er in der Historia Augusta in Erinnerung geblieben ist. Das architektonische Verdienst des monumentalen Kuppelsaals als baulich zeitgemässe Überbauung des vorgegebenen Grundrisses und als einzige herausragende konstruktive Leistung am Pantheum wäre jedoch Trajan — und das bedeutet dann vermutlich seinem Architekten Apollodorus — zuzuerkennen, wie das bereits Heilmeyer 1975 vorgeschlagen hatte.

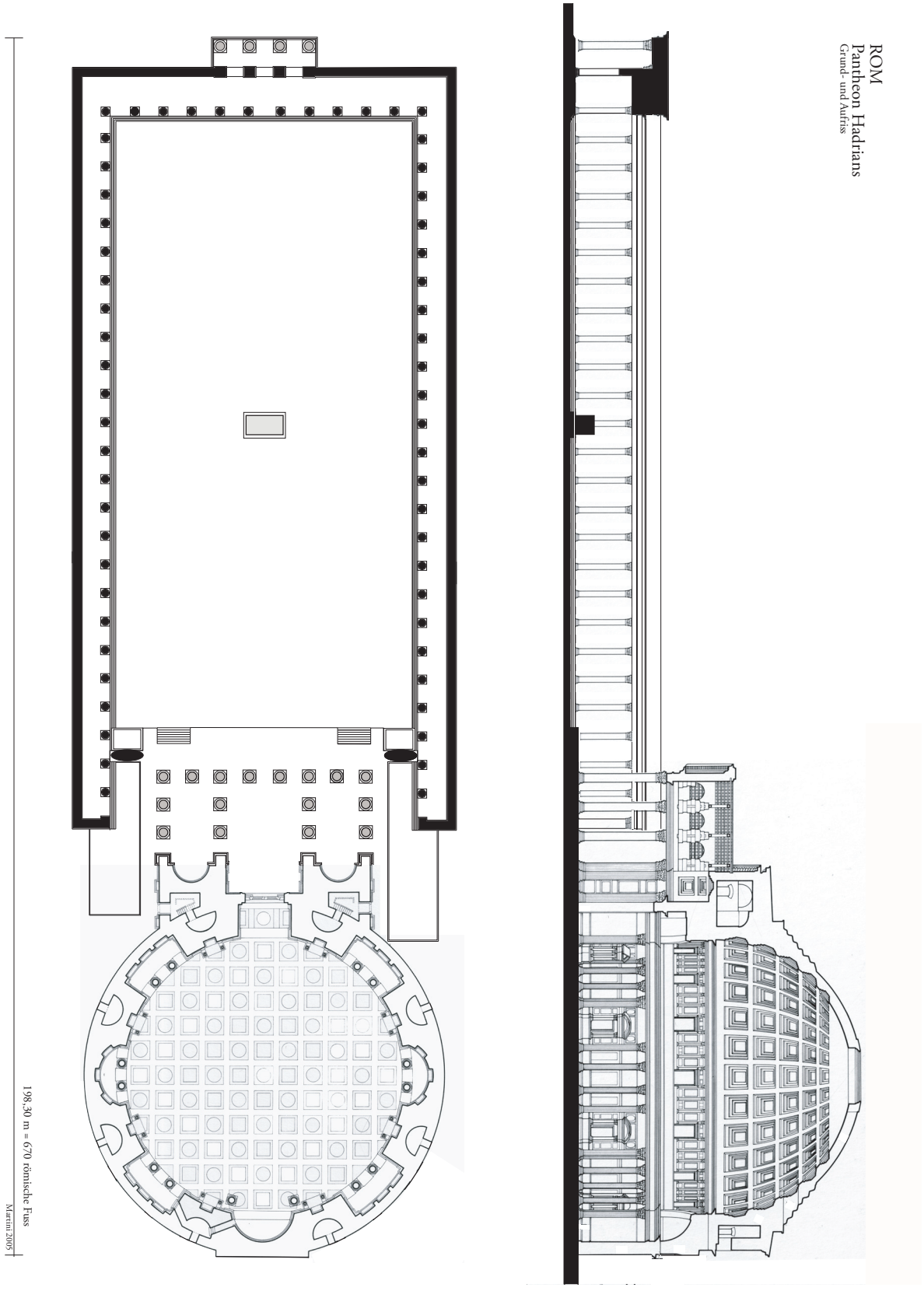
Das wäre m.E. eine plausible Hypothese, um die spättrajanische Datierung durch Hetland mit dem Zeugnis der Historia Augusta und auch meiner Deutung weitgehend in Einklang zu bringen.

Doch die Datierungsproblematik der Ziegelstempel ist sehr viel komplexer, wie Bloch mehrfach betont hat.[18] Hetland hat sich in ihrem Beitrag — soweit ich das beurteilen kann, ohne ihre gesamte Arbeit zu kennen — auf die unmittelbar aus den Ziegelstempeln hervorgehenden Datierungen konzentriert und wie bereits Heilmeyer das Serapeum in Ostia als Zeugnis für die sofortige Verbauung der Ziegel genannt. Doch die Ziegel der Jahre 114 bis 117 wurden nicht nur in Bauten trajanischer Zeit in Ostia und Porto[19] verbaut, sondern auch in der Villa Hadrians bei Tivoli in den Bauten der 1. Bauphase zusammen mit Ziegeln von 123, wie detailliert bei Bloch[20] dargelegt ist. Auch wenn seine Erklärung dafür[21] sehr hypothetisch ist, bleibt das Phänomen als solches bestehen, dass in der Villa Hadrians bei Tivoli Ziegel spättrajanischer Zeit noch in frühhadrianischer Zeit verbaut worden sind. Warum soll das Gleiche nicht auch für das Pantheon gelten? Vielleicht wurden Ziegel doch auf Vorrat gebrannt, wie das Serapeum in Ostia nahelegt?

Solange jedenfalls die Datierung anhand von Ziegelstempeln in der Zeit der Kaiser Trajan und Hadrian nicht als Ganzes neu bearbeitet wird und zu grundlegenden neuen methodischen Erkenntnissen führt, sehe ich keinen Anlass, von der üblichen Datierung des Pantheons in den Zeitraum von ca. 118 bis 125 abzugehen.

Abb. 2: Rom, Pantheon Hadrians, Grund- und Aufriss — nächste Seite.

15 Gros 1976, 115–18.
16 Gros 1999, 179–81; Cassatella/Panella 1990.
17 Martini 2006, 26–29.
18 S. a. Bloch 1959, bes. 234–238.
19 Bloch 1947, 84–98.
20 Bloch 1947, 113–165; bes. 115–123; Bloch 1959, 236.
21 Bloch 1947,184–188.



ROM
Pantheon Hadrians
Grund- und Aufriss

198.30 m = 670 römische Fuss

Martini 2005

The Pantheon after Antiquity

Tod A. Marder

So much has been published about the Pantheon in the early modern and modern periods that it would seem redundant to dedicate a presentation to that subject. Yet it turns out that a good deal of research in this post-antique phase of the monument goes largely unnoticed even among the experts. Meanwhile the field is expanding so quickly that it would seem sensible to take stock of the current state of research, which might prove useful for those studying the fabric of the Pantheon and its history.

Perhaps the least understood period in the life of the Pantheon lies between late antiquity and the conversion of the building to Christian purposes. We know from the *Liber Pontificalis* that Pope Boniface IV asked the Byzantine Emperor Phocas in Constantinople to cede the «temple» to the Church in the early seventh century. Phocas ruled from 602 to 610 and Boniface IV from 608 to 615. The date usually cited for the donation is 609, but a recent analysis of the evidence suggests that the event took place on May 13, 613, after the death of Phocas.[1] If the hypothesis proves true, we probably should not look to the politics of the Byzantine emperor for an explanation of the historic transfer but rather to the context of the Byzantine-dominated papacy in Rome.

The story that Boniface brought 28 cartloads of unnamed bones here from the catacombs is probably a legend, as it has little to do with contemporary customs.[2] Only in the mid-seventh century is it called *Sanctae Mariae* ad martyres; and in the latter half of the eighth century it is referred to as Sanctae Mariae Rotundae. At the turn of the seventh/eighth centuries the Venerable Bede likened the dedication of the Pantheon of all the ancient gods to all the martyrs of the Church, although he had no firmer basis than tradition for doing so.

It has recently been proposed that the dedication of the Pantheon to Mary came from the Eastern Empire.[3] Although Rome already had Marian churches — Santa Maria Maggiore, Santa Maria in Trastevere, and Santa Maria Antiqua — none is a centralized plan, whereas there are numerous examples of centralized *memoriae* dedicated to the Virgin Mary in the eastern part of the Christian world from the fifth century on. Such buildings may have provided a link in the chain that (especially in the Renaissance) strongly associates Marian churches in the west with the centralized plan.

The twelfth-century *Mirabilia Urbis Romae* stated that the dedication to Mary supplanted an original dedication to Cybele, the mother of all the pagan gods. The English pilgrim John Capgrave repeated the story in the early 1450s, recounting how the ancient general Agrippa had seen a vision of Cybele and vowed a church

1 Blaauw 1994.

2 Krautheimer 1980.

3 Schwarz 1990.

Fig. 1: Late 19th-century photograph of the exterior with the baroque towers.

Fig. 2: Drawing and annotations by Antonio da Sangallo the Younger, c. 1535 (Florence, Galleria degli Uffizi, Gabinetto Disegni e Stampe, Uff. 874A recto).

to her and all the gods if his campaign against the Persians was successful.[4] In fact, the Marian icon on the high altar of the Pantheon was enshrined under a canopy or *ciborium* of silver covered by a purple canopy at the end of the seventh century (684–685), and was restored several times through the late fifteenth century, when a choir screen described as a pergola was added to it on the orders of Innocent VIII in the 1490s.[5]

Christian veneration in the building did not guarantee its survival. As is well known, the Byzantine emperor Constans II (641–668) despoiled the dome of its gilded bronze plates, and they were lost en route to Constantinople. In the eighth century the dome was covered by lead sheets, and these were frequently restored and replaced into the early modern period.[6] In the twelfth century, a bell tower was constructed on the axis above the temple front and, in turn, the tower was replaced under Urban VIII by the twin campanili of Maderno and Borromini, and not Bernini (fig. 1).[7]

At some unspecified moment in the medieval era, access to the portico was restricted to three main doors and side entrances. Their locations, corresponding to sixteenth-century engravings, are evident from the corresponding notches for lintels still visible in the porch columns.[8] The date of the doors is uncertain, but they may date back to the time of Phocas and Boniface IV.

Papal control over the Pantheon began when the monument was rededicated to Christian worship, and papal stewardship continued well into the nineteenth century even after the fabric was put under the control of a chapter and its canons. Renaissance architects and antiquarians have left us many studies of the fabric, and these can be separated into two groups: those that attempt to record the monument as it stood and those that try to «improve» aspects of the composition that were considered inappropriate.

Among those who sought to record the Pantheon as it stood were Raphael and Palladio. Those who attempted to critique the composition and improve it in their drawings included Francesco di Giorgio Martini and Antonio da Sangallo the Younger. Francesco di Giorgio increased the height of the interior by adding a completely new attic register, he changed the number and rhythm of the pilasters in the attic, and he rearranged the coffering of the dome. He realigned vertical elements and altered the one-to-one propor-

4 Capgrave 1995.
5 Muñoz 1912.
6 Cerasoli 1909, p. 288.
7 Hibbard 1971.
8 Schwarz 1990.

tions of the interior height to width to become 3 : 4.6, a ratio preferred in the rest of his theoretical writing.[9]

The drawings and commentary of Sangallo the Younger of c. 1535 are even more extensive (fig. 2). Sangallo famously «corrected» the lack of vertical congruity between the main order, the orders of the attic, and the ribs of the dome in the original composition — a lack of alignment he called «a most pernicious thing.» He also changed the position of the columns of the porch and increased their number because of a supposed «erroneous» relationship to the niches; he connected the porch and rotunda with an unbroken row of pilasters and surrounded the temple with columns. The result has been characterized as simultaneously pedantic and megalomaniacal and, in the end, a «caricature» of the original.[10]

Although the hazards of using Renaissance prints and drawings for evidence of the earlier fabric are obvious, these studies can reveal inconsistencies in the design that deserve further study. Arnold Nesselrath has called attention to the features under the aediculae of the main piers, which are sometimes represented as solid socles and sometimes as separate pedestals. Whether these alterations were original to the pre-Renaissance building or took place later remains unclear.[11] More certain is the design of the original trusses of the portico shown in an anonymous French drawing of the second half of the sixteenth century before being stripped of their bronze sheathing.

With regard to the composition of the interior elevation and the connection of the portico and the rotunda, Michelangelo maintained that the rotunda had been built up to the large cornice by one architect, while another was responsible for the attic with its windows and dome. He thought that a third ancient architect had added the portico. Lack of vertical alignments and abrupt transitions of parts seem not

Fig. 3: Remodelled part of the attic, reconstructing the lost antique scheme.

to have dulled Michelangelo's enthusiasm. He thought the windows of the attic «most graceful»; the portico was a «cosa rarissima»; and from the pavement to the *cornicione* the Pantheon was a «disegno angelico, e non umano.» As I have tried to demonstrate, Bernini concurred with this judgment even with regard to the composition of the attic story, whose little pilasters conformed neither to the order below them nor to the ribs of the dome above them (fig. 3).[12]

According to an eighteenth-century source, Bernini's chief architectural patron, Pope Alexander VII (1655–1667), asked the master on three separate occasions (probably c. 1662) to modify the attic of the building. Each time Bernini refused, saying that he would do no more than repaint the *pilastrini* of the attic, assuming stone replacements were too expensive. His reasoning deciphered the code of a composition that even Michelangelo failed to note. For Bernini recognized that the relative dimensions and rhythms of the little pilasters in the attic corresponded to the arrangement of the main vertical members springing from the pavement.

That this is not exactly correct, as demonstrated in a drawing by Thomas Howe, does not negate the principle that Bernini observed.[13]

9 Buddensieg 1965; Buddensieg 1976.
10 Nesselrath 2009.
11 Nesselrath 2005 and Nesselrath 2009.
12 Marder 1989.
13 Vitruvius 1999, p. 147.

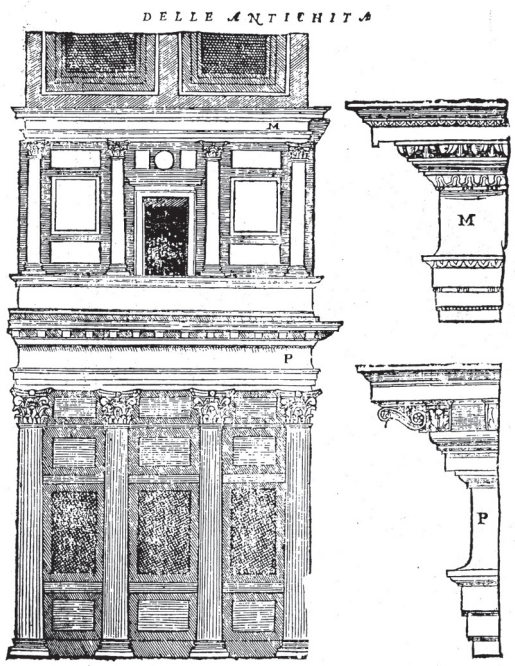


Fig. 4: Woodcut by Sebastiano Serlio (1537) showing a presumably ‹corrected› version of the antique scheme of the attic.

Indeed what he recognized was a contrapuntal rhythmic sequence as an organizing composition element that took precedence over simple vertical alignments. Bernini himself called this the «eurhythmy and symmetry» of the building. Although he may have used these Vitruvian terms imprecisely, Bernini established the possibility of reading a composition of horizontal rhythms in opposition to the strict code of vertical alignments embraced in the Renaissance. This clever reading of the ancient building insured its integrity against alteration or ruin, at least momentarily (fig. 4).

The mid-eighteenth-century story of Bernini's aperçu was in fact occasioned by an aesthetic debate in which Bernini's position came to be defeated, and Benedict XIII hired Paolo Posi to remodel the attic. As Susanna Pasquali has shown, this momentous change did not occur in 1747, as often cited, but rather 1756.[14] The context was a pitched battle between avant-garde Neoclassicists who wished to improve

14 Pasquali 1996, pp. 68–120.

Fig. 5: View of the interior before the attic was partly reconstructed in the 1930s.

monuments and the Old Guard Baroque whose proponents sought to preserve respect for the historical past. The circumstances of the new date are therefore as important to the history of taste as to the history of the Pantheon.

In 1753, stone began to fall from the upper reaches of the building. Work was placed in the hands of a papal administrator named Antonio Baldani, a noted antiquarian much admired by Winckelmann. Baldani was convinced that the attic decoration could not have been antique and must have been added when the Pantheon was consecrated as a Christian sanctuary in the seventh century, for it simply did not follow classical (Renaissance!) rules of composition. By contrast Giovanni Gaetano Bottari maintained that the building had been rededicated to Christianity «without moving a stone.»

As the battle lines were drawn, two architects from St Peter's were considered for the task of the consolidation, Luigi Vanvitelli and Paolo Posi. In the event Posi was selected, and it was he who invented the famously dull combination of square fields and pedimented niches still visible today. The radical revisionists had taken command, and the rotunda lost its rhythm (fig. 5).

In 1756 Francesco Algarotti decried how «they have dared to ruin that magnificently august fabric of the Pantheon, which alone among the works of antiquity remained complete …

What would (those) who worked so hard to measure the members of that classical building have to say? [He is no doubt thinking of Desgodetz 1682, and Fontana 1694: author.] What will Panini say, who so many times copied it in its ancient form?» In 1757 Vanvitelli claimed the composition still lacked meaningful correspondence with the vertical axes of the main body and the dome, and he maintained that the pediments imparted the air of a palace to the building rather than a church. The born-again palladian Antonio Visentini called the remodeling of the attic a disaster that should never have occurred.

Even the biographer Francesco Milizia characterized Posi as one of those afflicted by «the new fashion of thumbing one's nose at antiquity.» Carlo Fea termed the new attic «an unpardonable barbarism» and Posi a «nefarious, reckless, and arrogant architect.» Nor did time heal the ill-will. In 1895 Giovanni Eroli called the restoration «bestial.» In 1932 Alberto Terenzio called it «deplorable» and, under Mussolini's patronage, Terenzio reconstructed a small section of the attic as a reminder of the ancient fabric, positioned so that one will see it immediately upon entering (fig. 3).[15]

In these discussions it is striking how little interest there was in the dome, despite the enthusiasm of earlier visitors. To Ammianus Marcellinus, it seemed «like a rounded city-district, vaulted over in lofty beauty,» thus apparently reading the interior decoration as an exterior. In the mid-fifteenth century John Capgrave thought the dome must have been constructed over a mound of earth embedded with coins to insure its removal by the populace. (The scheme was resurrected during Brunelleschi's planning of the dome of Florence Cathedral, according to Vasari.)[16] In 1591 Giacomo della Porta was associated with a plan to glaze the *oculus* to prevent the infiltration of water.[17] Then, from Bernini's studio a drawing represents an unexecuted project to glaze the *oculus* «à squamme di pesce» (in the manner of fish scales)[18] (fig. 6).

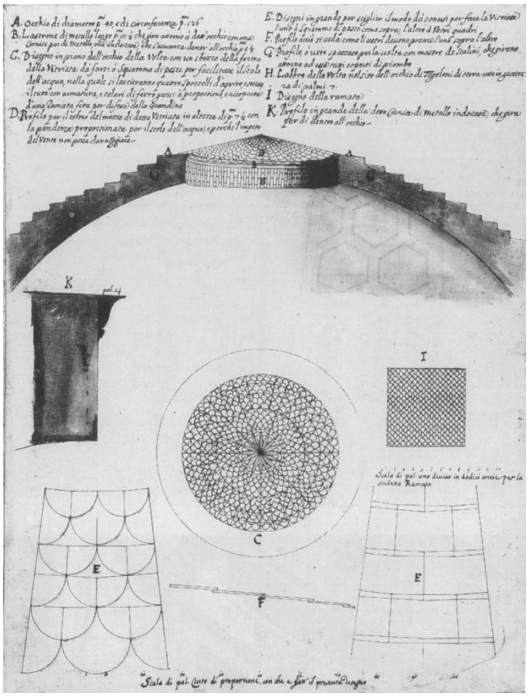


Fig. 6: Glazing of the *oculus* from the reconstruction project under Pope Alexander VII.

The dome was an enduring feature of the Pantheon's sepulchral imagery which began with the legendary reburial of the unnamed martyrs. Raphael depended on this association in specifying his own resting place here, and many artists of subsequent eras followed the precedent (see Pasquali 1996). Bernini's patron Alexander VII aspired to embellish the dome with an inscription around the *oculus* and his coat-of-arms in the coffers in a project often attributed to Carlo Fontana (figs. 7–8). Some of these garnishments were actually executed, as we know from payments for their removal during the subsequent pontificate of Clement IX (1667–1669).[19]

This funereal tradition was capped by the burial in the Pantheon of Victor Emmanuel II

15 ibid.
16 Nesselrath 2005, p. 191.
17 Donnelly 1986.
18 Marder 1989.
19 ibid.

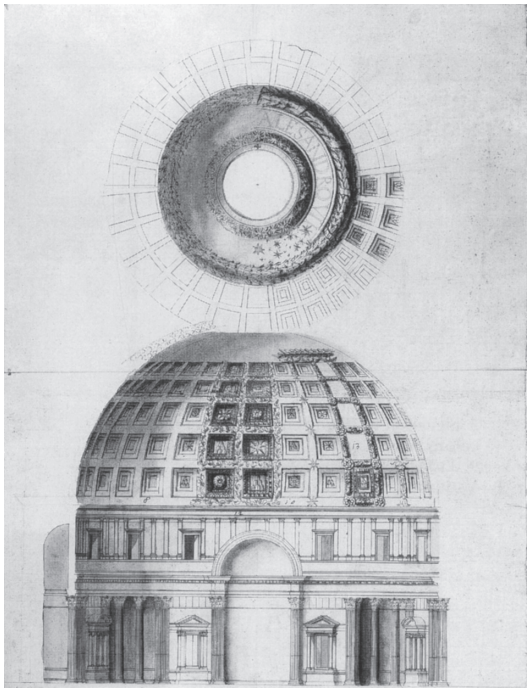


Fig. 7: Project of Pope Alexander VII, details: commemorative inscription around the *oculus* and placement of the pope's coat-of-arms in the dome's coffers.

(died 1878), the first king of united Italy. The tomb was located in the western niche of the building in 1884, on orders from his son and successor Umberto I, whose tomb was itself arranged in the eastern niche of the Pantheon in 1904–1911. Under the Lateran Accords of 1929, the Pantheon became the Palatine basilica of the Savoy family, enhancing the image of a dynastic monument, which we can trace from the days of Augustus.[20]

Meanwhile the building was continually restored to its ancient state.

In 1882–1883 the twin *campanili* were removed and the buildings abutting the rotunda were demolished. Pietro Camporini had projected a «Foro Vittorio Emanuele» in 1882, thus to anticipate and then to complement the king's resting place (fig. 9). The inspiration for the design was a project to regularize the Piazza della Rotonda under Alexander VII (fig. 10). By 1892 Chedanne had begun to reveal brick

20 Williams, 2008.

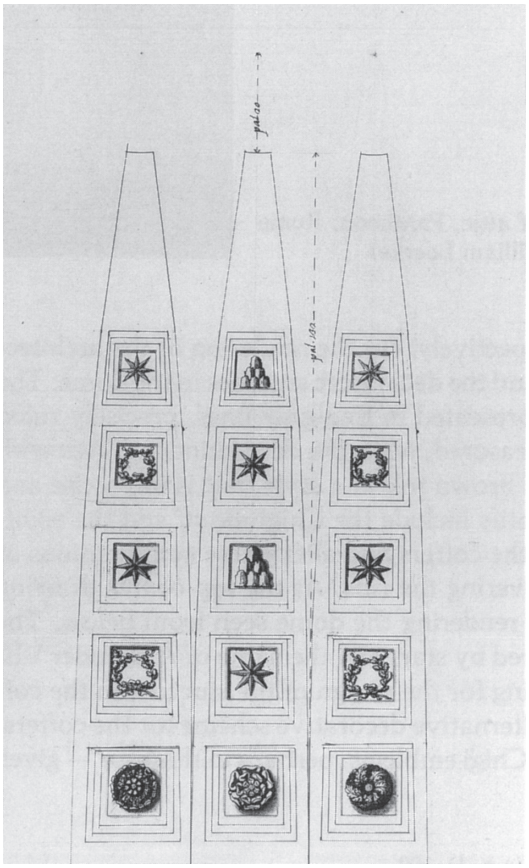


Fig. 8: Project of Pope Alexander VII, details: arrangement of the new decoration for the dome, showing the papal monti and the Chigi star.

stamps he associated with Hadrian's reign exactly when, paradoxically, the restoration of the bronze inscription to Agrippa was undertaken. Luca Beltrami, aided by Pier Olinto Armanini, immediately began new excavations, but the results were problematic.[21]

In the Fascist era the exterior brickwork was repaired (fig. 11) and repointed, the revetments of the interior were consolidated, the high altar (refashioned beginning in 1715 by Alessandro Specchi) was replaced by a sleek and spare modernist counterpart (fig. 12), and a small section of the original attic was reconstructed (fig. 3). These works were overseen by the architect Alberto Terenzio.[22]

21 Williams 2009; Racheli 2000, 354–357.

22 Marder 1980.

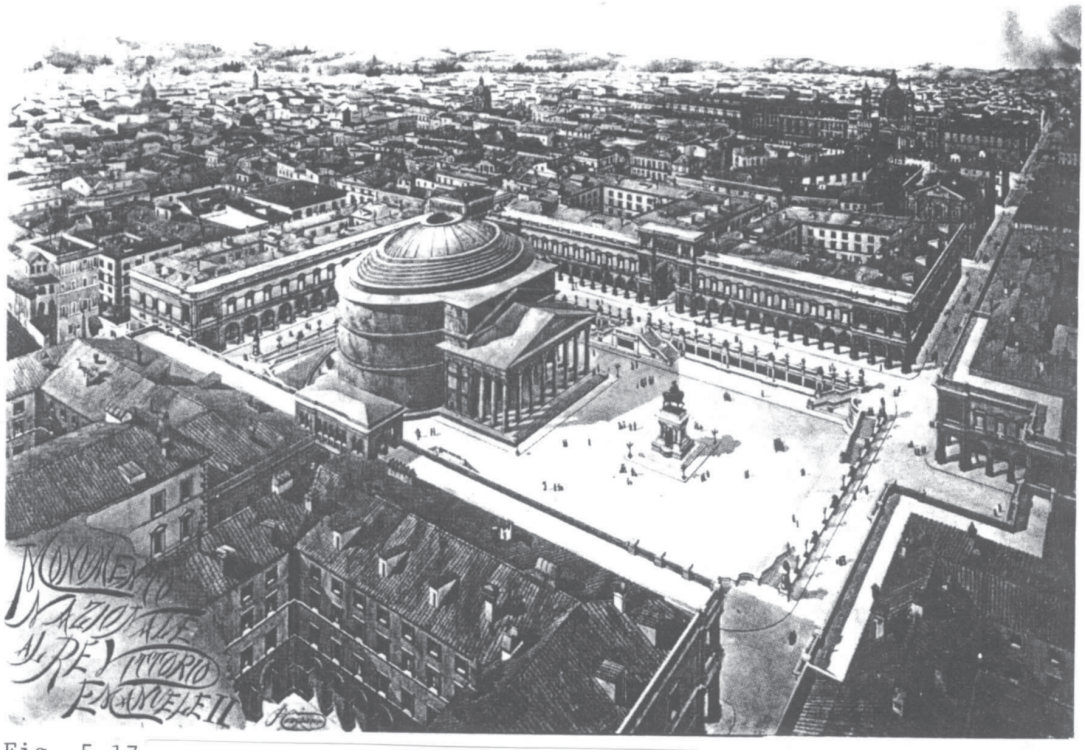


Fig. 9: Camporini's project for the remodeling of the Pantheon's surroundings as a «Foro Vittorio Emanuele».

For a time Mussolini or his agents hoped to capitalize on the reputation of the ancient building. Armando Brassini designed a «Foro Mussolini» (fig. 13), borrowing heavily from the Napoleonic schemes of De Tournon (fig. 14), the Camporini scheme for the Victor Emmanuel project, and the successive Master Plans from 1873. Brassini's vision included a commemorative statue and a sunken *platea* to be surrounded by famous ancient statues borrowed from Rome's best museums. Only the intervention of the architect and historian Gustavo Giovannoni prevented this development. An advocate of historic layering and «armonia ambientale», Giovannoni prevailed in support of preservation and conservation policies that would respect the rich heritage of monuments and local neighborhoods.[23]

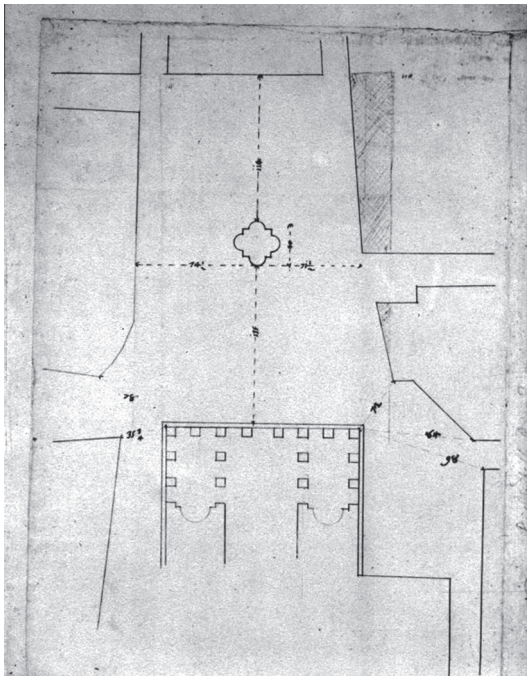


Fig. 10: Project of Pope Alexander VII: remodeling of the Piazza della Rotonda.

23 Racheli 2000.

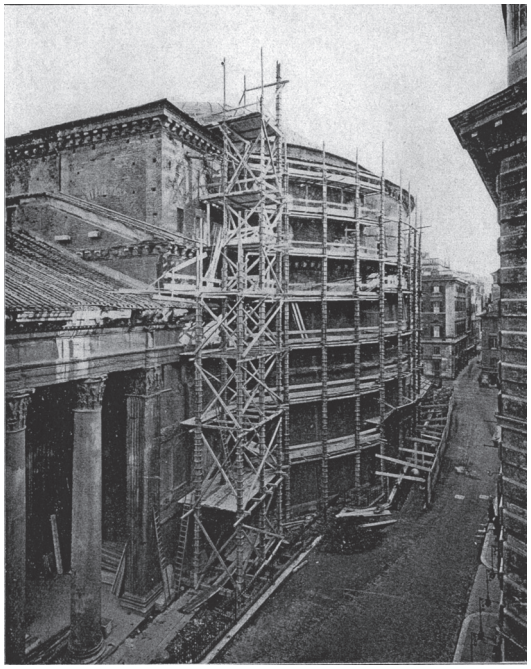


Fig. 11: Restoration work on the exterior during the 1930s.

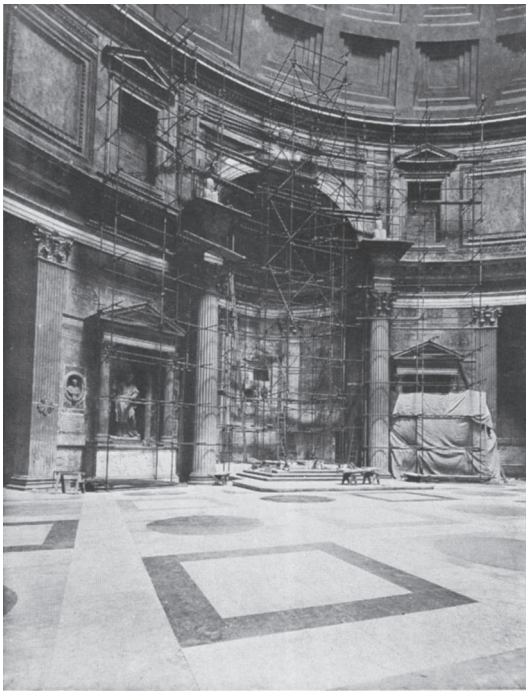


Fig. 12: Restoration of the altar niche during the 1930s (showing a section of the yet unchanged part of the attic on the right).

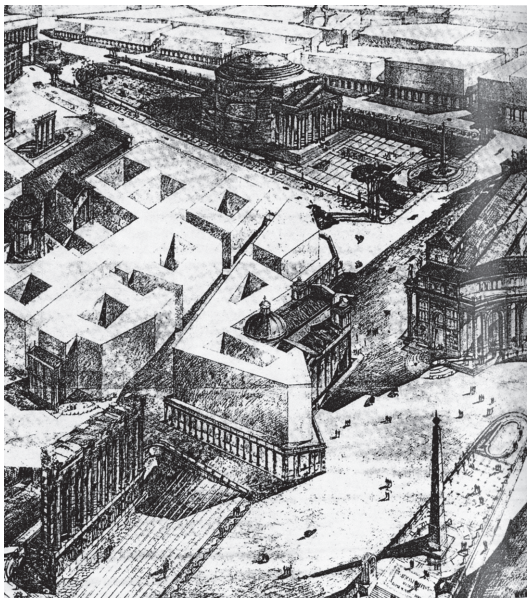


Fig. 13: Brassini's project for the «Foro Mussolini».

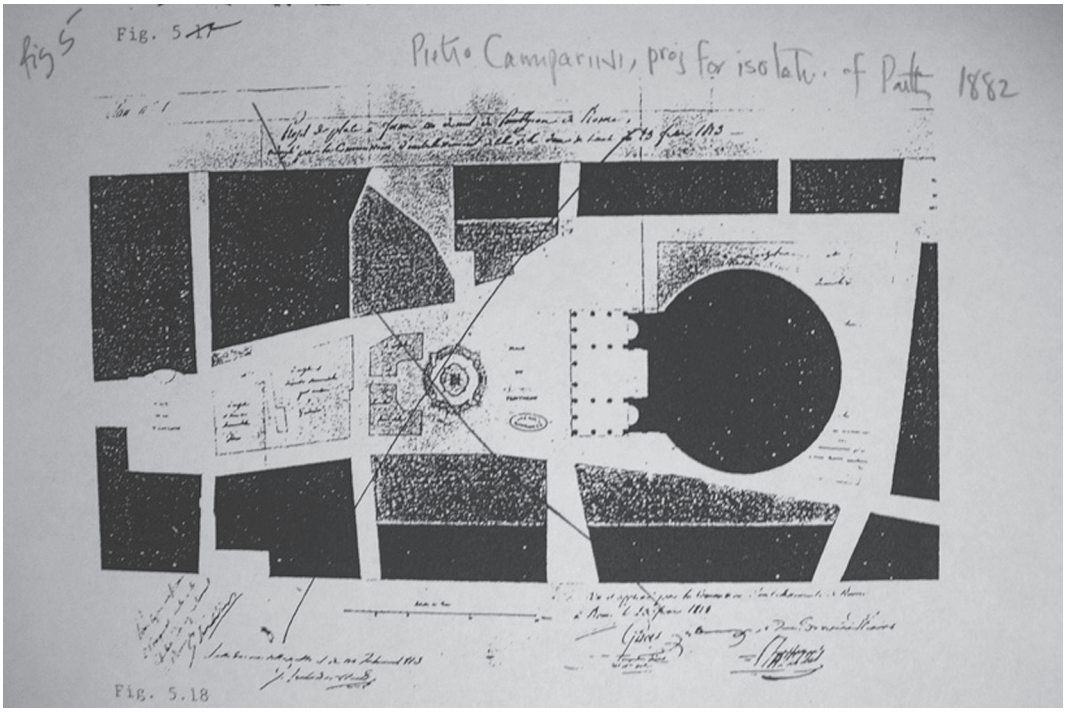


Fig. 14: De Tournon's plans to remodel the Piazza della Rotonda.

Pope Urban VIII and the Pantheon Portico (abstract)

Louise Rice

In 1625, Pope Urban VIII ordered the removal of the ancient bronze roof truss from the Pantheon portico. He took the metal to make guns to arm the ramparts of Castel Sant'Angelo. But his decision to denude one of Rome's best-preserved and most admired antiquities for the purpose of strengthening his arsenal caused a public-relations furor and the pope, facing angry criticism, found himself having to justify the appropriation. The strategy he adopted for appeasing his critics was twofold. First, he redefined his reason for taking the truss. He declared that a portion of the bronze was to be set aside for Bernini's colossal *baldacchino*, then under construction over the high altar of St Peter's basilica; recognizing that few would dare oppose so holy a project, he even allowed the impression to be given that the bulk of the metal was to be used for this purpose. This sudden shift — this reframing of his spoliation as an act of sacred conversion — was more rhetorical than real. Documents in the Fabbrica di San Pietro show: a) that the amount of Pantheon bronze assigned to Bernini was less than 2% of the total weight of the truss (the other 98.2% was immediately melted down for guns); and b) that Bernini, who had all the raw materials he needed to make the *baldacchino*, used none of the relatively small quantity of Pantheon bronze assigned to him and in fact returned it untouched to the Reverenda Camera Apostolica (this portion, too, was then melted down for guns). The commonly held belief that the *baldacchino* is made in part of Pantheon bronze is thus unfounded. The pope or his propagandists invented the story to deflect attention from his unpopular decision to strip the Pantheon bronze for cannon; their mythologized version of events, recorded in a pair of marble tablets installed on either side of the temple door in 1632, has proven remarkably enduring but is contradicted by the facts.

In a further effort to counter public outrage over the spoliation, the pope affirmed his respect for the ancient building by undertaking a major restoration of the very portico he had stripped. Whereas at first he planned only to replace the bronze truss with a wooden one and to rebuild the roof, he soon opted for a more ambitious scheme. He substituted one of the fallen columns at the east end of the portico, provided it with a splendid marble capital featuring a Barberini bee, and built the twin *campanili* over the intermediate block. His final project for the Pantheon portico was never realized. He had in mind to cover the interior with ceilings or vaults, which would have hidden the wooden replacement truss from view and given a statelier, more polished appearance to the space. Architects and antiquarians alike offered their suggestions as to how this might best be accomplished. Some argued that the portico's three aisles should be covered with masonry barrel vaults, imitating the magnificent coffered barrel vault over the door alcove.

Others favored suspended vault-shaped ceilings made of stucco and lathe or wood, copper, or bronze panels attached to some sort of wooden or metal framework. Still others considered flat ceilings the best and safest option. Logistical problems having to do, on the one hand, with the awkwardness of the superstructure's geometry (a consequence of the substitution of 40-foot [12.2 meter] columns for the 50-foot [15.2 meter] columns that were almost certainly originally planned for the portico) and, on the other hand, with the difficulty of constructing a wooden truss on the same design as the original bronze one, meant that, in the end, none of these options was viable and the project had to be abandoned. Nevertheless, the debate between those who favored ceilings and those who argued instead for the construction of vaults introduces a variety of practical and aesthetic considerations that can be extremely useful to us as we try to come to grips with this problematic aspect of the Pantheon's design.[1]

1 The material covered in this summary is treated in a couple of articles by the author, the first dealing primarily with Urban VIII's appropriation of the Pantheon bronze and the mythology surrounding that event (Rice 2008 a), and the second with Urban VIII's restoration of the portico and the design of its superstructure (Rice 2008 b).

L'attico del Pantheon. Nuovi documenti sui marmi e sulla controversa ricostruzione del 1757

Susanna Pasquali

Fig. 1: Scuola di Carlo Fontana, Interno del Pantheon, proiezione in piano di un quarto della superficie (BAV, Chigi P.VIII.9, c. 110, disegno acquerellato).

Lo stato di fatto

Il Pantheon fu convertito in chiesa nell'anno 608, grazie alla concessione che di questo edificio fece l'imperatore Foca al papa Bonifacio IV. Questa precoce trasformazione del tempio in un edificio di culto, rimasto da allora in poi pressoché sempre in uso, garantì nel tempo la sopravvivenza di gran parte della decorazione interna della grande rotonda. Protetto per secoli dalla continua spoliazione che colpì ogni altro edificio pagano, il Pantheon — in special modo per il suo interno — doveva perciò diventare uno dei pochi edifici integralmente conservati dell'intera architettura romana antica. Più difficile però è andare oltre questa constatazione generale se ci si chiede, più precisamente, quanti dei marmi del Pantheon di Adriano erano ancora al loro posto nel 608, o in alcuno dei tempi successivi della storia, altrettanto lunga e complessa, della sopravvenuta chiesa di Santa Maria ad Martyres.

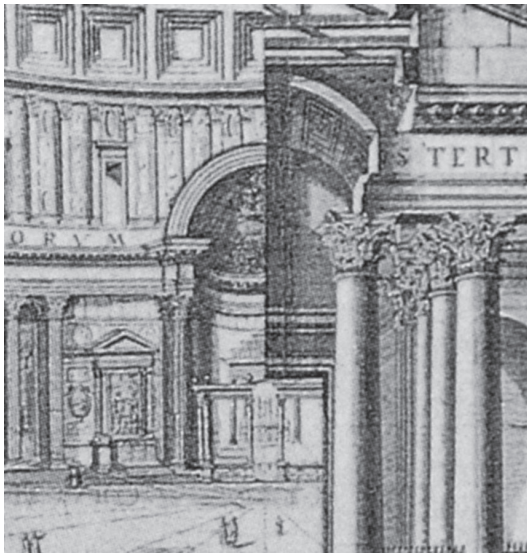


Fig. 2: Giuseppe Tiburzio Vergelli, *Prospetto interno ed esterno dell'antico tempio romano detto Pantheon/ oggi chiesa della Rotonda […],* 1692, dettaglio (incisione in rame).

Rispetto alla lunga storia del monumento, la documentazione conservata che consente questo genere di indagine è abbastanza recente. Solo nella seconda metà del Seicento furono redatti per la prima volta dei rilievi analitici della superficie interna della rotonda,[1] allo scopo di misurare quante lastre di porfido erano ancora al loro posto. Ne fu autore l'architetto Carlo Fontana, o un suo collaboratore, quando fu incaricato dal papa Alessandro VII Chigi di progettare un generale restauro dell'interno della chiesa, realizzato poi — seppure solo in parte — tra il 1662 e il 1667. I disegni e gli scritti relativi a questa campagna di lavori, conservati nell'archivio della famiglia Chigi[2] — essendo connessi ad un edificio così celebre — furono resi noti assai precocemente: già nel 1806 Carlo Fea, ne pubblicò una parte a corredo di una relazione legale;[3] successivamente sono stati più volte analizzati da quanti hanno studiato i lavori eseguiti dal papa nella chiesa, non ultimi Richard Krautheimer e Tod Marder.[4] Nessuno li ha però finora utilizzati per analizzare lo stato di conservazione del monumento. Perché fra questi documenti, alcuni specifici fogli permettono di descrivere con una certa precisione lo stato di conservazione dell'interno del Pantheon intorno al 1650: si tratta del noto disegno rappresentante la proiezione in piano di un quarto della superficie della Rotonda (fig. 1), e di una relazione scritta — molto meno nota — ove si dà conto della presenza o assenza delle lastre di rivestimento dell'intera struttura.[5]

Mettendo insieme disegno e relazione — che furono. in origine, concepiti per essere l'uno il necessario chiarimento dell'altro — la situazione che ne risulta è sorprendente. Per quando attiene l'architettura, l'interno del Pantheon così come è rappresentato nel disegno poteva genericamente definirsi ben conservato: esedre e edicole presentavano il loro aspetto originario e la parete del primo ordine e dell'attico — ad eccezione della grande iscrizione inserita da Fontana al di sopra della prima trabeazione — presentava gli spartimenti antichi. Ma per quanto riguardava la materia, così come veniva descritta nella relazione allegata, la situazione era ben diversa: gran parte delle lastre originarie era mancante. La perizia descrive lo stato del rivestimento in porfido, procedendo dall'alto verso il basso (fig. 1). Lo stato del fregio della trabeazione superiore, «troppo in alto» per essere osservato senza l'ausilio di ponteggi, fu dichiarato

1 Siccome, come è detto più oltre (cfr. nota 17), molte delle lastre si trovavano al momento supplite con pittura, non è da escludere che nella precedente campagna di lavori promossa da Paolo III nel Cinquecento, siano stati redati rilevamenti dello stato di conservazione dei porfidi e dei marmi; non è tuttavia noto alcun documento al riguardo. Nei pochi documenti, che attestano invece illecite vendite di marmi del Pantheon, non è mai specificata l'esatta loro collocazione originaria (per l'insieme dei documenti già pubblicati, si rimanda a Pasquali 1996; in questa sede si cita da questo libro solo quando è necessario chiarire le circostanze entro cui esaminare i nuovi documenti presentati).

2 ASV, Chigi P.VII.9, cc. 108r–114r.

3 Fea 1806, 116–117.

4 Krautheimer 1987, cap. VII; Marder 1991.

5 «Nota del Porfido che manca nell'Ornamento dell'Interno della Chiesa del Panteon» (ASV, Chigi P.VII., c. 102v).

non valutabile. Immediatamente al di sotto, nell'attico, la situazione era la seguente: della superficie complessiva delle lesene ne mancava più di tre quarti; delle dodici grandi lastre comprese tra le finestre, solo tre erano ancora al loro posto; delle 56 piccole lastre solo 13 erano esistenti. La situazione della parte inferiore, corrispondente al primo ordine dela rotonda, era di poco migliore: nel fregio della trabeazione mancavano solo un terzo dei rivestimenti di porfido; delle 31 lastre poste immediatamente sotto ne mancava solo un quinto; macavano però tutte le 16 rote (o lastre circolari) poste ai lati delle edicole. Dove le lastre erano mancanti, si trovavano «supplite con pittura»: esito di un restauro del disegno, senza reintegrazione della materia, eseguito presumibilmente nel Cinquecento, del quale tuttavia poco sappiamo.[6]

Se questa era la situazione del materiale più prezioso, quale era il porfido, si deve presumere che mancassero — con proporzioni analoghe — anche le altre lastre colorate del rivestimento, nonché altri marmi ordinari dalle trabeazioni o da ogni altro luogo della superficie della rotonda. Inoltre, della conservazione delle pareti interne alle sette esedre in cui si apre lo spazio centrale, siccome non figurano rappresentate precisamente in alcun disegno, poco si può dire di preciso; certo è solo che agli inizi del Settecento risultano tutte prive dello spartimento architettonico originario.[7] Infine c'è da ricordare che, finché non fu regolamentata la raccolta delle acque piovane nella piazza antistante al Pantheon intorno al 1660, le periodiche inondazioni invernali cui era soggetta la chiesa avevano sicuramente contribuito a divellere molte lastre del pavimento,[8] e se non a spostare, almeno a danneggiare, attraverso l'accumulo di strati di fango, tutte parti inferiori dell'edificio.

La presenza della chiesa inoltre, se nel tempo era stato uno dei migliori strumenti di difesa dell'integrità dell'edificio, aveva costituito anche, a causa delle necessità liturgiche, anche un fattore di continua trasformazione. Come si vede da una incisione del 1692[9] — una delle rarissime immagini che mostra la chiesa nel Pantheon, piuttosto che il solo il Pantheon antico — nell'esedra principale erano stati eretti durante il Medioevo un ciborio e una pergula antistante (fig. 2), che altri documenti ci dicono essere stati entrambi composti di colonne di porfido; smontate presumibilmente — aggiungiamo noi — dall'edificio antico e possibilmente dalle edicole.

Da Alessandro VII a Benedetto XIV: il restauro dei marmi all'interno della chiesa di Santa Maria ad Martires

L'accurata misurazione dei porfidi mancanti era stata compilata da Carlo Fontana al fine di stabilire il costo necessario per porli di nuovo in opera. Alla morte di Alessandro VII, sopravvenuta nel 1667, non tutti i lavori che il papa avrebbe desiderato e stava ancora decidendo di fare furono realizzati: la grande iscrizione dedicata alla Vergine fu eseguita secondo il disegno citato; il restauro del cassettonato dell'intradosso della volta fu eseguito, seguendo uno dei progetti presentati, per un solo terzo;[10] le lastre mancanti non furono invece reintegrate. Così almeno, in assenza di altri documenti, può desumersi dall'attenta osservazione dell'attico nelle tele del vedutista Giovan Paolo Pannini che, dal 1730 in poi, ha rappresentato più volte l'interno del Pantheon (fig. 3).

6 Cfr. nota 1.

7 Pasquali 1996, app. 1, in base ai resoconti delle Visite apostoliche effettuate nella chiesa.

8 In base alla prima documentazione grafica nota, risalente al 1813 (Pasquali 1996, fig. 31), risulta evidente che larghe pari del pavimento antico erano state via via sostituite con pavimentazioni ordinarie.

9 *Prospetto interno ed esterno dell'antico tempio romano detto Pantheon/ oggi chiesa della Rotonda dedicata a tutti i santi/ Nuovamente dato in luce con le stampe originali da Matteo Gregorio Rossi Romano, disegnato da Giuseppe Tiburzio Vergelli Recanatese, intagliato da Pietro Paolo Girelli romano l'an. 1692*. Dell'incisione conosciamo solo la seconda edizione, 1773.

10 Pasquali 1996, 74, fig. 33.

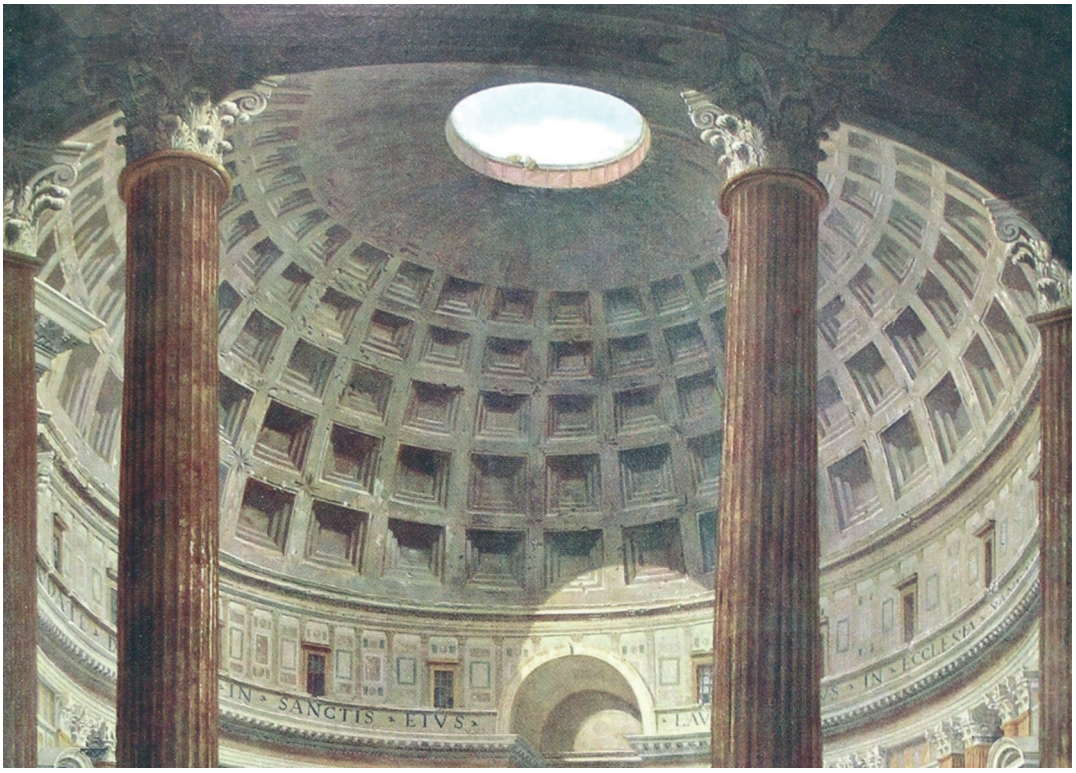


Fig. 3: Gian Paolo Pannini, Veduta dell'interno del Pantheon, dettaglio (Copenhagen, Staten Museum for Kunst, inv. n. 4694, olio su tela).

I marmi e i porfidi del Pantheon furono oggetto di una estensiva campagna di restauro solo nel Settecento. Sotto il pontificato di Clemente XI (1700–1721), l'architetto Alessandro Specchi fu incaricato del rinnovo di tutto l'interno della rotonda per quanto era compreso tra il pavimento e la prima trabeazione:[11] in quest'occasione, le colonne e i pilastri di pavonazzetto e giallo antico furono ripulite con «un certo acido» affinché potessero di nuovo essere lucidate; i capitelli e la trabeazione furono reintegrati, per tramite di inserti, delle parti mancanti. Almeno quattro delle otto edicole ebbero nuove colonne di giallo antico, fatte fare per l'occasione; ciborio e pergula vennero smontati, per essere sostituiti, alla fine dei lavori, da un altare moderno. La pulitura dei marmi fu estesa anche alle pareti, comportando estesi reintegri, se non addirittura una sostanziale demolizione e ricostruzione, con altre e moderne tecniche rispetto al partito decorativo policromo antico: in diversi luoghi, una recente campagna di restauro conservativo del 1994–1995,[12] ha messo infatti in evidenza la presenza di lastre di marmo più sottili di quelle abitualmente utilizzate negli edifici romani, le quali — fissate su un supporto di ardesia per tramite di pece — furono a loro volta collegate al muro per tramite di chiodi di moderna fattura. In almeno un luogo, questo processo di reintegro delle parti mancanti attraverso tale uso di lastre di supporto comportò anche una importante modifica nei materiali impiegati: le lastre quadrate di porfido al di sotto della prima trabeazione furono sostituite da marmo africano. Ciò è evidente dal confronto tra la situazione rappresentata nel citato disegno di

11 Pasquali 1996, capp. 3–4, 37–67.

12 Queste informazioni mi sono state comunicate dall'arch. Mario Lolli Ghetti, allora direttore di lavori, che qui ringrazio; le successive campagne di restauro sono documentate in: Pantheon 2007, 2.

Fontana con quella, immediatamente successiva ai lavori, desumibile dalle tele di Pannini. La precedente presenza di porfidi in quella posizione è inoltre documentata dalle note apposte dall'architetto Inigo Jones alla sua copia dei Quattro Libri di Palladio nel 1614[13] (fig. 4), nonché dalle proteste che nel 1705 Francesco Bartoli levò contro tale variazione apportata.[14]
La sorte dei marmi dell'attico fu invece, come è noto, diversa. Nel 1756, sotto il pontificato di Benedetto XIV, dovendosi provvedere a consolidare l'intradosso della intera volta, si diede inizio a una nuova campagna di lavori iniziando, questa volta, dall'alto. Nel corso dell'opera, si decise di cancellare il tenue partito decorativo che aveva contrassegnato il restauro del primo terzo della volta già compiuto sotto Alessandro VII, scegliendo piuttosto di lasciare l'intera calotta semplicemente intonacata. Terminati i lavori, questo nuovo candore dell'interno della volta cassettonata, sommato alla lucentezza già ritrovata nei marmi del primo ordine, rese evidente la necessità di provvedere al restauro anche dell'attico, rimasto allo stato documentato da Fontana quasi cento anni prima. In uno scritto assai tardo, e purtuttavia affidabile,[15] si afferma che il primo progetto consisteva prevedibilmente nello smontare tutti i marmi, per rimontarli — integrati delle parti mancanti — di nuovo al loro posto: un lavoro che avrebbe quindi mantenuto il disegno e la materia dell'architettura originale antica. Sta però di fatto che — stando al medesimo scritto — questa tecnica che aveva funzionato così bene quaranta anni prima, impiegata nel corso del 1757 portò al disastro: i marmi superstiti, che erano molto rovinati[16] si sbriciolarono durante l'operazione e non poterono più essere rimontati. Furono quindi tolti via,[17] aprendo così per la prima volta, un nuovo capitolo nella storia più che millenaria dell'edificio: una parte importante dell'interno della rotonda, quale era l'attico antico, non esisteva più e doveva essere sostituito da un moderno progetto.

Fig. 4: Andrea Palladio, Interno del Pantheon, in Id., *I Quattro Libri dell'architettura*, Venezia 1570, *Libro Quarto* (xilografia): vi sono trascritte le annotazioni supplementari fatte dall'architetto Inigo Jones nel 1612.

13 *Inigo Jones on Palladio : being the notes by Inigo Jones in the copy of «I quattro libri dell'architettura» di Andrea Palladio, 1601, in the Library of Worcester College, Oxford*, a cura di B. Allsopp, Newcastle upon Tyne 1970, Libro quarto, 79–81; P. Marini, *Le postille di Inigo Jones a «I Quattro Libri dell'Architettura» di Andrea Palladio*, in *Trattati scientifici nel Veneto fra il XV e XVI secolo*, a cura di E. Riondato, Vicenza, 1985, 73–102.

14 Pasquali 1996, app. 5, 143–144.

15 ASTo, *Archivio Canina*, b.2, fasc. 11, lettera al Cardinale Camerlengo, 16. 11. 1842 (Pasquali 1996, 75, nota 43).

16 «A poco a poco quasi tutte le pietre, che formavano l'incrostazione sono cadute, così al presente si vedono i pilastri e i ripartimenti, a riserva di poche pietre rimastevi, fatti tutti con pittura»: così è descritta la situazione nel febbraio 1756, poco prima che avvenisse la demolizione (Pasquali 1996, 158, app. 16).

17 Pasquali 1996, 75–77.

Il libro mancato di Giovan Battista Piranesi

Il consolidamento dell'interno della volta era stato eseguito attraverso un ingegnoso ponte mobile, inventato per l'occasione nel corso del 1756; già prima della fine dell'anno seguente, Giovan Battista Piranesi ne aveva richiesto i disegni.[18] Se si somma questa notizia a quanto il francese Pierre Jean Mariette scriveva a Giovanni Gaetano Bottari nel giugno 1758, è possibile capire il motivo di tale interesse. Riferiva infatti Mariette di aver saputo che, al momento, Piranesi stava lavorando ad un'opera specificamente dedicata al Pantheon;[19] questa, oltre a presentare nuovi disegni — a quanto ne sapeva lui — sarebbe stata anche dotata di un testo che, analogamente a quanto Piranesi aveva già fatto nelle sue Antichità romane del 1756, avrebbe discusso anche le maggiori questioni antiquarie collegate a quel monumento.[20] L'interesse, inoltre, per il ponte mobile fa tuttavia pensare che anche i recenti lavori sarebbero stati adeguatamente illustrati. Dell'opera, al novembre del 1758, Mariette chiedeva ancora informazioni, senza presumibilmente ottenerne alcuna, perché questa — così come era stata concepita da Piranesi — non sarebbe mai stata pubblicata; né forse pubblicabile. La demolizione dell'attico, intervenuta nel 1757, aveva infatti reso il tema del Pantheon un soggetto assai spinoso da trattare, finanche in un libro. Specie se edito a Roma.

Dell'andamento dei lavori nella chiesa di Santa Maria ad Martyres si era infatti cessato di parlare nella stampa romana dall'ottobre del 1756: senza che fosse stato mai scritto che l'attico antico sarebbe stato demolito, il periodico semiufficiale della città, il «Diario Romano», aveva fornito in quella data la notizia che il restauro della calotta si stava completando, limitandosi ad annunciare che «più, in appresso» sarebbe stato fatto all'interno della chiesa.[21] Nel marzo 1757 il progetto approntato dall'architetto Paolo Posi e approvato dal responsabile dei lavori, il card. Gerolamo Colonna era conosciuto a Roma, perlomeno nei circoli più vicini alla Curia;[22] due mesi dopo, nel maggio, girava a Roma un feroce libello contro l'architetto e i lavori intrapresi, ove si accusava il primo di «borrominismo» e gli imprenditori di scandaloso interesse per essersi impadroniti dei residui piombi presenti nella volta.[23]

Il libello, mai citato dalla stampa romana (e, a tutt'oggi, apparentemente perduto), ebbe

18 Il prestito del disegno è documentato perché l'inventore del ponte, Giovanni Corsini ne dispone nel suo testamento, specificando che al momento della stesura dell'atto si trova «in potere del Sig. Gio[van] Batt[ist]a Pirinese Veneziano» (ASRm, J. A. Serij (ora *in Collegio dei Trenta Notai Capitolini*, uff. 34), vol. 281, testamenti, c. 339s; Pasquali 1996, 80, nota 33).

19 «On m'assure que M. Piranesi est actuellement occupé d'un ouvrage sur le Panthéon»(BCRm, Lettere di Mariette a Bottari, 1606–1632. E. 27, 6 giugno 1758, cc. 65–68; 67r–v). Questa importante lettera e la seguente sono state per la prima volta pubblicate e discusse in relazione a Piranesi in: L. Kantor Kazovsky, *Pierre Jean Mariette and Piranesi: the controversy reconsidered*, in *The serpent and the stylus. Essays on G. B. Piranesi*, a cura di M. Bevilacqua, H. Hyde Minor, F. Barry, Ann Arbor (Michigan) 2006, 149–168; alla sua ricostruzione, noi abbiamo aggiunto una terza lettera inedita di Mariette (cfr. ivi nota 26) e varie notizie.

20 In mancaza di documenti, può suggerirsi che Mariette sia stato informato dell'impresa editoriale e dei dettagli sulle ipotesi antiquarie che vi sarebbero state presentate dall'editore Bouchard di Roma — con il quale egli, come emerge dalla medesima corrispondenza, era in rapporti costanti; Bouchard era, come è noto, in quegli anni in stretti rapporti anche con Piranesi. Il consiglio — contenuto nella lettera di Mariette — di abbandonare le vecchie tesi antiquarie di L. de Montjosieu è motivato dalla rilevanza accordatagli da Fontana, come ancora da padre Avril nelle pagine del «Journal de Trévoux», lettera seconda (cfr. ivi nota 19).

21 «Diario ordinario» (noto come «Chracas»), 30. x. 1756 (Pasquali 1996, 80).

22 Il progetto è noto a Luigi Vanvitelli nel marzo 1757 (*Le lettere di Luigi Vanvitelli* …, a cura di L. Strazzullo, Galatina (Le), n. 454, Caserta 29. III. 1757).

23 Il testo originale del libello non è noto: se ne può desumere il contento da un coevo commento di Vanvitelli che parla di «aspra correzione» e «infamamento» (*Le lettere di Luigi Vanvitelli […]*, cit., n. 465, 15. V. 1757; Pasquali 1996, III, nota 40) e da quanto ne scrive l'abate di Saint Non nel 1759 (*Saint Non, Fragonard. Panopticon italiano. Un diario di viaggio ritrovato 1759–1761*, a cura di P. Rosenberg, Paris-Roma 1986, 134–135; Pasquali 1996, III, nota 41).

un'eco importante nella stampa estera. La demolizione del Pantheon venne criticata, in base alle medesime accuse rivolte da quel testo anonimo all'architetto e agli imprenditori, prima in un giornale di Londra e quindi, attraverso la diffusione di quel medesimo testo tradotto, in un periodico di Parigi uscito nel luglio 1757, con il titolo Mémoires sur les Antiquités de Rome et sur le Panthéon.[24] E' questo il testo che — letto nella versione in inglese, o più probabilmente in quella francese — fece scrivere ad Algarotti nell'agosto dello stesso anno una celebre lettera di protesta[25] e a Mariette questa lettera indirizzata a Bottari:

> «On nous annonce une nouvelle qui désole tous les vrais et bons amateurs de la sçavante Antiquité. On déshonore, à ce quoi nous assure, le beau temple du Pantheon, et le plus barbares que les barbares mêmes en ont changé la décoration. Un architecte ignoran[t] et presomptueux le va donc charger d'ornemens dans le goût du Borromini, sans s'appercevoir que la noble sagesse du goût antique, ne s'allie point avec la folle bisarrerie du goût moderne et [ce] qui est pis il va risquer d'ajouter une lanterne postiche qui indubitabilement ecrasera une voute qui n'a point été faite pour une pareille charge. (…) Comment les choses ont elles pu changer à ce point là?»[26]

Quando Mariette chiedeva quindi a Bottari, nel novembre del 1758, ancora notizie sulla promessa pubblicazione di Piranesi sul Pantheon non era motivato dal solo interesse antiquario: desiderava, piuttosto, intervenire attivamente nella questione. In quest'ultima lettera infatti, avvertendo Bottari dell'avvenuta pubblicazione nel «Journal de Trévoux»[27] di un lungo testo del gesuita Louis Avril[28] teso a difendere dalle accuse del libello sia l'architetto Posi, sia l'eseguito restauro della volta e quello, solo previsto, del pavimento, Mariette prendeva esplicitamente le parti del libellista. Si offriva inoltre di aiutare Piranesi a dimostrare, attraverso un disegno in suo possesso, che non sempre e non necessariamente i papi avevano provveduto a conservare con la dovuta cura il Pantheon, dopo che questo era stato trasfomato in chiesa. Questione questa che vedeva Mariette e Bottari uniti in una evidente polemica

24 La pubblicazione, prima in un «Journal de Londres» e quindi la sua traduzione in francese in «un des Auteurs périodiques le plus justement estimés de Paris» nel luglio 1757 (entrambi i periodici non sono stati da noi purtroppo né individuati, né quindi reperiti) è cit. in «Mémoires pour l'histoire des sciences et beaux arts» (o «Journal de Trévoux»), octobre 1758, 2456–2484. Quest'ultimo articolo è, a sua volta, menzionato in BCRm, Lettere di Mariette a Bottari, 1606–32.E.27, 24 novembre 1758, cc. 118–119; 119r (G. G. Bottari [e S. Ticozzi], *Raccolta di lettere sulla pittura, scultura e architettura […]*, vol. 4, Milano 1822, lettera CCX, 492–497; 496; L. Kantor Kazovsky, *Pierre Jean Mariette…,* cit., 156–157, nota 36).

25 Lettera di Francesco Algarotti a Jacopo Bartolomeo Beccari (G. G. Bottari [e S. Ticozzi], *Raccolta di lettere […], cit., vol. 7, 405–408*; data ivi indicata, 10.VIII. 1756, non essendo congruente con la ricostruzione dei fatti, deve essere corretta in: 10. VIII. 1757).

26 BCRm, Lettere di Mariette a Bottari, 1606–32.E.27, sd., c. 158r. La lettera inedita, della quale si conserva solo il secondo foglio privo di data, è stata scritta appena dopo il luglio 1757 (quando è pubblicato il citato articolo in Francia, cfr. ivi nota 24). Nel novembre 1758 fu definitamente abbandonato il progetto della cit. copertura dell'oculo (Pasquali 1996, 157, app. 14.5).

27 Mariette avvertì Bottari dell'uscita della prima parte del lungo testo (cfr. nota 25). La confutazione del libello, sotto forma di tre lettere scritte tra l'agosto e il l'ottobre 1758, fu completata in altre due puntate: la seconda uscì nel novembre («Mémoires pour l'histoire […]«, cit., 2534–2560); la terza poco dopo (*ibidem*, 2743–2762). ~~più~~ Il medesimo testo fu pubblicato invariato anche nel «Journal de sçavans combiné avec les Mémoires de Trévoux», Amsterdam: n. 12, octobre 1758, 469–487; n. 13, novembre 1758, 162–179; n. 14, décembre 1758, 434–452.

28 Le tre lettere anonime sono attribuite al padre gesuita Louis Avril in: C. Sommervogel, *Table méthodique des Mémoires de Trévoux (1701–1775)*, voll. 3, Paris 1864–65; vol. 1, 704. Di questo padre, nato nel 1722, vissuto alcuni anni a Roma e morto negli anni '90, si conosce la seguente opera: *Temples anciens et modernes, ou observations historiques et critiques sur les plus célèbres monuments d'architecture greque et gothique*, Londra-Parigi 1774.

anti-gesuita,[29] e che qui interessa soprattutto per quanto può rivelare sulla progettata opera di Piranesi. Avrebbe il suo libro criticato la demolizione dell'attico? e in che termini?
Il Pantheon compare in più occasioni nelle tavole delle opere pubblicate da Piranesi dopo il 1758; solo però nel 1790, dopo che l'artista era morto da tempo, il figlio raccolse molte tavole presumibilmente disegnate o già incise, ne aggiunse di nuove[3030] e, senza corredo di testo, diede finalmente alle stampe una monografia dedicata a questo monumento con il titolo di Seconda parte de' tempj antichi che contiene il celebre Panteon. Non è tuttavia impossibile riconoscere, nel materiale sul Pantheon che Piranesi via via inserì in altre sue opere, alcune delle tavole previste per il mancato libro: l'attico antico compare accuratamente rappresentato, e fuori contesto, già nel 1761[31] (fig. 5). Altrove sono invece ravvisabili gli accenti polemici che avrebbero presumibilmente caratterizzato il testo dell'opera: sotto alla rappresentazione dell'urna di porfido, una volta davanti al Pantheon e dal 1732 utilizzata da papa Clemente XII per la sua tomba, c'è scritto: «labrum pro urna usurpatum est»;[32] in una veduta del portico, si specifica che due lastre di travertino di straordinaria grandezza furono portate via durante il restauro diretto da Posi, col solo scopo di essere trasformate in due altrettando grandi tavoli del Museo Sacro in Vaticano.[33]

Se quindi ciò che avrebbe potuto fermare l'opera di Piranesi sul Pantheon era la generale censura esercitata da parte del governo affinché nessuno parlasse del controverso restauro appena concluso, questa è stata presumibilmente esercitata. O più probabilmente, per Piranesi, la questione si è anche configurata come semplice valutazione di opportunità: nel luglio del 1758, nel pieno della polemica rilanciata dai giornali francesi, veniva eletto papa Clemente XIV Rezzonico e grazie a ciò, da quel momento in poi, l'artista avrebbe cominciato un'altra carriera, questa volta ben protetto da un papa che — come lui — era veneziano. Difficilmente quindi, nella sua nuova posizione, egli avrebbe potuto permettersi di pubblicare un'opera che, in ogni modo, sarebbe risultata polemica contro quei lavori appena eseguiti nel Pantheon, per cura e finanziamento del governo.[34] Ed è probabilmente in questa sua nuova condizione personale, ottenuta per tramite dei nipoti del papa, che debbono ricercarsi anche i motivi dell'irreversibile rottura — registrata da Mariette — che ebbe luogo tra Piranesi e Bottari intorno al febbraio del 1759.[35]

29 Per questo aspetto si rimanda a L. Kantor Kazovsky, *Pierre Jean Mariette […]*, cit., 157.

30 Francesco, da giovane, sarebbe stato consigliato dal padre di intraprendere il rilievo del Pantheon: Francesco «dessinât en grand sur nature tous les détails géometriques du Panthéon et les beaux ornemens qui en font partie» (G. Erouart, M. Mosser, *A propos de la «Notice historique sur la vie et les ouvrages de J. B. Piranesi»: origine et fortune d'une biographie*, in *Piranèse et les Français. Colloque tenu à la Villa Médicis 12–14.05.1976*, a cura di G. Brunel, Roma 1978, 213–256). Suoi disegni redatti per l'occasione potrebbero essere confluiti nel volume del 1790.

31 Piranesi 1761, tav. XXXV, fig. 1.

32 Piranesi 1790; didascalia della vignetta del frontespizio.

33 Piranesi 1765: *Veduta interna del pronao del Pantheon*, lettera D: «Parieti da dove furono levate le lastre di granito al tempo di Benedetto XIV l'anno 1757 […]».

34 In L. Kantor Kazovsky, *Pierre Jean Mariette […]*, cit., 158–159, si suggerisce che la mancata pubblicazione del libro sia da ascriversi alle opportunità, offerte da quel pontificato, di essere coinvolto in qualità di architetto in qualche lavoro nel Pantheon. Dato però che, a quella data, il progetto di Posi era ormai in via di completamento e che, comunque, gli eventuali ulteriori lavori sarebbero comunque stati eseguiti dall'Amministrazione dei Sacri Palazzi, io credo piuttosto che sia stata esercitata una censura, al fine di sopire le polemiche ingenerate dal libello.

35 «Il me fache que le Piranesi se soit écarté au point d'avoir perdu votre confiance et votre appui. Il ne fera que des sottises et nous n'aurons plus rien de lui»: questa importante lettera (BCRm, 1606–32.E.27, c. 19v, 10 febbraio 1759; trad. it. in G. G. Bottari [e S. Ticozzi], *Raccolta di lettere […]*, cit., vol. 4, lettera CCXI, 497–501; 501) che sancisce la rottura della collaborazione tra Bottari e Piranesi, è messa in evidenza in L. Kantor Kazovsky, *Pierre Jean Mariette […]*, cit., 159, nota 43.

«Bellezze reali, analoghe a quelle antiche»: i progetti alternativi per l'attico

Rispetto ad altre iniziative edilizie romane del Settecento, questo cantiere — dopo la demolizione dell'attico — operò, si può dire, in regime di segretezza. Soprattutto dopo il 1756, quando il Pantheon e la chiesa di Santa Maria ad Martyres ivi contenuta passarono alla sola competenza dell'amministrazione dei Sacri Palazzi, presieduta dal card. Girolamo Colonna,[36] ogni discussione in materia rimase confinata a poche persone. Tanto più, quindi, sono preziosi alcuni documenti, recentemente reperiti, che illustrano le tappe con cui l'architetto Paolo Posi elaborò il progetto di ricostruzione dell'attico, appena demolito. Questi comprendono: quanto del perduto libello è desumibile dalle lettere scritte padre Avril per contrastarlo e tre disegni; due attribuiti allo stesso Posi[37] (figg. 7–8) e uno di mano di un suo allievo[38] (fig. 9).

Dall'ultima delle tre lettere del «Journal de Trévoux», esplicitamente dedica a confutare le critiche mosse ai recenti lavori,[39] si deduce che le maggiori obiezioni presentate nel libello erano le seguenti: la volta, dopo essere stata privata dei residui dei piombi antichi, era stata dipinta di un bianco troppo candido;[40] l'attico era stato privato della sua decorazione originaria; gli scassi eseguiti per aumentare la dimensione delle finestre avrebbero indebolito la

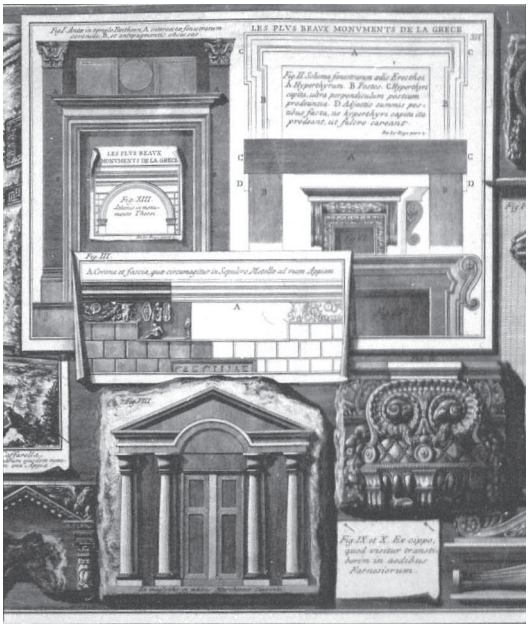


Fig. 5: Giovan Battista Piranesi, *Fig. 1, Antae in templo Pantheon*, in Id., *Della Magnificenza dei Romani […]*, Roma 1761, tav. XXXV, dettaglio (incisione in rame).

struttura muraria antica.[41] Nel nuovo progetto di Posi si criticava la mancanza di nuove paraste che avrebbero dovuto sorreggere — almeno figurativamente — la trabeazione superiore; l' esecuzione in stucco di tutto il nuovo attico, inoltre, mal s'adattava alla ricchezza del monumento antico. Infine, la prevista copertura dell'oculo, attraverso una struttura in ferro e vetro, e il rifacimento del pavimento, attraverso la sostituzione delle antiche pietre, contribuivano a suggerire la maggiore e più feroce critica all'iniziativa: si era demolito molto del Pantheon antico, per sostituirlo con moderni «fronzoli borromineschi».[42]

Paolo Posi era stato un architetto fino allora noto per l'inventiva mostrata soprattutto nell'al-

36 Pasquali 1996, 71–72.

37 Biasa, Roma, Coll. Lanciani *Roma* XI, 35, 92, disegno acquerellato (A. Spila, *L'architettura a Roma tra il 1750 ed il 1823 nei disegni della Collezione Lanciani*, in *Architetti e ingegneri a confronto*, a cura di E. Debenedetti, Roma 2006, 355–374); ASTo, Fondo Castelli Berroni, cat. 5, fasc. 109 (Manfredi 2004, 11–15).

38 Biblioteca Comunale, Foligno, *Fondo Piermarini*, n. H2 (*Giuseppe Piermarini: i disegni di Foligno*, a cura di M. Tabarrini, Milano 1998, scheda 1.3, 66; *Roma nel Settecento*, cat. mostra Roma 2005–2006, a cura di A. Lo Bianco e A. Negro, Roma 2005, 135–136, n. 19 (scheda di E. Kieven).

39 Cfr. ivi nota 26.

40 Echi del libello, su questo argomento, anche nel diario dell'abate di Saint Non (*Saint Non, Fragnard…*, cit., 134–135).

41 Echi del libello, su questo argomento, in Fea 1806, 104: «per rendere le finestre più bislunghe, e proporzionate a modo suo, [Posi] le ribassò di due palmi; troncando perciò affatto il grand'arco di grossi mattoni, che partendo da un pilone all'altro sosteneva tutto quel fabbricato superiore».

42 Nella terza lettera pubblicata da padre Avril (cfr. nota 27), si difende il progetto di Posi dall'accusa — evidentemente contenuta nel libello — di aver fatto mostra di un «goût des colifichets du Borromini».

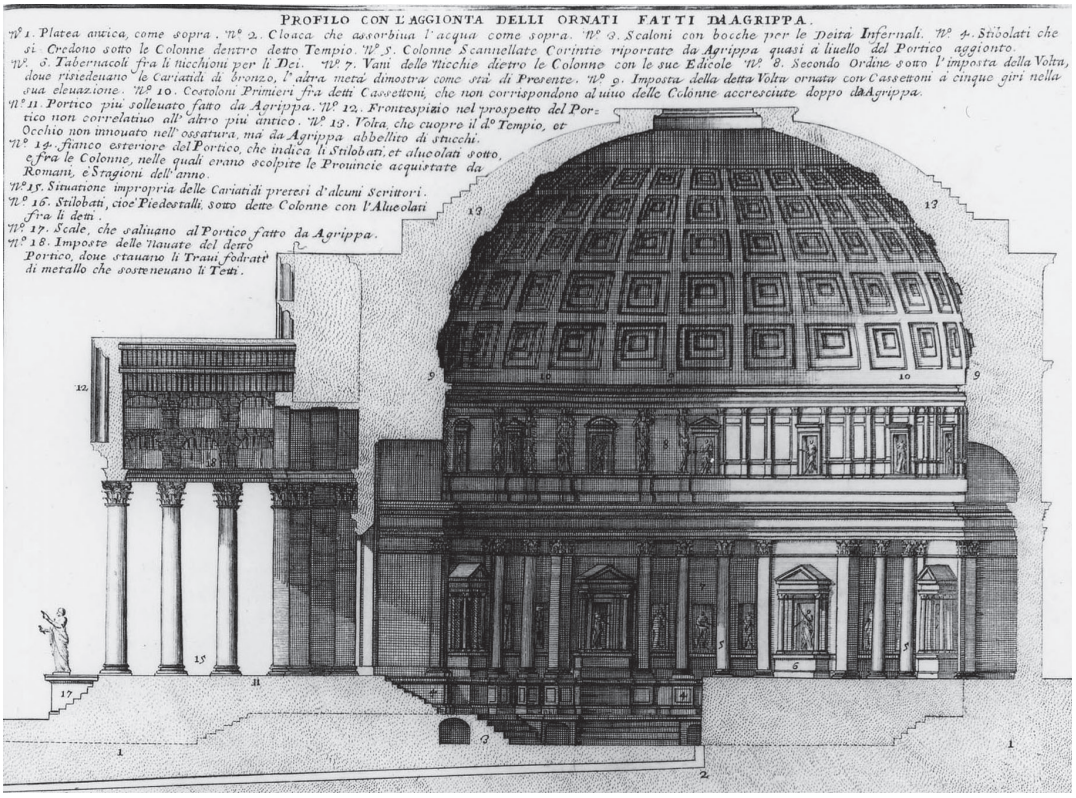
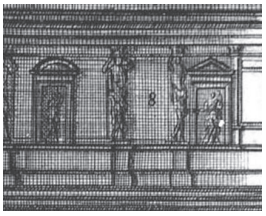


Fig. 6: Carlo Fontana, *Profilo con l'aggionta* [sic] *delli ornati datti da Agrippa*, in Fontana 1694, 457 (incisione in rame).



lestimento di feste e apparati:[43] era quindi facile accusarlo di introdurre nel Pantheon un genere di decorazione meno costretta dalle regole. Ma il suo procedere tutto fu meno che libero e tutto fu meno che riferito a Borromini. Nei primi mesi del 1757 l'architetto presentò presumibilmente vari progetti alternativi al card. Colonna; nei due disegni autografi conservati (figg. 7–8), le paraste — di cui si criticherà l'assenza nel progetto finale — furono da lui riproposte, seppure dopo avere emendato le più vistose incongruenze presenti in quelle antiche appena demolite: ridotte notevolmente di numero, compaiono infatti solo in corrispondenza delle colonne sottostanti. In entrambi i fogli inoltre, le mostre delle finestre compaiono modificate nelle proporzioni e dotate di frontespizi, al fine di essere paragonabili alle edicole sottostanti (di qui, l'accusa, quindi fondata, di aver tagliato parte della muratura antica). Nei due disegni quindi, al di là delle varianti introdotte nella ripartizione delle specchiature, evidente è l'intento — più che di aggiungere del nuovo — di ricavare il disegno dell'attico dalla ripartizione architettonica del primo ordine.

Il modello non è stato quindi cercato in Borromini, quanto nel più classico Carlo Fontana. Con tutta evidenza è dalla restituzione del Pantheon augusteo proposto da quest'ultimo nel 1694[44] (fig. 6) che Posi ricavò sia il posizio-

43 Pasquali 1996, cap. VIII.

44 Fontana 1694.

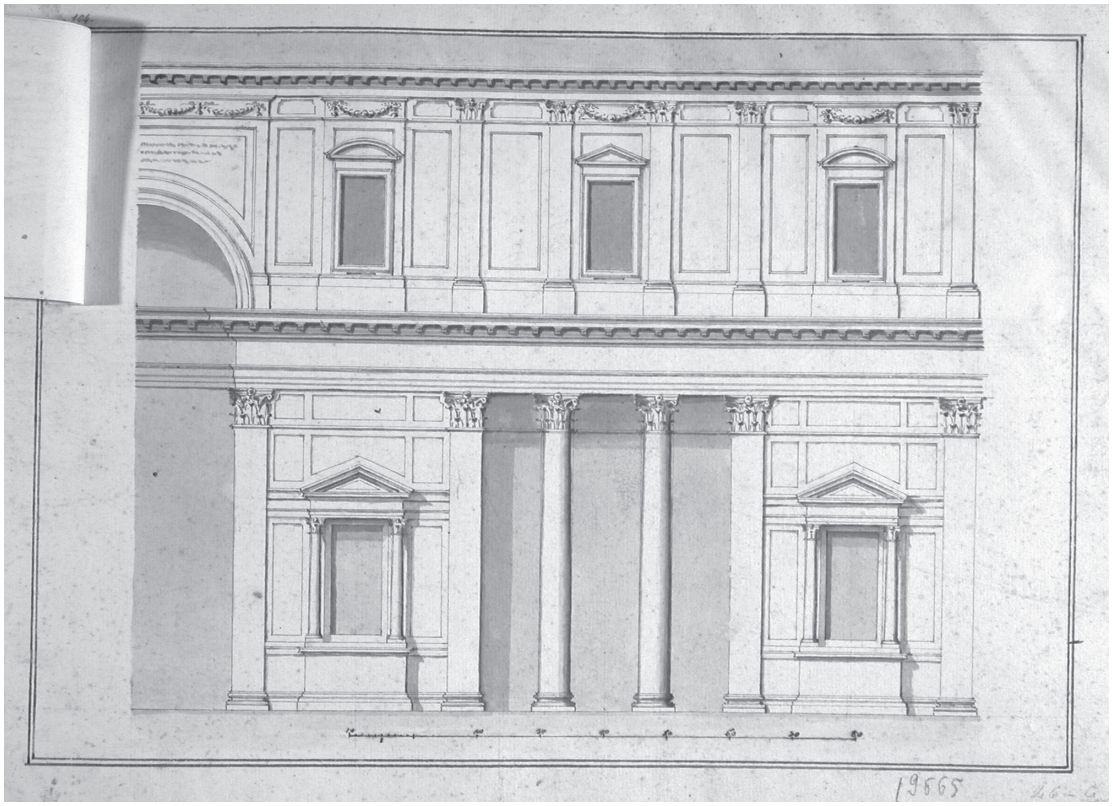


Fig. 7: Paolo Posi, Primo progetto per il nuovo attico, in rapporto al primo ordine del Pantheon antico (BIASA, Roma, Collezione Lanciani, *Roma* XI, 35, 92, disegno acquerellato).

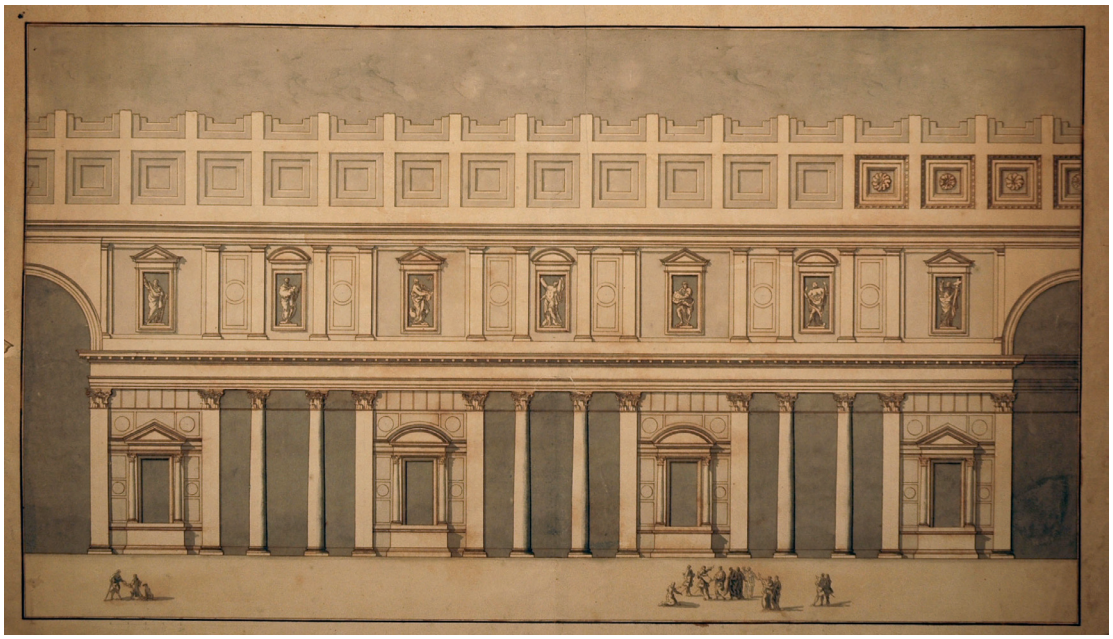


Fig. 8: Paolo Posi, Secondo progetto per il nuovo attico, in rapporto al primo ordine e al cassettonato del Pantheon antico (ASTo, Fondo Castelli Berroni, cart. 5, fasc. 109, disegno acquerellato).

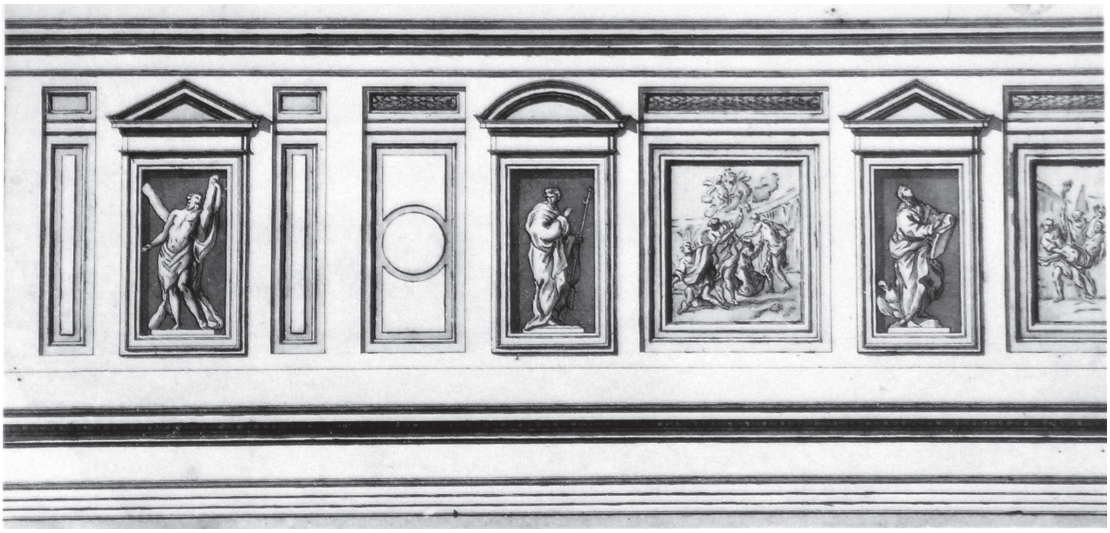


Fig. 9: Giuseppe Piermarini, Copia del terzo progetto di Posi per il nuovo attico (Biblioteca Comunale, Foligno, *Fondo Piermarini*, n. H2, disegno acquerellato).

namento delle paraste, sia la forma delle mostre delle finestre. Per la disposizione, laddove — inseguendo Plinio — Fontana aveva posto una cariatide, Posi si limitò a inserire una parasta, mantenendo persino, in uno dei due disegni, i piedistalli ivi rappresentati (fig. 7); delle finestre, invece, oltre a imitarne le forme ne copiò finanche la funzione: al posto degli dei pagani mostrati da Fontana, egli si limitò a porvi le effigi dei martiri, cui era dedicata la chiesa (fig. 8). Ciò equivale a dire che, al fine di riempire in qualche modo il vuoto lasciato dalla demolizione dell'attico antico, Posi e i suoi consiglieri, più che progettare liberamente il nuovo, si affidarono piuttosto all'autorità di una restituzione antiquaria. Questa, sebbene ormai superata,[45] era tuttavia attraente per più di una ragione. Giustificava la demolizione dell'attico antico, perché questo era stato da Fontana creduto «dei bassi tempi». Offriva quindi un'autorevole giustificazione per ricostruirne uno nuovo, bastando solo che fosse simile a quello proposto dallo stesso Fontana come augusteo. Di quest'ultimo inoltre, posto che l'architetto Fontana ne aveva fornito una sorta di progetto restitutivo, potevano essere facilmente copiate sinanche le forme delle singole parti: si vedano, in particolare, le mostre delle finestre cuspidate.

Secondo quanto scrive padre Avril nella terza lettera in difesa del Pantheon restaurato, Posi avrebbe tuttavia deciso in un secondo tempo di eliminare le paraste, per «scegliere un genere di decorazione che non era esposto a quegli inconvenienti»:[46] ai mancati allineamenti cioè, comunque inevitabili, con la ripartizione dei cassettoni sovrastanti. Il disegno di Piermarini (fig. 9) testimonia di questo passaggio: a destra può vedersi una versione ove è ancora evidente il vuoto lasciato dalle paraste; a sinistra, nella versione poi scelta, le finestre s'alternano a semplici grandi riquadri.[47] A quest'immagine finale — corrispondente all'opera realizzata in stucco dipinto (fig. 10) — c'è da aggiungere

45 Si veda al proposito Mariette che critica le restizioni di L. Montjosieu (cfr. nota 20), pienamente accettate da Fontana.

46 Avril 1758, 2749. C'è da notare, inoltre, che gran parte della difesa di padre Avril del progetto di Posi era basata sulla piena accettazione delle restituzioni antiquarie di Fontana (*ibidem*, 2747).

47 Nel disegno, ciascuna finestra ospita un santo martire (connesso quindi al titolo della chiesa di S. Maria ad Martyres); ciascum riquadro ospita un dipinto riferito a una scena di martirio collegata: non sappiamo se queste rappresentazioni furono mai state proposte, o sono da considerarsi un semplice completamento decorativo del disegno.

quanto di più, secondo Avril, si sarebbe poi fatto di lì a poco nel resto dell'edificio: le lastre rovinate e sconnesse del pavimento sarebbero state sostituite; l'oculo — senza tuttavia che Posi fosse d'accordo[48] — sarebbe stato coperto. Persino l'intradosso volta, in un imprecisato secondo tempo, sarebbe stata completato in altro modo: al bianco della calotta appena restaurata, sarebbe stato sostituito il grigio di un esteso rivestimento in marmo; ciascun lacunare avrebbe avuto il fondo rivestito in mosaico azzurro; dei rosoni di bronzo dorato sarebbero state posti al loro centro. Una volta completato secondo queste intenzioni, il Pantheon finalmente rinnovato avrebbe quindi offerto alla vista, non più lo spettacolo della sua millenaria e progressiva rovina, quanto piuttosto delle nuovissime «bellezze reali, analoghe a quelle antiche».[49] Non certo i «fronzoli borromineschi» imputati dal libello, ma quanto di più classico poteva in quel momento offrire la cultura tardo barocca a Roma. Peccato però che, alla metà del Settecento, anche una scelta di questo tipo non aveva ormai più senso.

Elenco delle abbreviazioni utilizzate:

ASRm: Archivio di Stato, Roma
ASTo: Archivio di Stato, Torino
ASV: Archivio Segreto Vaticano, Città del Vaticano
BCRm: Biblioteca Corsiniana, Roma
BIASA, Roma: Biblioteca dell'Istituto Nazionale di Archeologia e Storia dell'art

48 Nel difendere Posi («cette idée n'est cependant pas de l'Architecte»), padre Avril asserisce che la copertura dell'oculo sarebbe stata decisa dai suoi superiori (L. Avril, *Lettre aux Auteurs […]*, cit. 2757): posto che la principale documentazione nota su questo lavoro è costituita da lettere indirizzate al card. Gerolamo Colonna (Pasquali 1996, 157), è assai probabile che fosse stato costui ad averla voluta.

49 Avril 1758.

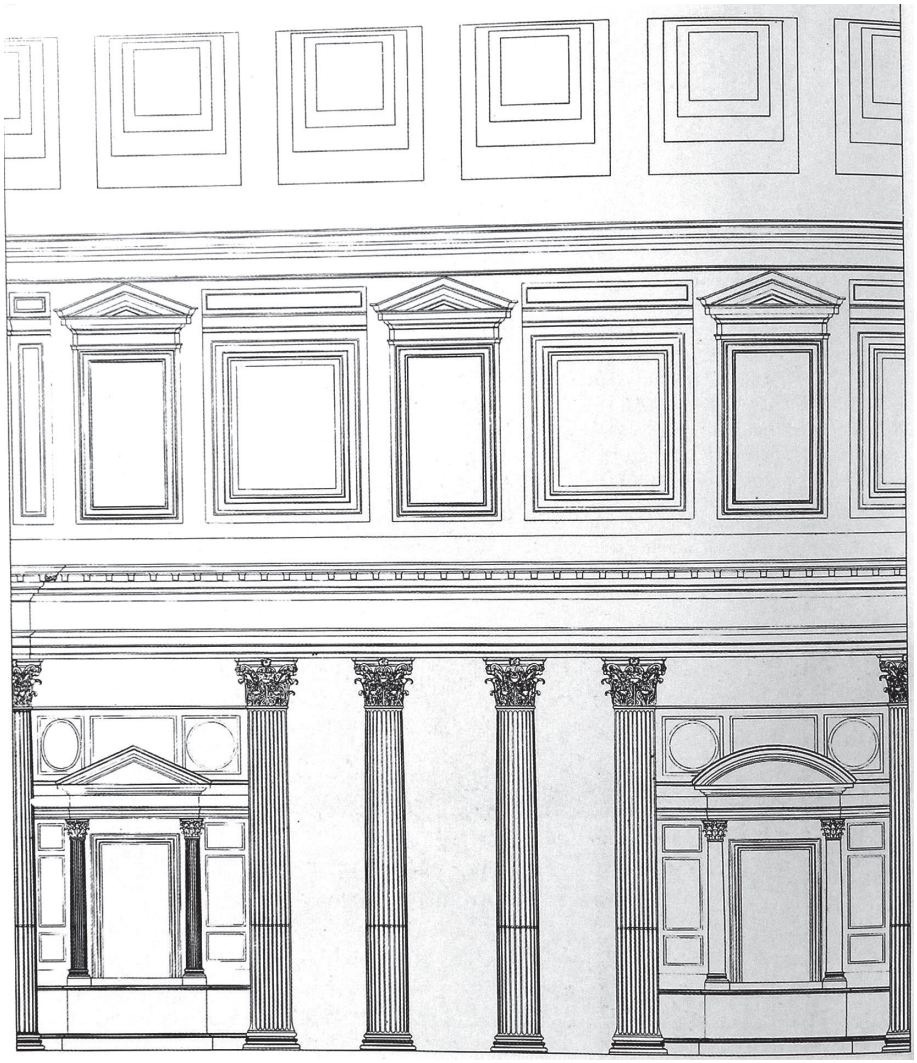


Fig. 10: Interno del Pantheon dopo il 1759, proiezione in piano di un quarto della superficie (restituzione grafica di Sharon Miura, 1995).

The Pantheon: Nagging Questions to No End

Lothar Haselberger

The Pantheon, as we know (or don't know) it, has been the object of puzzlement for several centuries. And it continues to haunt us with the uncomfortably nagging questions it still poses. This is a most welcome situation – as long as we admit the predicament, and do not gloss over it. Matters are complicated, and much is unresolved.

Even with its unanimously accepted name, Pantheon, we are living on borrowed terms by drawing on a strange hybrid from the Middle Ages. The ancient name was *Pantheum* in Latin, and Πανθειον in Greek. Principally, we do know this; we just have difficulties accepting it.[1] And there are other pieces of oft-repeated wisdom that we should not accept, such as continually assuring ourselves that the Pantheon was «erected by Hadrian during the period AD 118–25» (thus the announcement for this conference), because we do not know this with precision. In fact, it remains perfectly unclear whether it was Hadrian at all who initiated the building.[2]

In a way, our refusal to admit to the open questions surrounding the Pantheon maintains the willfully blind and destructive mindset of the 18th century that could not bear any longer the ‹problematic› interior order. Frustration boiled over in view of a nagging question still unresolved today: the blatant misalignment of almost all interior axis lines, along with a puzzlingly flat and spindly upper order where the pilasters were ostensively unable to live up to their load-bearing task, thus leaving the rotunda's entire dome without a plausible base. As well-known and still visible today, the problem was ‹resolved› in 1756 by hacking off the offending pilasters and revetment, and replacing an inconvenient ancient reality with neutral stucco panels.[3]

What I would like to present here is a list of unresolved issues: my wish list of questions that I believe we must keep open for further investigation, hoping, of course, that the admirable level of documentation achieved by the open-minded institution that invited us for this conference may bring us closer toward solutions. I will address seven points here which are all, except for the last one, directly related to precise technical documentation, or rather, the absence of such documentation.

1 For a list of ancient sources mentioning the *Pantheum* or Πανθειον, see Fine Licht 1968, 180–84; on the issue Haselberger 2007, 113 n. 143. A rare attempt at introducing the term *Pantheum* in common parlance is Kienast 1980, 399, 412.

2 The generally accepted, exclusively Hadrianic date of the existing Pantheon (e.g., Fine Licht 1968, 186; MacDonald 1976, 12–13) was first challenged by Heilmeyer 1975, 327–28; in some detail then Haselberger 1994, 296–98. Now Hetland 2007 and in this volume.

3 On this destructive intervention of 1756, see Pasquali 1996, 68–91 and now ead., as well as T. Marder, in this volume.

Curvature in the façade?

First, I would like to know whether the ‹showside› of the Pantheon, its pronaos façade, features an intentional curvature, that upward bending of all seemingly horizontal lines from the stepped platform to the entablature (fig. 1). The issue is almost a century old. In 1912, William Goodyear claimed such a curvature for the front entablature of the pronaos, based on modern visual technology: a photograph, taken at a flat angle across the façade at the height of the entablature, shows a distinct regular upward curve under the pediment's horizontal cornice as it exists today.[4] However, subsequent scholarly discussion of the complexities of curvature demonstrated that a deformation of this sort is not a reliable indication for the intentionality — and thus the originality — of ancient curvature. Much rather, technical indicators had to be found: measurable deviations from right angles and straight lines cut by the ancient stone masons in order to create and accommodate those curves (fig. 2). For example, as N. Balanos pointed out in 1925 with regard to the Parthenon, the existence of a ‹donkey's back› on top of the capitals delivers tangible proof that the architraves described a polygonal line closely approximating the building's curvature and are, in fact, themselves cut with oblique angles so as to follow that curve.[5] Yet, while G.P. Stevens measured the Pantheon columns with painstaking accuracy in order to document their entasis curves in 1924, neither he nor anyone else has ever put the question of the Pantheon's curvature to the test.[6] We urgently need specific documentation here — one that does not merely rely on a documentation of the status quo, but draws on a detailed examination of the stone-cutting features in the architectural elements of the pronaos.

Other refinements?

Second, along the same lines: Were other Greek-Hellenistic standard refinements applied in the architecture of the pronaos, such as an intentional inward inclination of the columns or thicker corner columns? In the case of the Pantheon, this question has never been

4 Goodyear 1912, 133 fig. 76 (Brooklyn Museum photograph of 1895, with added straight line to show curve) and 135 n. 11: «There is also a rising curve in the front cornice of the Pantheon… This curve may be accidental, but its existence is worthy of mention. It appears to be confined to the cornice.» The validity of this photographic documentation is, of course, affected by the repaired east corner of the façade in the foreground of that photograph (below, n. 8), but the original parts of the cornice seem to support Goodyear's point. To a well-reasoned negative conclusion came now N. Theocharis in this volume, based on thorough digital measurements of the Pantheon. However, even the best photographic or digital documentation of the status quo cannot replace a direct examination of critical stone-cutting details, such as the abacus surface of the pronaos capitals (cf. here fig. 2).

5 Full account of the discussion in Haselberger 1999, 44–56, esp. 47–48 with figs. 53–54. The fundamental observation of measurable ‹distortions› in the cut of the Parthenon's architectural elements was published by Balanos 1925, yet without images, and not before the final publication of his work were illustrations presented: Balanos 1940, esp. pl. 2. For critical structural evidence demonstrating the presence of intentional curvature in a building: Haselberger 1999, 6–9 with figs.

6 Stevens 1924, 123 no. 5 (Pantheon, pronaos columns), no. 6 (Pantheon, interior columns); 142 tabella; 144–45 figs. 17–18; pl. 57 fig. 1. Stevens documented only «the best preserved shaft» per type of column (ibid. 123); judging from the photograph ibid. fig. 1, Stevens' selection in the pronaos was the 6th front-row column from east. A comparative study of the range of entasis curves – from column to column, but also within one and the same column – was not made, as Stevens points out, and is still lacking. Stevens' later, theoretical studies (Stevens 1934; id. 1943) tackle the curvature of the Parthenon, but do not return to the Roman side anymore. For the Roman use and re-interpretation of curvature: Haselberger 1999, 20–22. In Rome itself just one single building, the Republican predecessor of the Apollo Sosianus temple, is a known candidate for intentional curvature (ibid. 22 with fig. 26). In the Roman east, a dramatic re-interpretation of intentional curvature occurred around AD 110–20, thus at about the time of the Pantheon, in the Library of Celsus at Ephesos: Hueber 1999, 212–17; further Haselberger 2005, 142–43 with fig. 46.

Fig. 1: Pantheon. Frontal view, 1972, with pronaos, transitional block, and rotunda (DAI neg. 72.3099, H. Sichtermann).

pursued systematically.[7] Only K. de Fine Licht, in his fundamental Pantheon study of 1968, mentions an increased diameter in «the corner columns» of the pronaos, «noticeable only with the base of the east corner column, which is intended to be for a thicker shaft than the present one.» Yet the present east corner column, while ancient, is a baroque-era replacement column from another ancient building (along with the two adjacent flank columns of the pronaos) and thus of no help in clarifying this point.[8] A resolution was easy in this case:

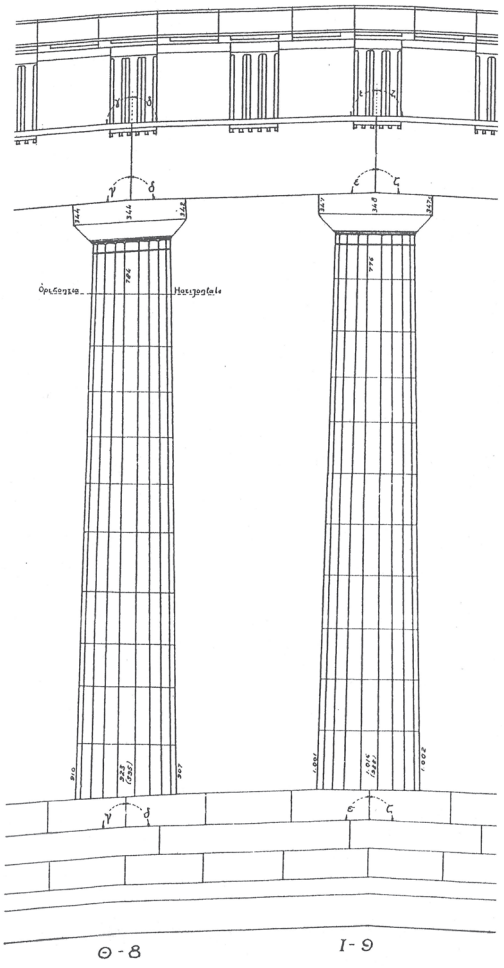


Fig. 2: Oblique angles and other critical deviations resulting from curvature in a stone-building, as observed at the Parthenon by Balanos (Balanos 1940, pl. 2, detail).

In the summer of 2006, with the kind permission of the Sovraintendenza Archeologica, S. Zink and I carried out simple circumference measurements of all pronaos columns, and the result leaves no doubt. With its diameter of 153 cm, the original, western corner column so far exceeds the range of diameters for the other original front columns (146 cm – 149 cm) that we can now plausibly postulate an intentionally thicker shaft diameter of the pronaos' corner columns, just as in the case of the corner columns at the Parthenon and other Greek

7 On the definition and other types of ancient architectural ‹refinements› in addition to curvature and entasis, see the summary ibid. 32–36.

8 Fine Licht 1968, 40 (with quotes above); cf. ibid. 241, pointing out that, since «the east side of the pronaos was very dilapidated», Urban VII «had the corner column erected.» Its material of *red* granite, as opposed to the *gray* granite of all in-situ columns of the pronaos façade, demonstrates the east corner column as originally not belonging to the Pantheon. The column shaft (broken and re-joined) probably came from the nearby Baths of Nero, as did the two other re-erected flank columns (ibid. 241). The thickening of the corner columns of the pronaos is then presented as a fact by MacDonald 1976, 63, which had no plausible basis: Haselberger 1994, 304 n. 94.

buildings.[9] For the Pantheon, we are thus one down, while an investigation on other sorts of refinements is yet to be done. Are the walls, columns, pilasters, antae, entablature or pediment intentionally inclined?

Third, further along these lines: Is there an intentional curvature in the interior of the Pantheon, in the pavement of its rotunda? I discussed this question intensively a couple of years ago with M. Korres right at the site. What has been reliably measured is a general upward bulging in the rotunda's pavement, countered by a slight but measurable depression in the center — just where it is needed to drain the rainwater coming down from the oculus.[10] Consequently, an ancient drainage channel (observed by F. Piranesi and still functioning) exits from there. There is no good reason to doubt the intentionality, and thus the ancient origin, of the central depression. Trickier to assess is the downward slope toward the walls of the rotunda: it could be intentional, but also could result from settling under the pressure of the massive rotunda walls and weighty cupola. The entire building, after all, stands on marshy, alluvial ground. How can we answer the question? In our discussion, Korres and I eventually concluded that a key criterion is to be found outside, in the pavement of the pronaos. If this pavement shows a similar downward curve toward the rotunda (which, according to several emptied water bottles, seems to be the case), then a later settlement must, at least, have *contributed* to the existing curvature of the interior. A simple, but comprehensive, leveling procedure could bring the discussion to a new level. An intriguing comparanda is now, thanks to K. Nohlen, known in detail: the monumental, roughly contemporaneous courtyard of Pergamon's Traianeum has a pavement — fully open to the sky — that features an intentional curve, created not just for the drainage of rainwater but also as an «optical-aesthetic strategy» of the architect.[11]

Misfitting elements

Fourth comes a hugely consequential question that concerns the technical fit of the Pantheon's dressed stone elements or, more precisely, the sometimes blatant absence of their appropriate adjoinment. Quite a few ‹misfits› have been observed in the pronaos architecture — where they are interpreted as evidence for a change of

9 In collegial generosity, Eugenio La Rocca and Giovanni Belardi, Sovraintendenza Archeologica del Comune di Roma, made our measurements at the Pantheon possible on short notice. I am also grateful for the practical assistance of Stephan Zink. The measurements were taken as circumferences of the column shafts at a height of c. 45 cm above the base and resulted, for the front columns, in the following diameters, from the east: (147.7 cm; not original) — 149.1 cm — 145.9 cm — 147.7 cm — 148.6 cm – 148.5 cm — 148.3 cm — **152.8** cm (original corner column in bold, columns with repaired shaft tops underlined); a more detailed account will be published separately. The relative increase of the western corner column amounts c. 1/30 of the regular diameter which averages 148.0 cm (+1 cm/–2 cm). It remains open whether this increase was the result of a specific commission or whether, among a range of prefabricated column shafts delivered to the building site, simply the thickest were selected. On the intentionally increased diameter (by precisely 1/50) of the Parthenon's corner columns of the Parthenon as well as similar increases in the corner columns of other 5th c. BC Attic buildings and the codification of such an increase (1/50) in Vitruvius 3.3.11, see Haselberger 2005, 124.

10 On this and the following aspects, Haselberger 1999, 22–23 with figs. From the delightful hours of discussion with Manolis Korres at the Pantheon in June 2002 I have benefitted more than these lines can express. The first documentation of the rotunda's curved pavement comes from a Danish architect: Bergh 1954, esp. 13 fig. 2; more recently Pelletti/Fosci 1989, esp. 12 fig. 2; now see N. Theocharis in this volume. Francesco Piranesi's observation of a «cloaca antica per ricevere le acque piovane» under the center of the rotunda pavement is recorded in: Piranesi 1836, pl. 10.

11 Nohlen 2005, with quote ibid. 165; on the date (c. AD 114–29) Radt 1999, 212–13. For the interpretation of the Pantheon's interior as a ‹courtyard› rather than an interior, see Heilmeyer 1992, 13.

Fig. 3: Pantheon, interior of rotunda (west). Striking ‹misfit› between pilaster capital and shaft, both perfectly carved in themselves, yet neither matching in width nor in alignment (E.A. Dumser).

plan in the pronaos design.[12] Yet we can also, and almost regularly, find such misfits within the rotunda. There too, the misconceived alignment and width of the elaborate pilaster capitals and their fluted shafts — well-crafted in themselves but ill-suited to the structure as a whole — is striking (fig. 3). Thus, this quality (or lack thereof) is not restricted to the pronaos, and instead it appears to be an overarching characteristic of the Pantheon's dressed stone architecture: carefully carved individual pieces, often badly fit into the context of other pieces. Does this seeming madness have any method? Could it be the result of a rigorous and professional division of labor applied by the imperial building yards? In the case of Augustus' Temple of Mars Ultor J. Ganzert compellingly reached just this result.[13] Hardly any drum of the still-standing columns aligns its flutes properly to those of the adjoining drum. Unlike Greek standard practice, the drums were all completely prefabricated, flutes included, which permitted a vastly increased speed of building, though with compromises in detail. The possibility of deliberate, acceptable ‹compromises› in quality has not been taken into account for the Pantheon, while it appears to explain best what looks so strange otherwise.

In fact, such misfits emerge as a broader, still unappreciated characteristic of Roman-imperial building yards, in particular when working on grand-scale projects. For the Pantheon, the list of technical shortcomings can easily be continued. In the pronaos itself, the column capitals, deemed to be «the finest Roman capitals of the Corinthian order we know of,»[14] sit on monolithic shafts whose entasis curve is by no means as perfect as Stevens' «best preserved» shaft might indicate.[15] Even sighting along the column shafts with the bare eye reveals this without measurement. Markedly deficient appears the entasis curve of the façade column right next to the one Stevens selected; it is one

12 Wilson Jones 2000, 202–06. Among the features of the Pantheon «that are sufficiently unusual or perverse as to suggest that they may not have been desirable» Wilson Jones includes the misaligned pronaos pilasters (whose flutes grossly mismatch the capitals: no. VI, ibid. 202–03 with figs. 7–8) as well as the badly joined groups of pilaster capitals in the pronaos (no. VII, ibid. 203, with fig. 10.9). On the first shortcoming in Wilson Jones' list, the ancillary second pediment of the pronaos façade, see below with fig. 7.

13 Ganzert 1996a, 150 fig. 38; id. 1996b, esp. 201, limiting, however, such industrial production and «Schlampereien» to the specific time pressure of the Augustan building program.

14 Heilmeyer, in: Heilmeyer et al. 1992, 8 (quote); cf. Heilmeyer 1975, 330, with reference to Jacob Burkhardt.

15 Stevens 1924, 144 fig. 17 (entasis curve) with fig. 1 (work at 6th front-row column from east); further ibid. 123: «No attempt was made to compare the entases of different columns of the same order. In each case the best preserved shaft was selected for measurement.»

of two front-row columns with an elaborate repair at the top of the shaft, where it shows a strangely flat (if not actually concave) contour.[16] Furthermore, the perfection of the capitals contrasts stunningly with the irregular spacing of the modillions in the entablature (fig. 4), with random variations amounting to about half the width of a modillion (or c. 12 cm over an axial average distance of 81–82 cm).[17] And as long observed, there is no vertical concordance in the modillions of the pediment, both in themselves and in relation to the column axes.[18]

Imperial haste, a temporary shortage of material, or the lack of skilled manpower might explain this evidence. But one should also consider whether the various shortcomings in the Pantheon's cut-stone architecture were part of a characteristic picture — one in which ‹messy› solutions form an intrinsic ingredient in the planning and building process. Despite masterful stone-carving, a lack of coordination, especially in joining operations, can be observed. There are no clear seams separating the perfect from the less-than-perfect results. Rather, the phenomenon emerges as a recurrent feature *throughout* the structure and, while not confined to certain locations, affects lines of *juncture* in particular. It is, for instance, unlikely that the same subtle-minded designers and stone-masons responsible for the capitals also produced the cornice blocks with their irregularly spaced modillions. Also, neither the workmen carving the pilasters (in both the pronaos and the rotunda) nor the site-supervising architect seem to have been aware that the pilasters were too wide for their capitals. Despite the isolated perfection of the finally sculpted capitals and masterfully fluted pilasters, their combination is awkwardly mismatched.[19] This is not a matter of hasty workmanship since the fine quality achieved in the capitals alone amounts to a multiple of the work required to fix the lack of alignments and flawed connections — had they been known, or anticipated, at the right time and place!

Division of labor, prefabrication, standardization, stock-piling, surplus production, long-distance trade in Roman imperial cut-stone architecture as an innovative building strategy: it is along these lines in the first place, I think, that we have to understand the puzzling contradictions in workmanship and design of the Pantheon (or the Temple of Mars Ultor, for that matter). In the wake of J.B. Ward-Perkins' seminal work, this trait in Roman imperial building has recently received new attention within Rome's metropolitan perimeter through the marble yard studies of P. Pensabene and M. Maischberger.[20] And it has been recognized that the prefabrication of cut-stone

16 On the repaired — or extended — shaft tops of the 2nd and 7th front-row columns of the pronaos (from east) now in detail: Hoffmann in this volume, with further evidence of such repairs among Rome's imperial buildings. For additional observations by S. Zink on the entasis of the pronaos columns, see Addendum.

17 Haselberger 1994, 290–92 with figs. 3–4; in the horizontal pronaos cornice, an average of 81–82 cm for the axial distance of the modillions was derived from both frontal photographs of the pediment (with little distortion) and the documentation drawing of A. Leclère (1813), see below with n. 34. Yet based on the same evidence, as well as personal autopsy, it is obvious that the actual spacing of the modillions may vary considerably, as for example in the horizontal cornice above the 6th and 7th front-row column from east (here fig. 4). On the irregular distances in the modillions of the pediment drawing at the Mausoleum of Augustus, see below with n. 32.

18 Fine Licht 1968, 42: «There is no rhythmic harmony between the consoles and the position of the columns.» Earlier, Desgodetz 1682, 20: «Les modillons ne répondent point au milieu des colonnes ni des pillastres.»

19 A special testimony to the careful fluting procedure applied at the Pantheon (and other imperial marble buildings in and around Rome) is still preserved at the bottom of the far-western front pilaster of the pronaos: incised straight lines and circles for the precise definition of flutes and fillets. Along with additional incisions preserved some 5 m from the top of the same pilaster, these traces were first observed by Claridge 1983, 125 with fig. 13.

20 Pensabene 1994; Maischberger 1997. For the work of J.B. Ward-Perkins since 1950s, see his collected essays in: Dodge/Ward-Perkins 1992, esp. 1330, 61–105.

Fig. 4: Pantheon, entablature of pronaos. Detail of cornice with grossly irregular spacing of modillions (author).

elements critically increased in the periods after Augustus toward ever more specialized trade and processing patterns ranging, in the course of the 2nd c. AD, from major changes in the operating systems of imperial quarries to a notable circulation of semifinished products and an ‹internationalization› of local stylistic forms.[21] Yet we still have to consider the emergence of new, disconcertingly ‹un-Greek› building strategies, such as the use of pre-fluted column drums in a major Augustan temple, in conjunction with the Pantheon.

Even then, our understanding of the Pantheon's misfits may still not be complete. The lack of concordance in the pronaos modillions (between horizontal and raking cornice as well as to the column axes) may well lie in the conscious artistic decision to abandon a vertical alignment in favor of a more fluid treatment, a development acutely observed by T. Mattern for the post-Augustan and Flavian periods in Rome.[22] Most important in this context is the stunning avoidance of alignment in the Pantheon's interior orders, as documented in detail by M. Pelletti and M. Fosci.[23] Adding to the disjointed organization is the rotunda's square-based pavement design which leads to drastically truncated floor patterns at its perimeter.[24] So far, no one has interpreted these mismatches as results of a change of plan, with an embarrassed Hadrian accepting yet another flawed design. Rather, attempts must be made to explain such ‹disconnects› as a calculated design strategy. Analyzing the numerical relationships in the divisions of the interior orders and the cupola, G. Gruben arrived at a system of rationally staggered proportions based on the number 28 of the cupola division as leit-

21 On these developments esp. Fant 1988; Mattern 2000.

22 Mattern 2001, 82–83; further below, n. 32.

23 Pelletti/Fosci 1989, 13 fig. 3; cf. Wilson Jones 2000, 194 fig. 25. Ibid. 189–90 on the criticism since the Renaissance.

24 Pelletti/Fosci 1989, 11 fig. 1.

motif.[25] In view of the consistent discordances of the interior zones from floor to cupola, M. Wilson Jones has sensibly described the rotunda's composition as weaving «a magical dance around a syncopated, almost jazzy, rhythm.»[26]

In this context, we will have to finally see the flat and thin attic pilasters. The problem is not their visual ‹denial› of a load-bearing role, but our foisting such a role upon them. The cupola was not supposed to appear to rest on them; instead, with the actual flow of forces consciously veiled, the dome defies the impression of weight.[27] Traditional perceptions, as reinforced in the façade of the Pantheon, were fundamentally reversed in its interior. The weightless ‹syncopation› of the domed space reveals itself as a momentous step toward metaphysical architecture. By literally plastering over the most offensive, and at once most telling, part of this endeavor for lack of scholarly explanation, one missed a culminating point in the development of Classical architecture.

The construction drawings

The aspect of highly specialized imperial work yards brings me, *fifth*, to the ancient construction drawings in front of the Mausoleum of Augustus. As is well known, they cover nearly all of the remaining travertine pavement in front of the Augustan tomb and belong to four partially or fully preserved drawing complexes representing a small and a very large pediment as well as a huge Corinthian pilaster capital and an arched construction.[28] Incised on the pavement, these drawings obviously postdate the construction of the pavement which in turn postdates the construction of the Mausoleum since the slabs sit at a raised level atop one of the steps to the Mausoleum entrance. Thus, the construction of the pavement is either post-Augustan or at least late-Augustan, and later still are the drawings. (A Renaissance or post-Renaissance origin, on the other hand, can safely be excluded as no one would excavate a ‹drawing surface› situated, at that time, some 6–7 m below ground.)

Important for our purposes is the attribution of the larger of the two pediments to the Pantheon. This attribution rests on the identical, or tightly coinciding, measurements of the drawing with those of the Pantheon's pronaos pediment. They are the axial column distance; the — exceptionally steep — pitch of the pediment; all tangible details of the entablature, especially the distances of the modillions; and even a random course line of the tympanum. While the small pediment drawn on the pavement can be reasonably excluded for the Pantheon, and so the Corinthian pilaster capital (as too big, at least for the existing Pantheon[29]), I did attempt to connect the drawing of the arched construction with the Pantheon's pronaos and its roof construction.

25 Gruben/Gruben 1997, 68–70 with fig. 31, based on the documentation of Pelletti/Fosci 1989 and the interpretation of Martines 1991, 4–5. Independently along these same lines of interpretation: Loerke 1990, 35–41.

26 Wilson Jones 2000, 194 (with quote), contrasting this «syncopated» composition with «the more obvious 4/4 march band beat associated with academic architecture, whether ancient, Renaissance or Neoclassical.» Further on this: Martini 2006, 33–34, stressing the «ganz ungewöhnliche Aufgabe der Achsenbindung.»

27 The pivotal analysis comes from Kähler 1965, 58–62 (shortened Engl. transl.: Kähler 1967, 45–46), pointing out the «hovering» effect of the cupola in the interior and the ‹visual obstruction› of the actual load-bearing system «by an entirely different static framework» of columns, pilasters, and coffering. Further MacDonald 1976, 70–72, addressing the step toward ‹dematerialization› in the Pantheon's interior.

28 Haselberger 1994/1994a/1995 (pediments and pilaster capital); with addition: Haselberger 1996 (arched construction). On these drawings, e.g., Gros 1996, 176–77; Heilmeyer 2000, 130–31; Wilson Jones 2000, 206–07.

29 Haselberger 1994, 284; the abacus width surpasses that of existing Pantheon capitals by c. 60 cm or almost one third. However, Wilson Jones 2000, 207 connects this oversize with the postulated plan of a taller Pantheon façade with bigger capitals.

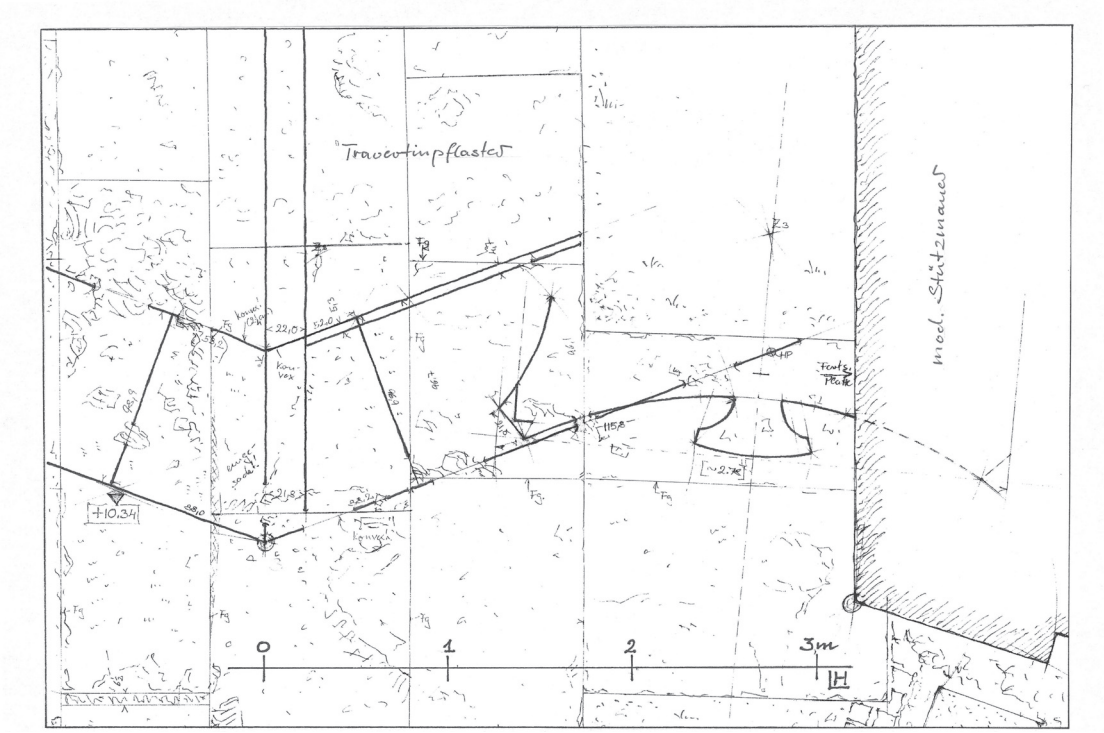


Fig. 5: Ancient construction drawings of the Mausoleum of Augustus, detail. Documentation plan with Corinthian pilaster capital and part of pediment (author).

Meanwhile, I documented all the drawings in full detail, and apart from some changes in the curve of the pilaster capital (fig. 5) no new findings or aspects came up.[30] The connection of the big pediment drawing has recently been questioned, with the argument that by Hadrianic times the general level of the northern Campus Martius had risen by about 1½ m and therefore the pavement at the Mausoleum may not have been visible anymore.[31] Yet the fact of rising levels also applies to the Ara Pacis, and we do know that this important monument was kept accessible, in a dignified way, by erecting 2 m-high precinct walls topped by a metal balustrade. Similar provisions we can assume for the tomb site of the first emperor. Still, I very much agree that the attribution of the large pediment to the Pantheon, while supported by a compelling coincidence of measurements, is not fully concluded. Indeed, with a full photogrammetric documentation of the Pantheon pediment now available, it is about time to produce a detailed graphic comparison between the drawn and the built pediments.

But at least two aspects have become tangible with all clarity. In a broader perspective: the grounds in front of the Augustan Mausoleum, no doubt imperial property, served at some time after the tomb's construction (but before the end of Antiquity) as an expansive planning and drawing site, with the purpose of preparing monumental dressed-stone elements for building projects situated at some distance. This attests to a remarkable

30 With the kind permission of Eugenio La Rocca and Paola Virgili, Sovraintendenza Archeologica del Comune di Roma, and the assistance of Betsey Robinson, Harvard University, the tracing floor at the Mausoleum of Augustus — freshly cleaned for us — was completely documented during two weeks of work in May/June 1996. It resulted in an overall plan drawing in the scale of 1 : 25, of which fig. 5, above, provides a detail.

31 Martini 2006, 14. For the following reference to the Ara Pacis and its buttressing wall against the rising terrain: Rakob 1987, 699–703, esp. 703 fig. 7, phase C.

specialization and an attendant spatial separation in the organization and implementation of Rome's grand-scale building projects. It is this kind of disconnected compartmentalization that might produce the ‹misfit› perfection seen in the carved marbles of the Pantheon. Further, from a detailed point of view: while the drawings render overall construction lines (straight lines, parallels, or verticals) with the accuracy one expects from an important planning document, some of the details are incised with surprising irregularity, such as the intervals of the modillions in the large pediment. Along the raking cornice, for instance, their axial distance (measured horizontally) changes from about 74 cm at the bottom to 78–80 cm in the upper section; in the horizontal cornice, where the distances closely adhere to axial distances of 81 cm, one interval abruptly shrinks to c. 70 cm; and no attempt was made at achieving a vertical concordance between to two series of modillions.[32] This reflects the very same characteristics observed at the Pantheon façade and now extends the puzzling contradictions in workmanship to the level of preparatory drawings. Grand-scale building in the imperial period appears to have followed, and developed, procedures of design and execution still deeply unfamiliar to us.

The tympanum lacuna

My *sixth* wish leads us to the Pantheon's pronaos pediment, as carried out, and more specifically to the huge blank pedimental field it presents today. There exists no specific and sufficiently detailed study of the holes and cuttings in the tympanum, many of them no doubt ancient, but perhaps not all of them. All the more confidently repeated is the reconstruction of the pediment decoration with eagle, wreath, and ribbon — which, as is well known, essentially rests on the Trajanic relief built into the portico of Santi Apostoli church.[33] The best published documentation of the pediment, along with the tympanum cuttings, remains Leclère's elevational drawing of 1813, published as a needle-sharp heliogravure by H. d'Espouy c. 1910.[34] Yet even this fine documentation omits, spectacularly, the massive ancient stone projection readily seen in the center of the tympanum (and deemed by some to have served as support for the hypothesized central eagle).[35] The admirably drawn traditional visualization by Sheila Gibson, authoritatively presented in Ward-Perkins' *Roman Imperial Architecture* and widely accepted, has now even more suggestively become ‹petrified› in John Burge's computerized reconstruction of the Pantheon.[36] Yet the only correct description of the state of affairs has been spelled out by MacDonald with laconic precision: «The fastigium sculpture is unknown.»[37]

32 For the incised evidence, Haselberger 1994, 281–82 and esp. fig. 1; cf. above with n. 17. The suggestion of Mattern 2001, 99 n. 528 to interpret the increasing distances of the incised raking modillions as the result of a refined design strategy is intriguing, but alas not borne out by the random variance in one of the incised horizontal modillion distances (the one preserved last toward the pediment center).

33 On this, and on the observations of Lucos Cozza during restoration work on the Pantheon's pronaos pediment in 1954, Fine Licht 1968, 45–46, with reference to a similar tympanum decoration above the portal suggested by Donaldson 1833, pl. 17.

34 D'Espouy II, 135 plate (scale 1 : 200); the extraordinary potential of this heliogravure became obvious when a photographic enlargement (c. 1: 85) was made for the *Scientific American*: Haselberger 1995, 60 fig. (G. Fadellin, Philadelphia). The original ink and watercolor drawing, in the scale of 1 : 50, is in the possession of the École nationale supérieure des beaux-arts, Paris.

35 Fine Licht 1968, 46.

36 Ward-Perkins 1981, 111 fig. 52 (restored view of the Pantheon façade by S. Gibson); cf. the earlier version of this drawing, also from S. Gibson, with a figure-filled pediment in Boëthius/Ward-Perkins 1970, 257, fig. 101. John Burge's extraordinarily successful computer reconstructions of the Pantheon in Wilson Jones 2000, 213 figs.; now also in Kleiner 2007, 182 fig. 19. Further see façade view of Pantheon (by K. Wolter) with same tympanum reconstruction in Martini 2006, 23 fig. 10.

37 MacDonald 1976, 63.

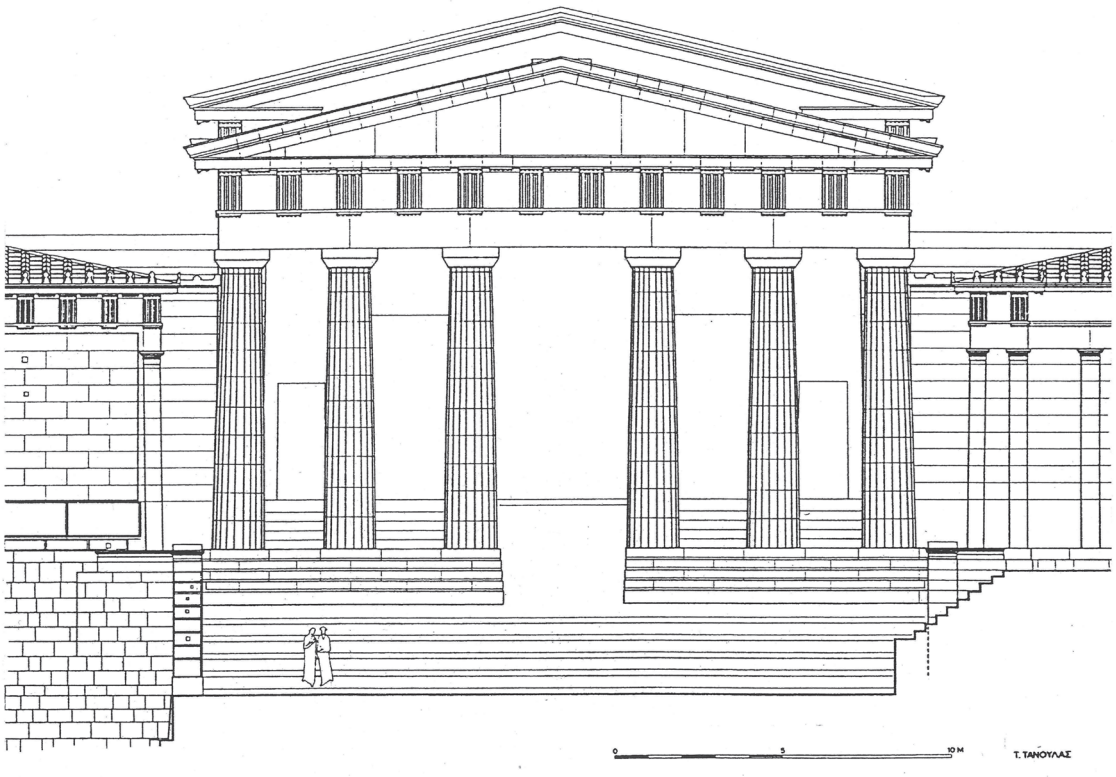


Fig. 6: Mnesiklean Propylaia, Athens, 430s BC, west façade with staggered pediments (Tanoulas 1994, pl. 2, trimmed).

We urgently need a thorough documentation and study of the Pantheon's pronaos tympanum, in order to fill this monumental, and blatant, lacuna in our knowledge of Roman art. A visual documentation alone, even if superbly precise, will not do. It must be accompanied by a direct, eye-and-hand examination in the established tradition of *Bauforschung*.

The alleged portico fiasco

Seventh and final in my list of unresolved questions comes the much-debated «compromise» in the design of the existing Pantheon façade. According to Wilson Jones' argumentation, the existing portico is «second best» compared to what was really intended to be built. And this is the reason for the flawed connections between pronaos, transitional block, and rotunda, which are tangible in a whole list of architectural misfits, most visibly in the two stacked, interfering pediments of the pronaos and transitional block. The claimed original design of the Pantheon façade is supposed to have featured a taller front architecture utilizing 50-foot column shafts, so that the height of the pronaos pediment coincided with the second pediment in the transitional block. The existing Pantheon façade becomes the result of a remarkable, in fact regrettable, imperial compromise. Since the emperor could not receive the 50-foot monolithic column shafts in time, he had no choice but to give in and settle for the second best with all the (alleged or real) infelicities that came with this monumental «portico fiasco.» Did the emperor in the end, by having Agrippa's name inscribed on the portico, «not want to take the credit for a flawed outcome?» Only by «mentally restor(ing) a taller portico,» we are told, will we truly gain «a Pantheon consonant with the

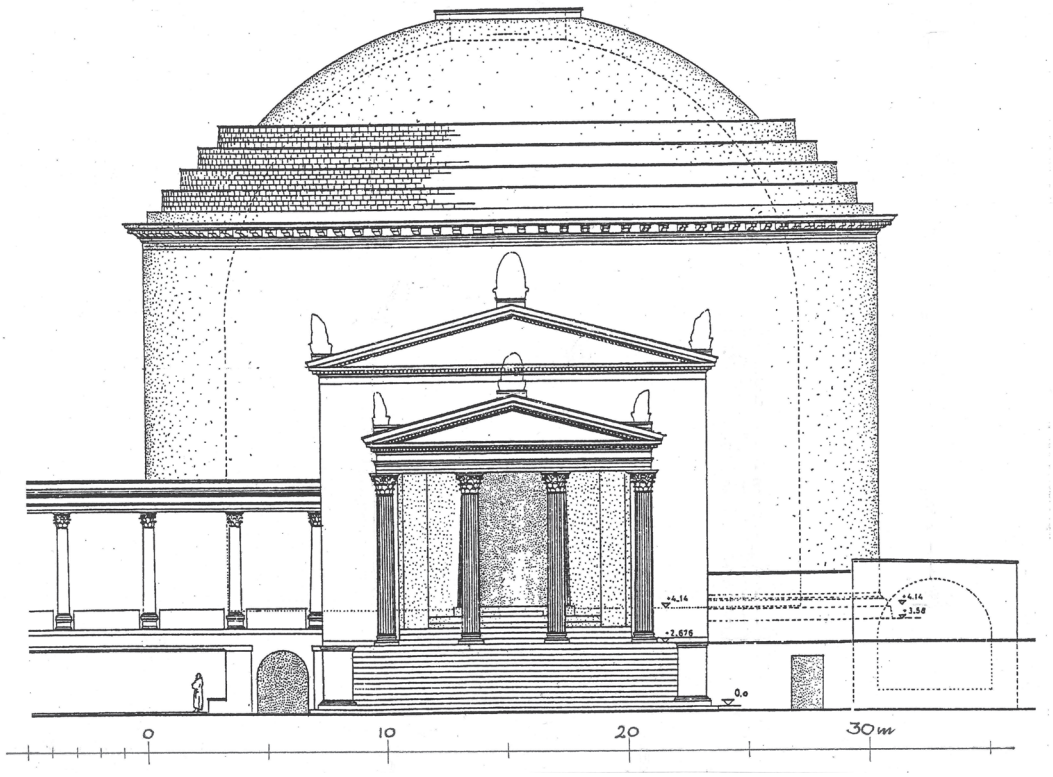


Fig. 7: Temple of Zeus Asklepios, Pergamon, AD 120s/30s, with double façade pediments. Reconstruction on the basis of extant fragments (Ziegenaus 1981, pl. 2, detail).

thunderous climax of Roman architecture that is Hadrian's legacy.» [38]

Yet despite the almost universal applause this hypothesis has received, I wonder whether accepting this dramatic solution and ‹re-designing› the Pantheon as it *should* have been might not prevent us from a subtler understanding of what *is*. Many of the structural-architectural misfits used to buttress the argument of a design fiasco can, and to my mind should, be explained in view of the now-emerging ‹non-Classical› traits of Roman-imperial building mentioned above. Not trying hard enough to understand these might obscure, rather than clarify, our view. Does the accessory pediment of the Pantheon's transitional block have no parallel in ancient architecture? Do we really have to accept the point that «no ancient building copies this arrangement»?[39]

In the case of Classical Propylaia on the Athenian Akropolis, the double pediment is considered an integral element of Mnesikles' pioneering creation.[40] The unprecedented ‹break› in the axis of this building in line with its five-doorway wall defines the momentous division between exterior and interior, between the profane and the sacred (fig. 6). Athens' paradigmatic gateway with its double pediment could well have stood as the model for the gateway to the Pantheon. Of more direct importance is the younger sibling of the Pantheon in the Greek east that has, strangely enough, been

38 For a full presentation of the argument, see Wilson Jones 2000, 199–212, with quotes ibid. 202, 211–12. Further observations and conclusions see Wilson Jones in this volume.

39 Wilson Jones 2000, 203, with quote.

40 Gruben 2001, 193–202; Haselberger 2005, 109–11, 133–36, 145–46. The double pediment of the Propylaia has now been tied into the Pantheon discussion, see Wilson Jones in this volume.

completely excluded from the discussion: the Temple of Zeus Asklepios in Pergamon, built during the AD 120s/30s in direct response to Rome's Pantheon (fig. 7). Enough pieces of its frontal architecture survive to prove beyond doubt the existence of two staggered pediments. [41] It remains unclear only whether two pediments were indeed, as shown in the published reconstruction, so neatly separated or whether they might not have intersected, just as in the lamented Pantheon compromise. The immediate impact of the Pantheon in Rome on the design of the Pergamene ‹Pantheon› is undisputed.[42] Should we then assume that Hadrian promulgated the imperial building defeat in the capital and imposed a similar deficient solution on a prominent Pergamene sanctuary — declaring beautiful, as it were, the emperor's ‹new clothes›?

Still, we have to ask why later ancient reinterpretations of the Pantheon in the vicinity of Rome, such as the Tor de' Schiavi and the Mausoleum of Maxentius (both from c. AD 310), do not show the ‹compromise solution› of the existing Pantheon façade. Was it, from the distance of two centuries, finally acceptable to realize an uncompromised design — one that echoes the postulated original design of the Pantheon façade and appears, in our eyes, as the clearly preferable solution? For the comparatively small Tor de' Schiavi mausoleum such a façade design is indeed documented (while not preserved anymore), yet still deemed gravely deficient.[43] As for the Mausoleum of Maxentius, reaching about half the size of the Pantheon and thus a closer comparison, there is a different explanation (fig. 8).[44] The relevant parts of the Maxentian Mausoleum are a free reconstruction, with no specific elements of the superstructure found at all, and we prefer this solution for the same reason that a Classical-minded Thomas Jefferson wished to see it at his design for the Rotunda of the University of Virginia (fig. 9). In the spirit of an age that plastered over the Pantheon's disconcerting interior order, Jefferson improved on the ancient model, thus avoiding the puzzling double pediment and its alleged «disastrous appearance.»[45]

The essential question that arises from this discussion is whether, at today's subtler level of research, we do ourselves — and the realities of history — a favor by evading aspects of the

41 Monographic treatment of the Zeus Asklepios temple: Ziegenaus 1981, 30–75; for the preserved dressed-stone elements of the pronaos and its portico 47–56 with pl. 65–74 and overview pl. 64; reconstruction drawing ibid. pl. 85. Neither the full separation of the two frontal pediments nor the step-rings of the rotunda's dome are attested, which is unfortunately, along with other assumptions, not expressed in the reconstruction drawing. Basic for the revised date: Habicht 1969, 9–11 (Hadrianic period, presumably between AD 123–38); cf. Radt 1999, 231. While addressed in studies of the Pantheon (Thomas 1997, 182–84 with fig. 9; Martini 2006, 9 with fig. 2), the Pergamene Temple of Zeus Asklepios has consistently been omitted in the debate on the two pediments of the Pantheon façade.

42 E.g., Habicht 1969, 11; Hoffmann 1984, esp. 99; id. 1998, 50; Jones 1998, 69; Radt 1999, 231; Gruben 2001, 485.

43 Tor de' Schiavi, Via Praenestina (c. AD 305–09), with clear diameter of c. 14 m (main level of rotunda): Rasch 1993, esp. pl. 28, 1–2 (18th c. veduta), pl. 87–88 (reconstruction drawings). Even in this case of a ‹perfect› alignment of the cornices, Rasch points out the resulting grave imbalances in the connection between rotunda and pronaos: ibid. 86–87 («… handelte man sich durch ein solches Zusammenfügen nur schwer zueinander passender Bauformen an der Anschlußstelle gravierende, nicht auszugleichende Unausgewogenheiten ein»). On the building date ibid. 78.

44 Mausoleum of Maxentius, Via Appia (c. AD 308–12), with clear diameter of c. 25 m (main level of rotunda): Rasch 1984, esp. pl. 66–67 (in situ evidence), pl. 84–85 (reconstruction drawings); reconstruction of the pronaos elevation according to ‹usual› column proportions ibid. 64. On the building date ibid. 70–74. For the Mausoleum of Helena, Via Labicana/Casilina (AD 320s; clear diam. c. 20 m), and the ‹Tempio della Tosse› in Tivoli (decades after AD 386; clear diam. c. 12.5 m), see Rasch 1998.

45 Wilson Jones 2000, 206, with quote and reference to Jefferson's Rotunda as well as Canova's Tempio in Possagno, northern Italy.

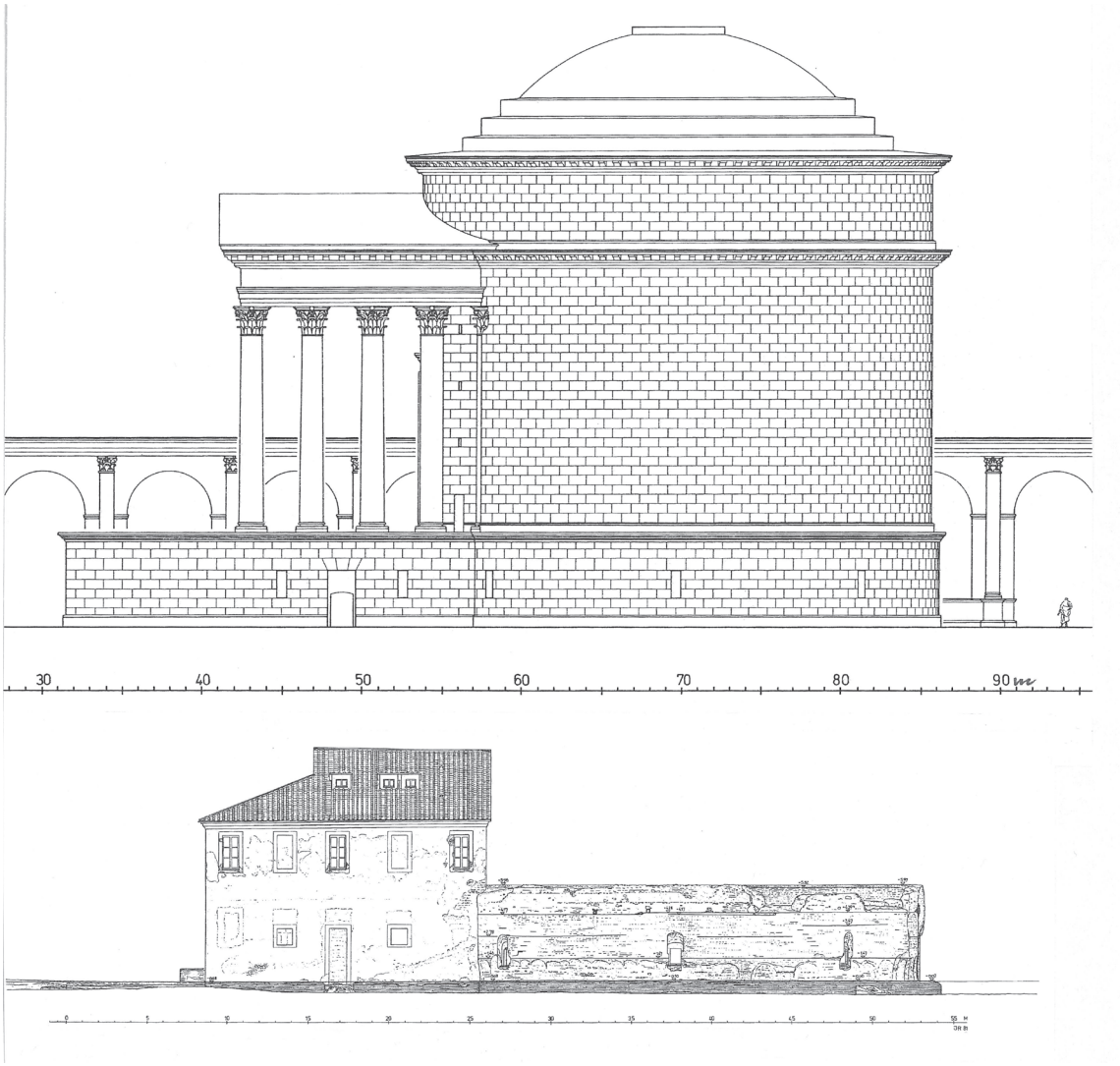


Fig. 8: Mausoleum of Maxentius, Rome, c. AD 310. Reconstruction, with hypothetical alignment between pronaos and rotunda, and actual evidence (Rasch 1984, pl. 85, detail, and pl. 67 A, resp.).

Pantheon that we cannot find acceptable. The easy acceptance of the «portico fiasco» narrative might prematurely close a file that should, to my mind, remain open. We risk plastering over the uncomfortable realities of the Pantheon yet again.

Addendum, April 2008

And my *eighth* open question regards the entasis documentation of the pronaos columns. Stephan Zink of the University of Pennsylvania was kind enough to verify, as far as possible with the plain eye, the character of the entasis curve applied in the pronaos' seventh front-row column from the east. He extended this examination to characterize all the frontal columns of the pronaos, in a way that does not exist at present. I quote at greater length from his letter of April 16th, 2008:

> Ebendiese zweite Säule von rechts [die siebte Säule von Osten] ist grundsätzlich etwas schlanker als die Ecksäule daneben. … Auch die Entasis-Kurve der Ecksäule er-

Fig. 9: University of Virginia, Charlottesville, USA. Rotunda, ca. 1810–20, by Thomas Jefferson, with alignment between pronaos and rotunda as suggested for original design of Pantheon (author).

scheint mir deutlich verschieden von jener der zweiten Säule. Bei der Ecksäule ist die Entasis nämlich auch in der oberen Hälfte noch sehr ausgeprägt, wobei die Kurve sich in der Hälfte des Schafts wieder einzuziehen beginnt. Im Vergleich dazu ist die Entasis der zweiten Säule von rechts ganz anders gearbeitet. Bei dieser liegt die ‹Betonung› der Entasis nämlich im unteren Bereich, während die obere Hälfte sehr schlank ist. Der Säulenhals erscheint sogar fast etwas überschlank, so daß sich der Hals knapp unter dem Kapitell sogar nochmal verbreitern muß, um zum Kapitell überzuleiten.

Zur Flickstelle der zweiten Säule [von rechts]: Der obere Säulenablauf wurde hier wohl komplett ersetzt, und das Reparaturstück scheint dabei etwas zu dick ausgefallen zu sein. … Die Entasis-Kurve des Schafts wurde jedenfalls *nicht* mehr berücksichtigt.

Die zweite Säule von *links* [Osten] besitzt eine Flickstelle an gleicher Stelle mit denselben Charakteristika. Auch die Entasis-Kurve dieser Säule ist jener der zweiten Säule von rechts sehr ähnlich (also wieder ein schlanker Schaft mit betonter Entasis-Kurve im unteren Bereich und sehr schlankem Hals).

Die Säulen zwischen den beiden eben beschriebenen geflickten Säulen — das sind dann die vier mittleren — sind im Gegensatz zu den jeweils zweiten Säulen (von links und rechts) wieder etwas massiver (wobei eben immer noch die Ecksäule ganz rechts deutlich massiver zu sein scheint). Der Hals dieser Säulen kommt mir auch nicht so schmal vor, und die Entasis-Kurve schwingt erst relativ weit oben ein. Die ‹Betonung› ist hier also ziemlich gleichmäßig am Schaft verteilt.

Nun habe ich mir auch noch die unteren Säulenabläufe angeschaut: Hier ist auffallend, daß die zwei Säulen mit Flickstellen (also jeweils die zweiten von den Ecken her) wieder ‹aus der Reihe tanzen›. Bei diesen zieht die Kurve nach unten hin nämlich vergleichsweise abrupt ein, so daß der Schaft vor dem Ablauf nochmal deutlich schmaler wird (so, als ob man einen Ring um den Ablauf gearbeitet hat und diesen dann mit dem Rest verbunden). Die anderen Säulenabläufe hingegen schwingen relativ flach und gleichmäßig aus. …

Insgesamt also lassen sich drei Gruppen von Säulen unterscheiden (ohne jetzt die linke Ecksäule miteinzubeziehen, die ja von einer päpstlichen Reparatur stammt):

1. die jeweils zweiten Säulen mit ihren Flickstellen,
2. die vier mittleren Säulen,
3. die Ecksäule rechts.

… Das geht jetzt alles schon etwas weit, und ich weiß eigentlich nicht, was Du mit Deiner ursprünglichen Bitte, mir die zweite Säule und deren Flickstelle anzuschauen, für eine Fragestellung verfolgt hast. …

(with the author's kind permission)

Clearly, Stevens' entasis measurement of the «best» column in the pronaos (above with n. 15) will have to be placed in the context of a fuller entasis documentation of the pronaos columns. In particular, these entasis measurements should include the two façade columns with repaired shaft tops. Unlike the four central façade columns, and the [intentionally thicker] (right) corner column, their shafts seem to have arrived at the construction site with fully prefabicated entasis curves, yet in somewhat undersized lengths. Could this be another one of those ‹misfits› that came with a highly structured division of labor? Should we construct a new twist in the complex story of the Pantheon's design? In any case, this aspect of the design process remains to be fathomed, and the evidence waiting to be explored stands right in front of our eyes.

How the Bern Digital Pantheon model can help answer ‹nagging questions› about the Pantheon

Nikolaos Theocharis

During his presentation «The Pantheon: Nagging Questions to No End», Lothar Haselberger raised several topics that still require adequate explanation. However, answers have been found to the following two questions thanks to the 3D Bern Digital Pantheon Model:

1. Is the surface of the Pantheon's floor intentionally curved, and if so, why?
2. Is there any form of entasis in the architectural system of the portico?

1. The Curvature of the Floor

Our measurements clearly show that the floor of the rotunda is curved, albeit irregularly. However, the measurements do not reveal a significant enough depression in the centre of the floor to explain the presence of a kind of impluvium directly beneath the opaion (oculus).
Figure 1 shows a slice of the point cloud below and above ground level: the slice is 2 m thick and contains 400 colours at the maximum range, which change every 1 mm.

Spherical structure
As can clearly be seen (Fig. 1), the curvature of the floor in the rotunda almost conforms to the idea that the builders wanted to give it the form of the surface segment of a very large sphere. This theory has been subject to a number of interpretations, one of which is that the surface was intended to represent the earth's surface. However, the curvature is simply too imprecise for this to be the case. As Figure 1 shows, the largest deviation from a spherical form appears in the western half of the rotunda; even there the deviation is not symmetrical but is more pronounced in the northern than in the southern quarter. We can, therefore, deduce that the curvature was not intentional but is rather the result of deformations that occurred during construction or after the building had been completed. This can be confirmed (or supported) by the sloping deviation of the pavement in the portico, which can also be seen in Figure 1: as many scholars have already observed — indeed, Lothar Haselberger once tested this observation with some bottles of water — the floor of the portico slopes down slightly to the entrance, or rather to the transitional block, and, consequently, across the entire span of the rotunda.
The conclusion that can be drawn from Figure 1 is that the curvature of the floor inside the rotunda as well as its inclination in the portico may have been caused by the weight of the rotunda: during construction and after the building had been completed, the rotunda's walls must have created an enormous amount of pressure on the substructure and the soft ground below, which may have led to a settling of the floor that followed the direction of the walls downwards.

Impluvium
The second observation that this measurement-based image (Fig. 1) reveals concerns the slight dip of the curved floor near the centre of the rotunda. It has been suggested that this was done intentionally to create a kind of impluvium, from where the rainwater coming in through the opaion would collect and then drain into the antique canal, discovered by Piranesi, beneath the floor. However, as the image shows, the strongest inclination or deviation from a spherical form of the surface does not appear in the centre of the floor but in its northwestern quarter (in pink and magenta in the image). Again, the irregular form and position of these areas suggest that this was not created intentionally but may have other causes, such as partly differentiating pressure points in different areas of the ground and/or the foundations.

2. Was entasis used in the portico of the Pantheon?

The second question that can be answered thanks to the 3D Bern Digital Pantheon Model and the measurements taken is whether or not entasis was used in the classical Corinthian Order of the portico. In his paper, Lothar Haselberger referred to a 1920s photograph taken from a window of a building next to the portico, in which the architrave seems clearly to curve upwards towards its centre So, does this building — until recently commonly believed to have been erected under Hadrian and, therefore, with close ties to classical Greek architecture — show entasis, a characteristic device of classical Greek architecture, even in a very subtle way? Indeed, as entasis is not obvious to the casual observer standing inside the building, it would have had to be very subtle and, consequently, carefully constructed.
Figure 2 shows the ground plan of the portico with an overlaid raster grid with a distance of 1 m between the grid lines. Thanks to the transparent silhouette representation chosen for this «extraction» from the point cloud of the model, the structure of the roof can also be recognised. This overlay of different levels has revealed two facts:

(a) As has previously been observed by many scholars from measurements drawn of the ground plan, the ground plan itself reveals no sign of entasis, as in the famous curvature of the Parthenon, for instance.

(b) If the entire portico structure inclined inwards from the ground level to the architrave as a result of entasis, it would be clearly visible in Figure 2. As can be seen from a comparison with the overlaid grid, this is not the case.

Are there, then, any signs of entasis in the elevation, that is, regarding the architrave's curvature or an inclination of the columns?
The orthogonal elevation of the portico's façade (Fig. 3), overlaid again with a raster grid with a distance of 1 m between the grid lines, once more clearly shows that — besides the entasis of the column shafts themselves — no entasis was used in the horizontal or vertical design of the portico as a whole. Neither the ground floor nor the architrave/entablature shows any sign of curvature when compared with the grid. And what about the entablature itself? The image suggests that it has no entasis, either. This can be easily proven by examining Figure 4, which shows a part of the point cloud of the architrave (because of the length of the frieze, the entire architrave has been divided into two in this image).
As can clearly be seen in comparison with the raster grid (this time with a distance of 25 cm between the grid lines), the architrave and its elements are astonishingly straight, and show no sign of any entasis. Indeed, after almost 2,000 years one would have expected greater inconsistencies between the individual elements over such a long distance. However, the entire architrave is in surprisingly good condition — at least as far as its straightness is concerned. The differences along the grid

lines are almost invisible, and their irregularity strongly suggests that they were caused by mechanical or other influences since the time of the building's construction: they are clearly not intended deformations. Therefore, it can be concluded that entasis was not employed in the portico of the Pantheon, and that the 1920s photograph cited by Haselberger possibly shows the opposite because of optical complications in the imaging process.
If the presence or absence of entasis is anything to go by, one could argue that neither the architect of the Pantheon nor the person who commissioned the building had a strong enough interest in classical Greek architecture to cite it in the building. This could be interpreted as another argument against the established, but now shattered, view that it was Hadrian who commissioned the Pantheon, provided that entasis as a characteristic device of classical Greek architecture can be found in those buildings erected under Hadrian.

3. Conclusion

As these two examples reveal, the 3D Bern Digital Pantheon Model has been able to help answer certain outstanding questions on the Pantheon, especially questions pertaining to the geometry of the building, its original design, the construction techniques used, its structure, even its purpose and the intentions of the person who commissioned the building and/or its architect(s). However, in order to be able to answer the other outstanding questions, a volume model or scalable vector graphics model may be needed. This could be generated from the 3D digital point cloud, although at this point in the technical development of the appropriate software, much more work still needs to be undertaken. However, by collaborating with mathematicians from the University of Bern, we hope to be able to generate these other digital representations in the not-too-distant future.

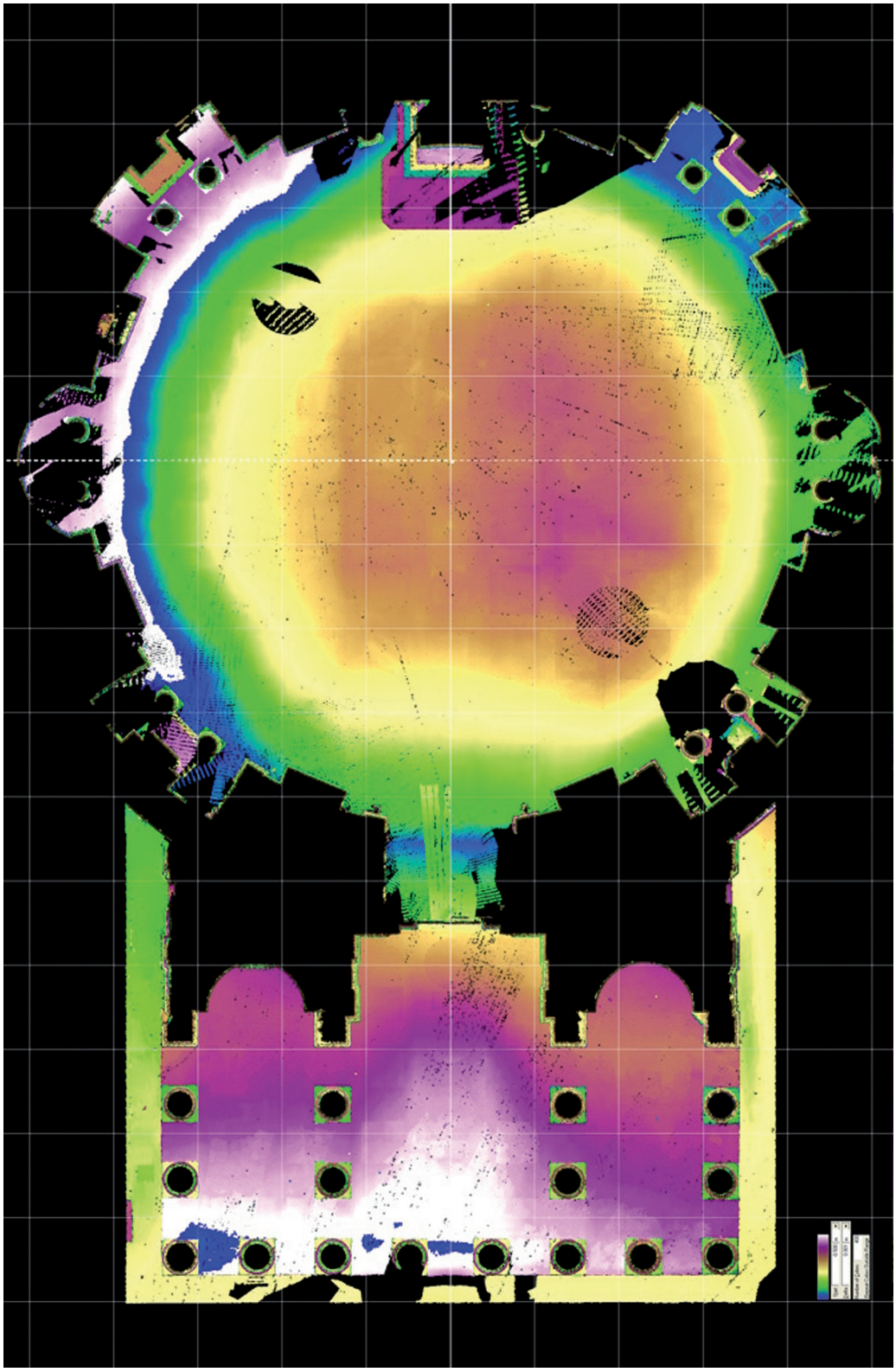


Fig. 1: Slice of the point cloud below and above ground level.

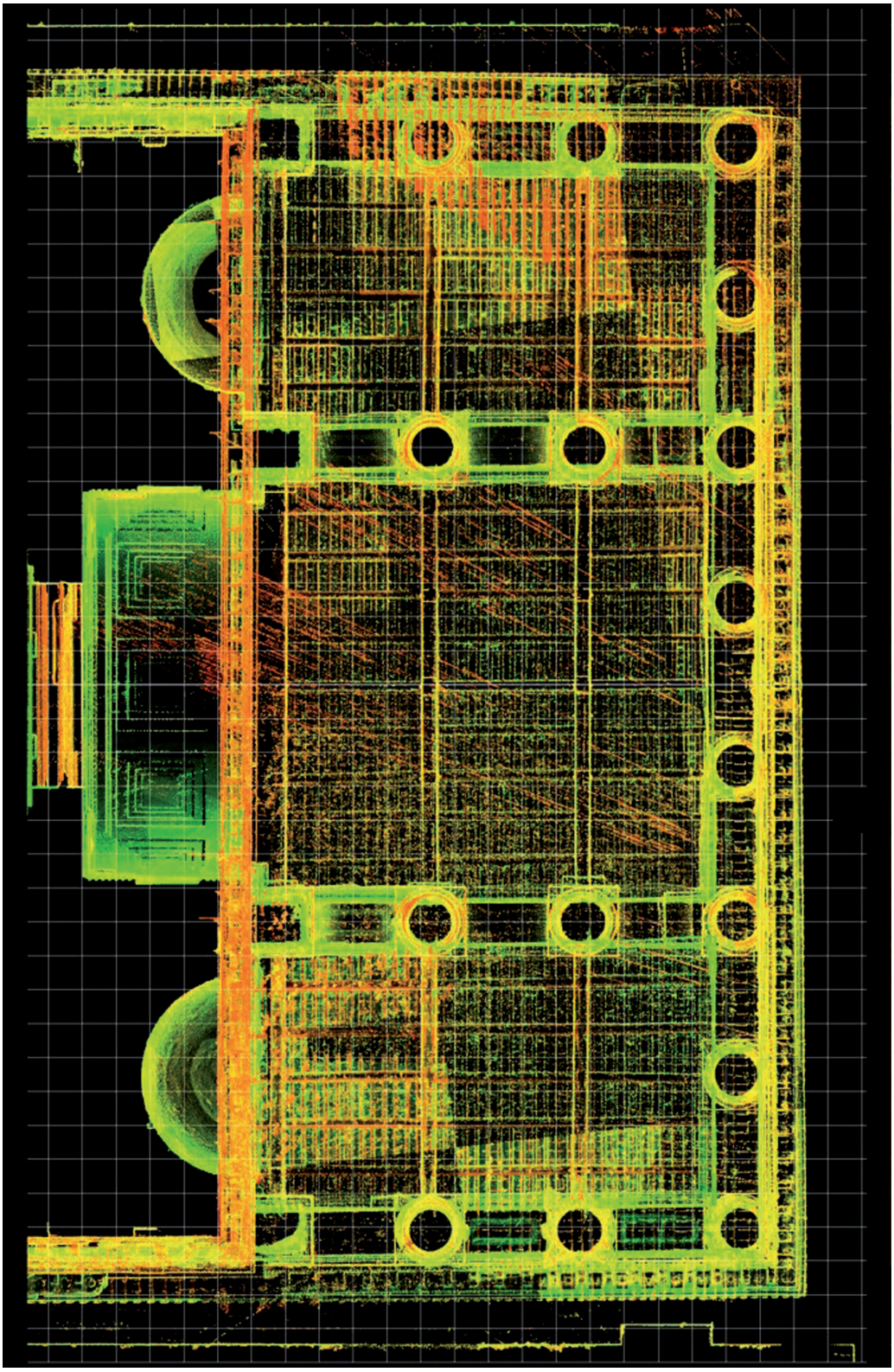


Fig. 2: Ground plan of the portico, with an overlaid raster grid of 1 m.

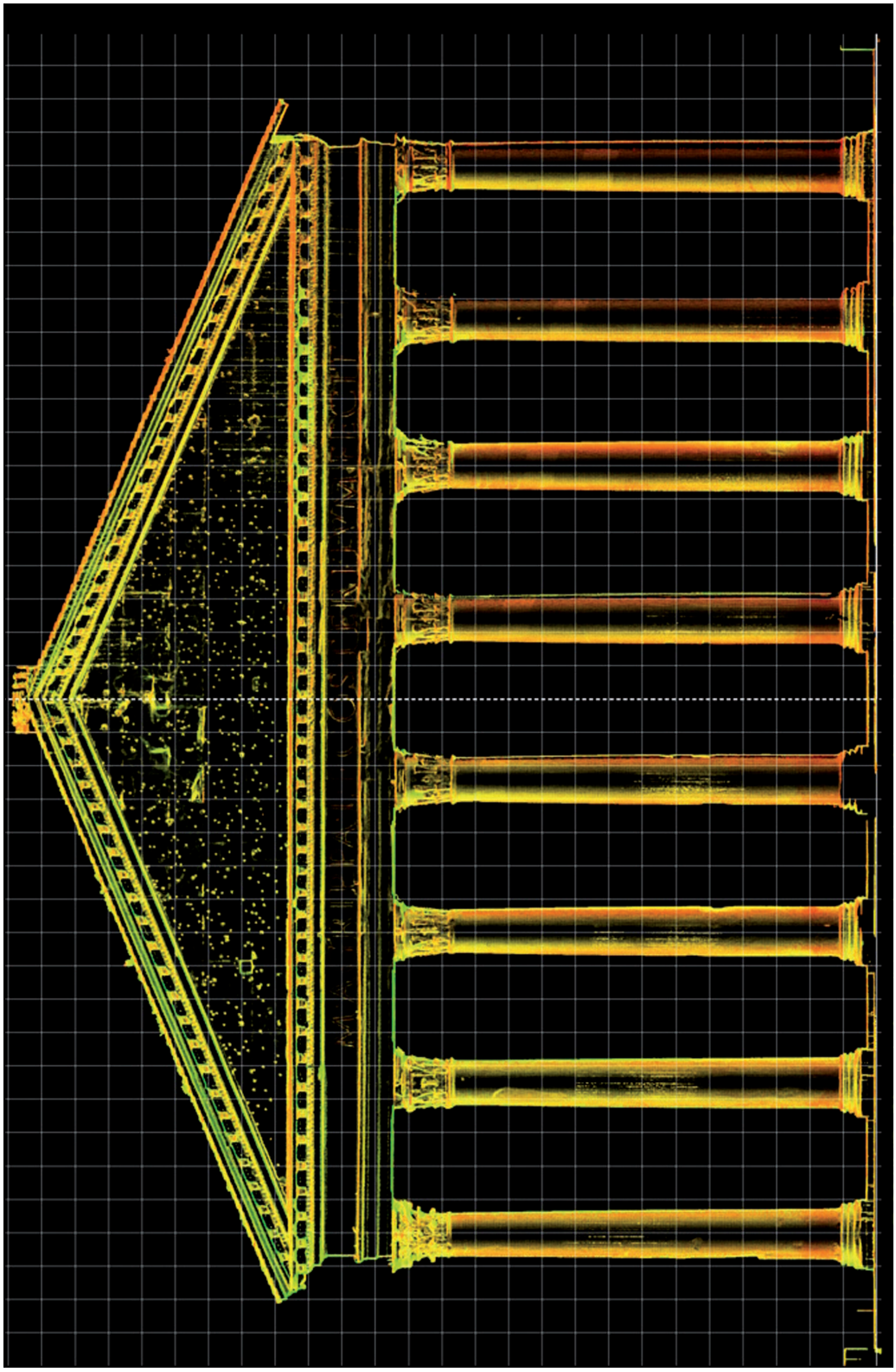


Fig. 3: The façade of the portico, overlaid again with a raster grid of 1 m.

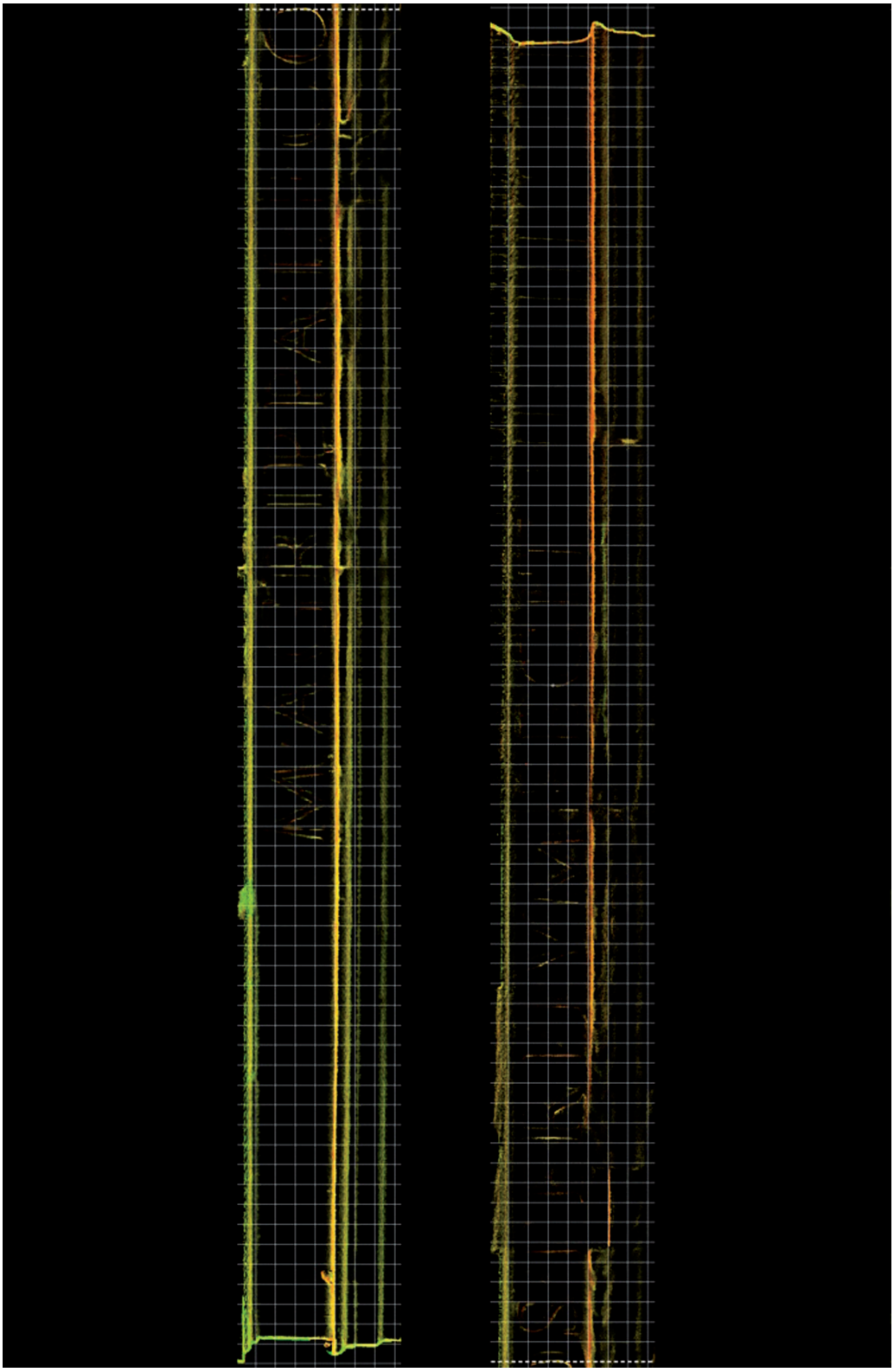


Fig. 4: The portico's architrave shows no sign of entasis.

The Repaired Columns of the Pantheon (abstract)

Volker Hoffmann[1]

My starting point is an observation I made in the portico of the Pantheon. On the second and seventh columns from the left a wavy line can be seen beneath the ring of the upper shaft (figures 1 and 2). Although this feature had been noticed by Giovanni Battista Piranesi and shown in his View of the Pantheon etched around 1750, as well as by Giovanni Fontana in 1838, neither mentioned it in the text accompanying their images.

However, in 1830 in his treatise on architecture, *Traité de l'art de bâtir*, Jean Rondelet had shown the upper part of one of these two columns from the Pantheon in an orthogonal projection, in which the wavy line is slightly schematised (planche II, figure X' = our figure 3). Next to it, he places images, in perspective, of two shaft pieces (Rondelet's figures XXI and XXII in our figure 3) that had been uncovered in 1813 during excavations close to the Arch of Titus, and which could help explain the stonemason's work on the wavy joints in the interior columns. The column shafts have been carved in such a way that there is a flat plate in the centre, extending over roughly three-quarters of the shaft's diameter; it is surrounded by a wavy ring that has also been carved out of the column shaft and extends either above the central plate (Rondelet's figure XXI in our figure 3) or both above and below the central plate (Rondelet's figure XXII in our figure 3).

What we have here is clearly a method either to lengthen slightly too short columns or to repair damaged or twisty monolithic columns. The part of the shaft that had to be repaired is positive in form, while the part added is negative in form.[2] The horizontal plates are the surfaces upon which the weight rests and is forced downwards through the column's shaft. The wavy convex-concave rings serve to interlock the two pieces of the column — and are, in themselves, a sophisticated art form. The «repaired columns» of the Pantheon are not the only two of their kind in Rome: I found another six in the grounds of Trajan's Forum, more exactly: in the Basilica Ulpia (see figure 4); and six too in the area of the temple of Venus and Roma (figure 5, see also Rondelet's figure XXI in our figure 3).

The columns of the Pantheon, Trajan's Forum and the temple of Venus and Roma are — as far as is known today — the first large and colossal columns made from Egyptian granite that where erected in Rome in large numbers (Martini). As far as I am aware, the «repaired columns» appear only within and outside

1 My paper will appear because of an earlier arrangement in an extended version in the journal BOREAS, Münstersche Beiträge zur Archäologie (Contributions to Archaeology from Munster), vol. 30, 2007. Therefore, only an extended abstract is given here.

2 I cannot examine here the technique used to carry out these repairs, i.e. exactly how the positive profile of the piece of shaft was placed on the piece to be attached.

Rome in the aforementioned buildings, which are, in addition, associated with the emperors Trajan (98–117 AD) and Hadrian (117–138 AD) as their commissioners. Textual sources cite the architect Apollodoros of Damascus as the architect and master builder of Trajan's Forum and as a critic of Emperor Hadrian's design for the Temple of Venus and Roma; Wolf-Dieter Heilmeyer argues convincingly that Apollodorus had an important role in designing and constructing the Pantheon.
From these preliminary remarks, I have drawn the following conclusions:

1. After having being damanged, one did not wish to reject but to repair the in every respect valuable Egyptian column shafts/ granite monoliths. A more obvious solution would have been to connect the two parts with a horizonal plane straight through the shaft, as was usually the case with large marble columns with horizontal base areas (Trajan's Column), and which was later still practised in the porphyry Column of Constantine at Constantinople.
2. Therefore, if the complicated wavy cut only appears in columns of the aforementioned Trajanic-Hadrianic buildings in Rome during a period of only 40 years, there must be a reason for this fact. I see this reason in the person of Apollodoros of Damascus and suspect that it was he who invented or introduced this wavy cut during the construction of the Trajan's Forum; to be able to carry out their work, stonemasons needed to be well trained. However, even though I consider this wavy cut — besides its technical function of connecting two pieces of a column's shaft — to be a sophisticated art form as well as a kind signature of the architect, I do not take it to be *proof* that Apollodoros designed the Pantheon and the temple of Venus and Roma. Nevertheless, these circumstances do support this assumption and also reinforce Heilmeyer's revised dating of the Pantheon (from 113 AD).

Images:

Fig. 3 after Jean Rondelet, Traité de l'art de bâtir, planche II. All other images taken by the author.

Fig. 1: Pantheon, portico, second column from the left.

Fig. 2: Pantheon, portico, seventh column from the left.

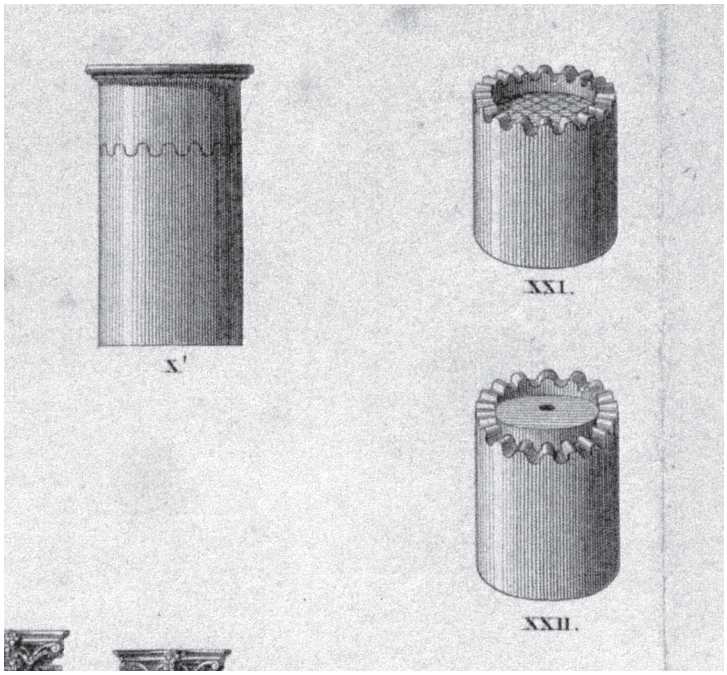


Fig. 3: Jean Rondelet, *Traité de l'art de bâtir*, planche II, detail.

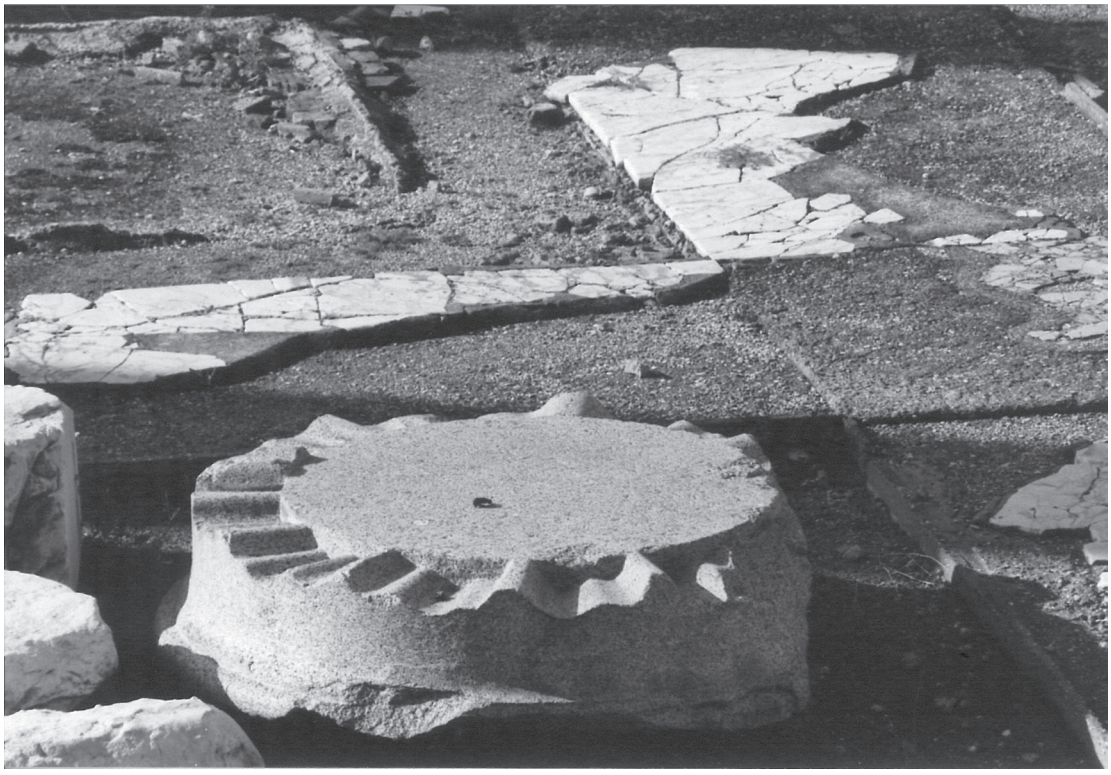


Fig. 4: Basilica Ulpia.

Fig. 5: Temple of Venus and Roma.

Fig. 1: Veduta del Pantheon e della piazza (Sovraintendenza B.C. del Comune di Roma. Archivio Fotografico Monumenti e Scavi. MSh 5669 Foto Colantoni).

Scavi in piazza della Rotonda e sulla fronte del Pantheon

Paola Virgili

Tra il 1995 e il 1997 (fig. 1), per consentire la messa in opera di una galleria di pubblici servizi (cunicolo intelligente fig. 2), sono stati effettuati vari saggi e trincee di scavo in piazza della Rotonda[1] (fig. 3).
Sono stati esplorati i livelli antichi conservati sotto l'attuale piano di calpestio rinvenendo ampi tratti della pavimentazione in lastre di travertino della piazza realizzata da Adriano (fig. 4). Un tratto di circa 30 m. di lunghezza è stato mantenuto accessibile e visitabile attraverso una botola ubicata all'imbocco di via della Rotonda (fig. 5).
Il lastricato di travertino, nelle aree esplorate, presenta una tessitura a tolda di nave con lastre di m. 0,18/0,20 di spessore, posizionate ortogonalmente alla fronte del Pantheon.
Le file di lastre presentano una larghezza disomogenea ma costante, mentre la lunghezza appare variabile e, per quanto si è potuto osservare, la variabilità é del tutto casuale, non l'esecuzione di un disegno (fig. 6).
La pavimentazione si arresta in corrispondenza della cloaca adrianea che corre parallela alla fronte del Pantheon (fig. 7–8).
La cloaca è coperta da lastroni in travertino di m. 1 x m. 2; i lastroni di m. 0,30 di spessore sono appoggiati sui fianchi della cloaca e,

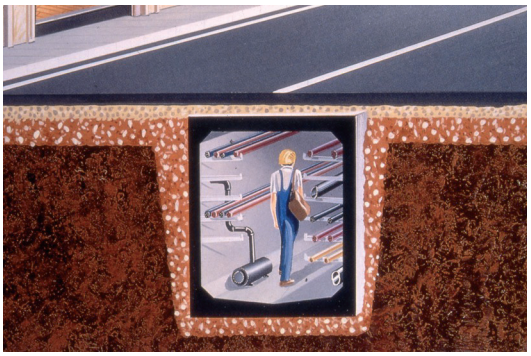


Fig. 2: Galleria di pubblici servizi «cunicolo intelligente» (MSh 5664).

già in antico erano sollevabili, per consentirne l'ispezionabilità.
La lastricatura della piazza rimase in uso fino al IX–X secolo; lo scavo dei livelli superiori ha accertato che a tale periodo è da far risalire un consistente interro, causato dalle rovine dei fabbricati circostanti e dagli allagamenti del Tevere che coprì tutta la lastricatura, il podio e la scalinata di accesso al Pantheon, portando il livello del calpestio al di sopra della quota stessa del pronao. Papa Alessandro VII ripristinò l'ingresso al tempio divenuto la Chiesa di S.Maria ad Martyres, liberando dalle terre sopratutto l'area antistante, per cui la piazza, anche ora, presenta quote maggori di interro a ridosso dei fabbricati e minori sulla fronte del tempio.
Dati di archivio confermano che molti tratti dell'antica lastricatura sono venuti in luce sia in piazza della Rotonda che in piazza della

1 I risultati dello scavo sono pubblicati: Battistelli/Virgili 1999, 138–154 con bibliografia precedente e di riferimento ed inoltre: Orlandi et al. 2006, 123–136; Virgili 2006, 167–170.

Fig. 3: Trincea di scavo in corrispondenza di via della Rotonda (MSh 5383 Foto Colantoni).

Maddalena. Sulla base di tali elementi il Lanciani, nella *Forma Urbis Romae,* ricostruisce una piazza di m. 60 di larghezza e m. 120 di lunghezza — dimensioni di poco superiori alle attuali — delimitata, sul lato orientale dalla *Basilica Alexandrina* e sul lato occidentale dalle Terme Neroniane Alessandrine, mentre il lato settentrionale della piazza aveva come limite la direttrice stradale antica corrispondente a via delle Coppelle — via Dell'Acqua Santa dove, nel 1873, è stata rinvenuta una via basolata (fig. 9).

Nell'ambito del suo grandioso programma edilizio per la città Augusto destinò l'area del Campo Marzio centrale e settentrionale alla realizzazione di un piano urbanistico di ampio respiro, denso di valenze religiose ed epopeiche e pregnante di cultura alessandrina, in particolare astronomica, e incentrato sul nuovo simbolo del potere e della sacralità del *princeps,* erigendo il Pantheon, l'*Ara Pacis,* l'*Horologium Solarium Augusti* ed il Mausoleo.

Fig. 4: Lastricato in travertino della piazza adrianea (MSh 5803 Foto Colantoni.

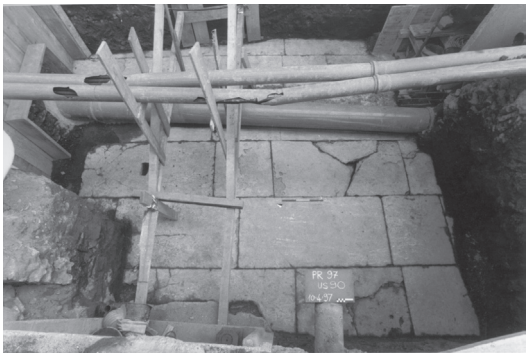


Fig. 5: Tratto di mt.30 di lastricato in travertino della piazza adrianea lasciato in vista sotto la piazza moderna (MSh Foto Colantoni).

Il Pantheon ed il Mausoleo sono ad una distanza di m. 739, pari a mezzo miglio romano (fig. 10); lungo questa direttrice si svolgevano forse le *ambulationes* di cui parla Svetonio descrivendo il Mausoleo di Augusto. Dall'ampio lastricato della piazza che prospicieva il Pantheon, si poteva quindi raggiungere direttamente il Mausoleo, anch'esso circondato da un lastricato in travertino di mt.120 di lato; una serie di direttrici stradali tagliavano ortogonalmente il percorso probabilmente intercalato da *silvae.* Anche sulla fronte del Mausoleo transitava una via antica che collegava la via Flaminia, poi *Lata*, al Tevere; tale strada basolata fu vista da B.Peruzzi nel 1519 accanto alla chiesa S. Rocco e nel 1612 durante i lavori di ampliamento della Chiesa di S.Carlo[2] (figg. 11, 12).

2 Lanciani 1964, tav. 8, II G7 p. 151.

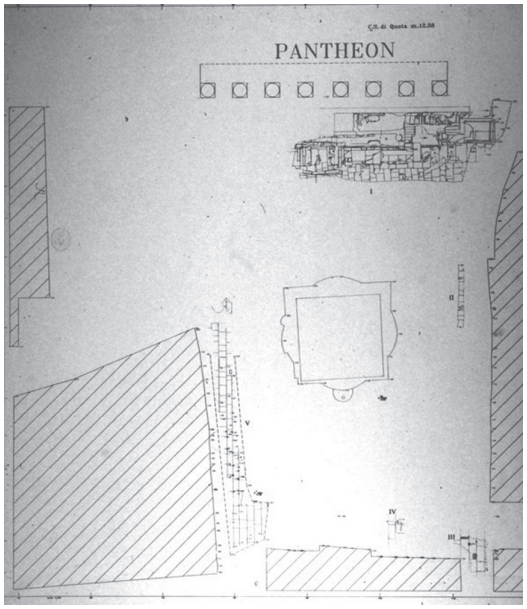


Fig. 6: Tratti di lastricatura venuti in luce nella piazza durante gli scavi per la messa in opera della galleria di pubblici servizi (MSh 5694 Foto Colantoni).

Successivamente alla messa in opera della galleria dei pubblici servizi è stato aperto lungo la metà occidentale della fronte del Pantheon un scavo esplorativo di oltre 200 mq.(fig. 13).
Lo scavo aveva lo scopo di ricostruire lo sviluppo della scalinata d'accesso al pronao del Tempio di Adriano e di definire l'orientamento del precedente edificio augusteo.
L'area di scavo, compresa fra la quarte e l'ultima colonna ed oltre aveva un estensione in senso N–S di circa m. 12, giungendo a scoprire i primi lastroni della pavimentazione adrianea della piazza; nell'arte di secolo sono state messe in luce strutture pertinenti alla sistemazione adrianea della fronte del Pantheon e, inglobate in esse, strutture più antiche pertinenti al Pantheon di Augusto (fig. 14).
Già nell'800 l'area era stata oggetto di indagini esplorative. Il Fea, nel 1804, scavò nell'area antistante la V e la VI colonna rinvenendo, per un estensione di 24 piedi — ovvero circa m. 7, 10 — *un piano di marmi in continuazione del podio* davanti al quale ipotizzò fossero ubicati i gradini della scalinata di accesso al tempio (fig. 15), che suppose essere cinque per

Fig. 7: Interno della cloaca adrianea posizionata sulla fronte del Pantheon; pareti e copertura in lastre di travertino. La cloaca si appoggia sulla pavimentazione augustea della piazza anch'essa realizzata in lastre di travertino (MSh 5746 Foto Colantoni).

analogia con la scaletta presente sul lato E del podio.
Nel 1874 il Lanciani, in occasione della parziale demolizione di palazzo Ruggeri, ubicato a ridosso del tempio sul lato orientale, effettuò uno scavo nell'area antistante le prime tre colonne del pronao rinvenendo parte della gradinata; un suo rilievo (fig. 16) raffigura in pianta i ritrovamenti effettuati e, nella descrizione dello scavo, il Lanciani afferma che l'avancorpo del pronao, sporgente dal colonnato, si estendeva per m. 4,46.
Sulla base anche dei dati del Fea, quindi, il Lanciani ricostruisce, una scalinata continua di cinque gradini (fig. 17).
I nuovi scavi, ben più estesi di quelli ottocenteschi, hanno consentito di precisare le caratteristiche dell'avancorpo frontale del Pantheon di Adriano. L'avancorpo risulta articolato dall'inserimento di due scalinate laterali di sette gradini ognuna separate da un largo podio intermedio di 20 m. di ampiezza aggettante per m. 7,10 dalla fronte del colonnato. Tale distanza si riduceva a m. 4,46 dalla fronte del colonnato in corrispondenza delle scalinate (fig. 18).
Al lato del tempio, oltre l'ultima colonna ad O, è stato inoltre messo in luce un bacino di fontana in marmo proconnesio, di m. 5 di larghezza e m. 3 di profondità, delimitato sul lato esterno da una transenna (figg. 19, 20). A

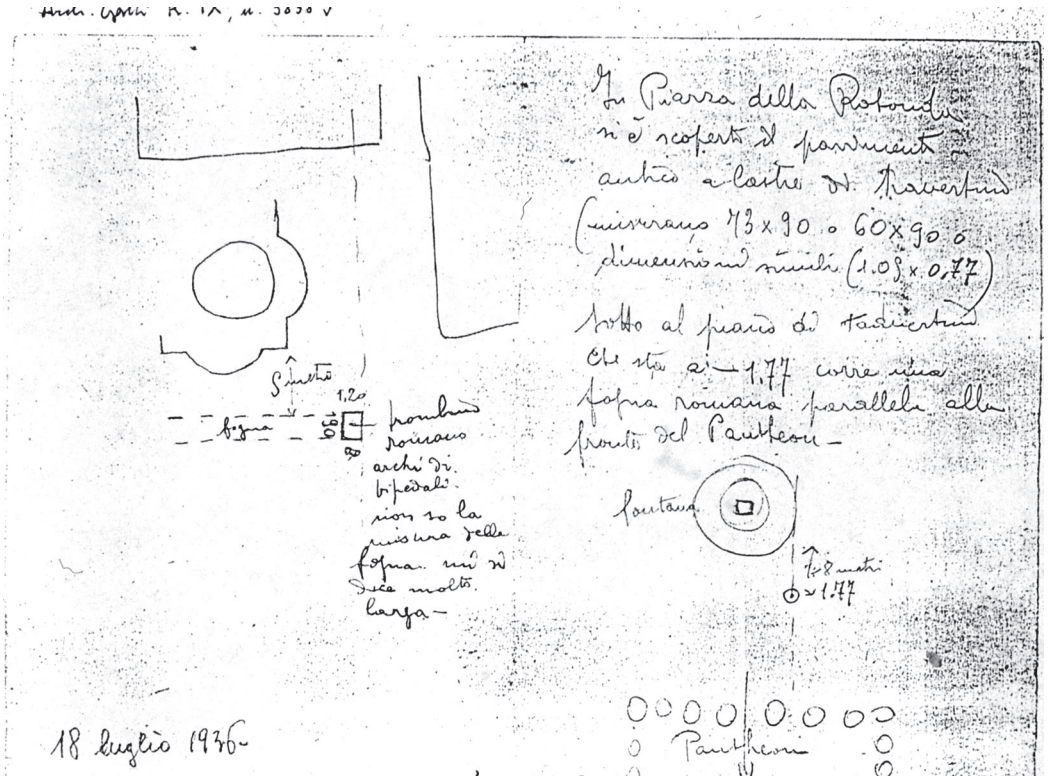


Fig. 8: Appunti Gatti: rinvenimento di tratti di lastricatura e della cloaca (Sovraintendenza B.C. Archivio Storico -MSh 5683).

ridosso del bacino, alla base del colonnato, è ubicato un basamento in laterizio con una *fistula* in piombo per l'adduzione dell'acqua; su tale basamento doveva essere appoggiato l'elemento da cui scaturiva l'acqua, esattamente come nel tempio di Venere Genitrice nel foro di Cesare dove, nei bacini di fontana ai lati del tempio, narra Ovidio, «le Ninfe Appiadi fanno irrompere un getto d'acqua».

Al centro del bacino un'impronta quadrata localizza la posizione delle coppe di raccolta dell'acqua; analogo bacino fu visto, nel 1876 sull'altro lato del podio, dal Lanciani, durante i lavori di demolizione del palazzo Ruggeri (cfr. fig. 16).

Il mutamento determinante che si riscontra nella ricostruzione adrianea del Pantheon riguarda il livello di calpestio dell'area intorno al tempio che viene rialzato di circa m. 2 rispetto alla piazza augustea (fig. 21).

Il podio del Pantheon augusteo è alto m. 2,45,[3] è decisamente imponente e con dieci colonne sulla fronte; nella ricostruzione adrianea è meno alto — m. 1,40 — e con otto colonne sulla fronte.

I nuovi scavi e una reinterpretazione del testo di Beltrami[4] e dei disegni dell' Armanini hanno consentito quindi di definire che il tempio augusteo era decastilo e con l'ingresso rivolto verso N; la fronte era articolata con due scalinate laterali di undici gradini ognuna, separate da un largo podio di 20 m. di ampiezza e m. 7,10 di profondità, esattamente come nel tempio di Adriano (fig. 22).

Le due fasi non presentano quindi cambiamenti sostanziali nella disposizione planimetrica delle strutture ; il tempio adrianeo viene riproposto ad una nuova quota di calpestio

3 L'altezza del conglomerato è di m. 2,25 sul quale va considerata la foderatura con lastre di circa m. 0,20.

4 Beltrami 1898.

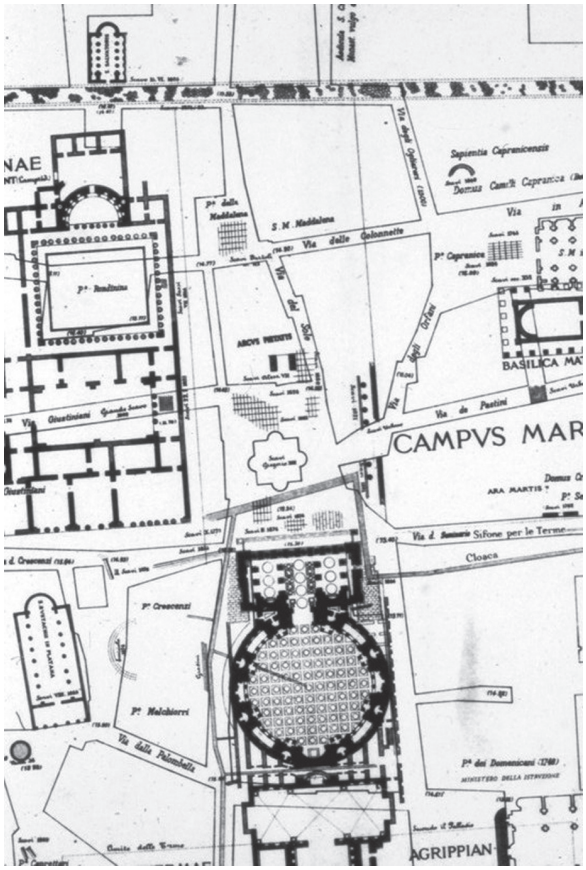


Fig. 9: Lanciani 1964 (dettaglio).

della città e di spiccato degli edifici e riutilizza, in corrispondenza della fronte, le medesime fondazioni del precedente, sopraelevandole.
Il rialzamento del livello del podio viene effettuato mediante filari di blocchi di tufo. Viene anche sopraelevata e riutilizzata la fondazione del colonnato frontale limitatamente all'ampiezza del nuovo podio (m. 38,80). (fig. 23).
Resti della fase augustea del Pantheon consistenti in parte del podio un conglomerato di tufo rosso con lacerti del rivestimento in marmo (figg. 24, 25) e resti della lastricatura in travertino della relativa piazza, sono stati visti, nel corso degli scavi, all'interno della cloaca, 2 m. al di sotto della piazza adrianea.
Eliminando inoltre alcune delle lastre che delimitavano la cloaca adrianea è stato possibile mettere allo scoperto le impronte dei gradini della scala augustea impresse nel conglomerato di tufo (fig. 26) e resti del primo gradino in marmo, ancora parzialmente in posto e alcune delle lastre della pavimentazione in travertino della piazza augustea (fig. 27). Nello spazio di m. 2, di risulta tra le due pavimentazioni, viene posizionato un nuovo sistema fognario di cui sono stati intercettati dagli scavi, la cloaca, ubicata sulla fronte del tempio e il c.d. chiavicone della Giuditta, costruito con laterizi dell'età di Adriano, riutilizzato dal sistema fognario rinascimentale[5] della città e tuttora in uso.

Addossato al pronao e giusto in asse con il portale di accesso alla Rotonda è stato inoltre messo in luce un basamento che, per la presenza di un canale di alloggiamento di una *fistula* di adduzione dell'acqua (fig. 28), può essere interpretato come il basamento della fontana, forse eretta da papa Adriano I per celebrare il ripristino dell'Acqua Vergine.
In una seconda fase il basamento di fontana venne trasformato in una struttura funzionale d'accesso al piano del pronao del Pantheon già trasformato nella chiesa cristiana di S.Maria ad Martyres; i gradini in marmo impiegati sono antichi, e di riutilizzo dalla scalinata del Pantheon di Adriano (fig. 29)
L'intero basamento d'altronde fu realizzato con materiali di recupero ed in particolare nella fondazione è stata rinvenuta una lastra marmorea con graffita una *tabula lusoria* (figg. 30, 31); tale lastra per forma e dimensioni è relativa alla pavimentazione del podio del Pantheon di Adriano, e venne probabilmente graffita quando era ancora collocata nel posto di origine.

5 Narducci 1889.

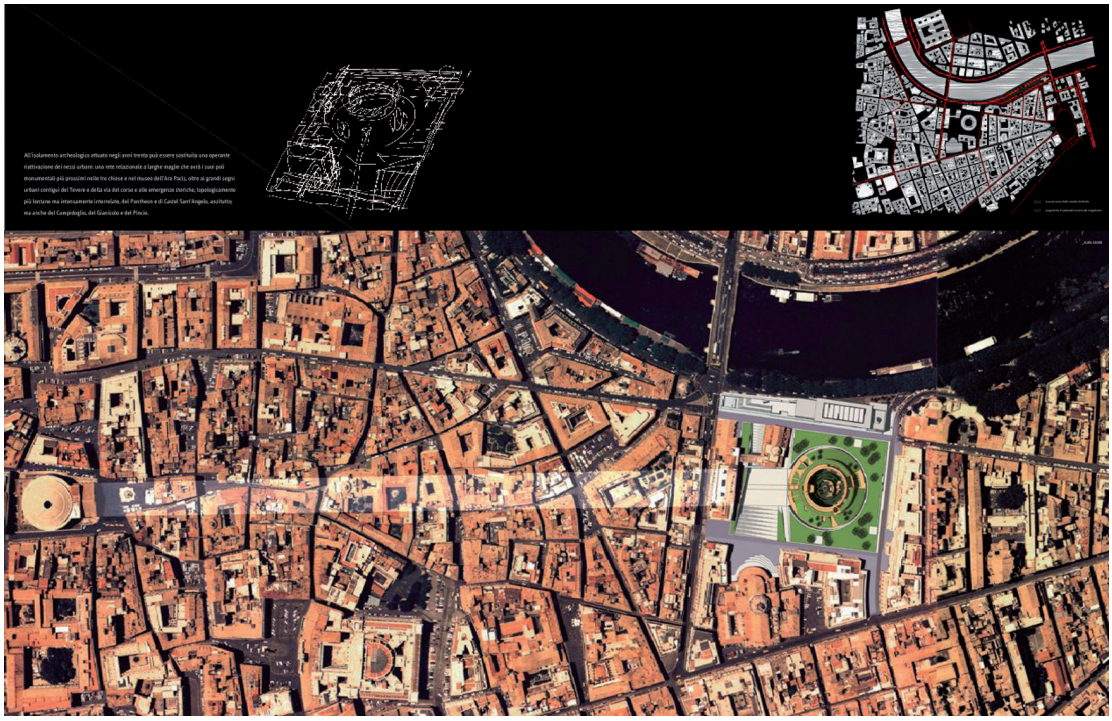


Fig. 10: Veduta di Roma moderna con evidenziati Pantheon e Mausoleo di Augusto (dal progetto di sistemazione di piazza Augusto Imperatore Urbs et Civitas).

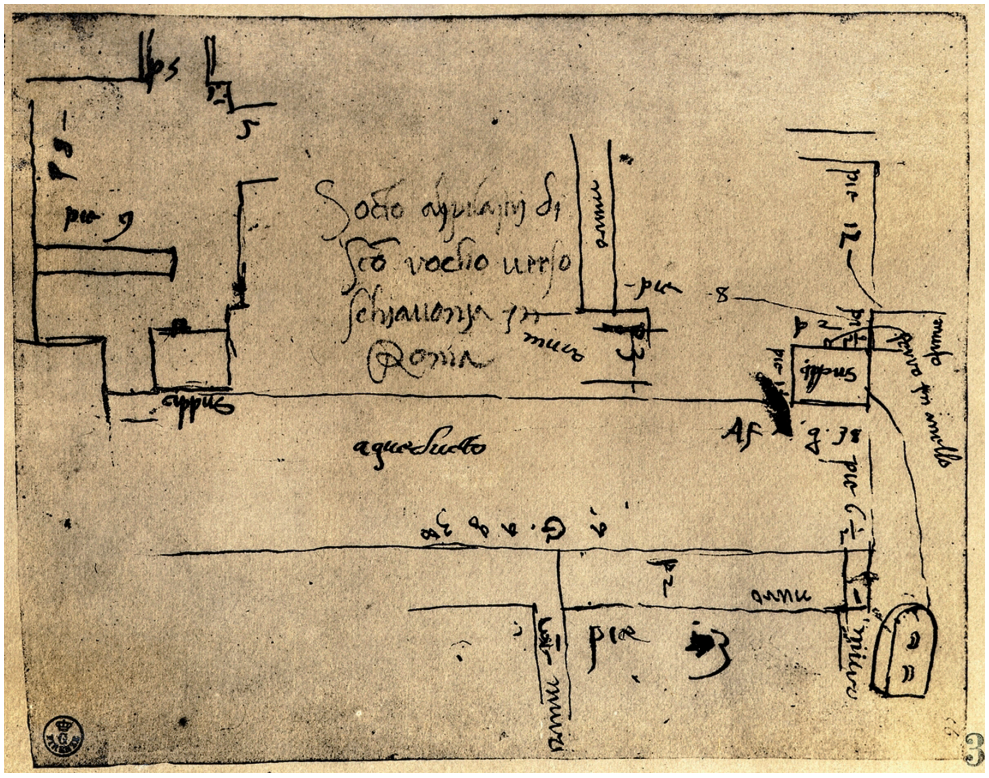


Fig. 11: Baldassarre Peruzzi, Firenze, Uffizi, Gabinetto Disegni e Stampe, Architettura: UA 394.

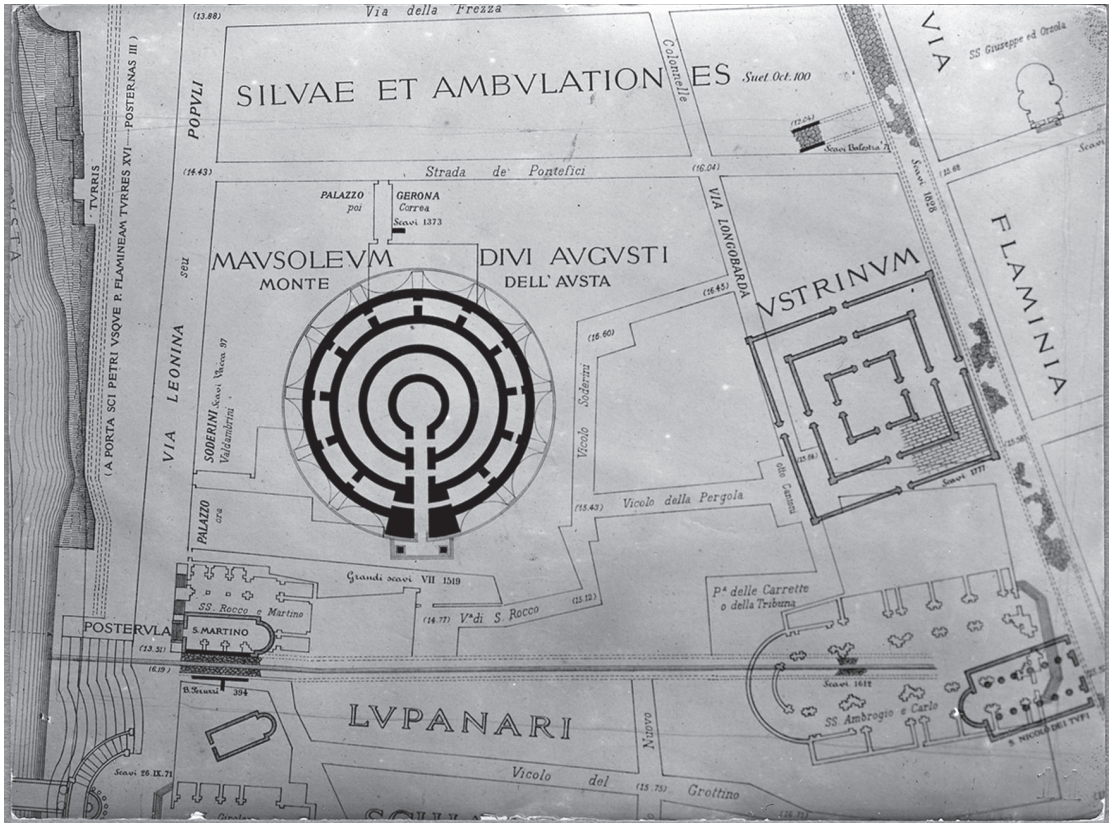


Fig. 12: Lanciani 1964, tav. 8.

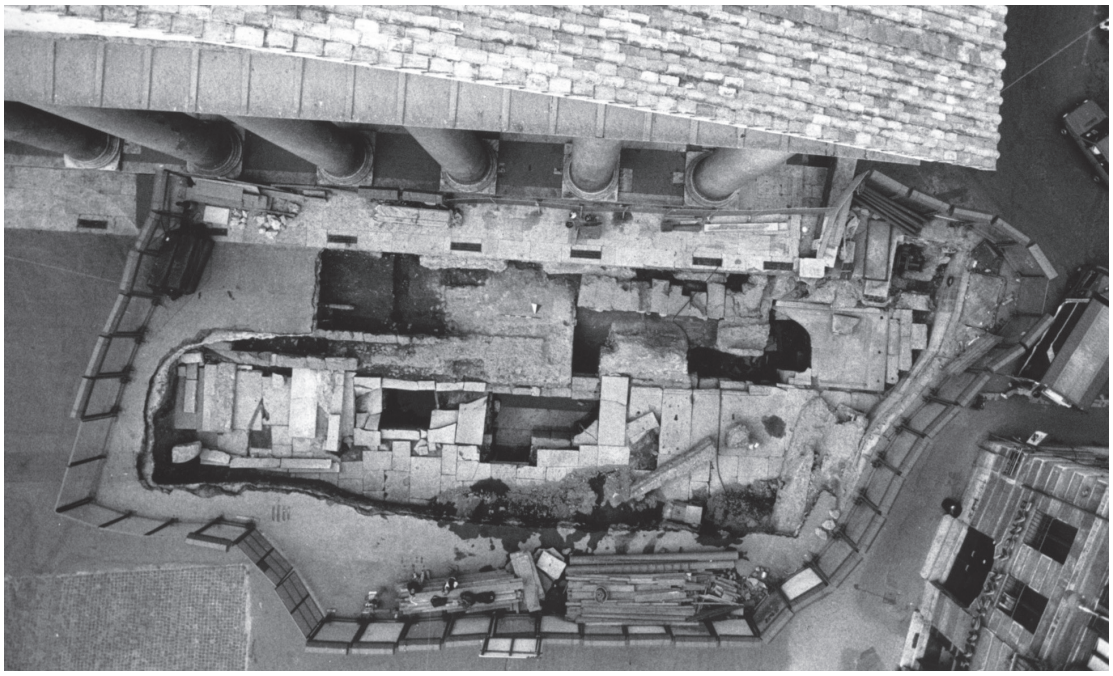


Fig. 13: Veduta dall'alto dell'area di scavo (Foto Letizia).

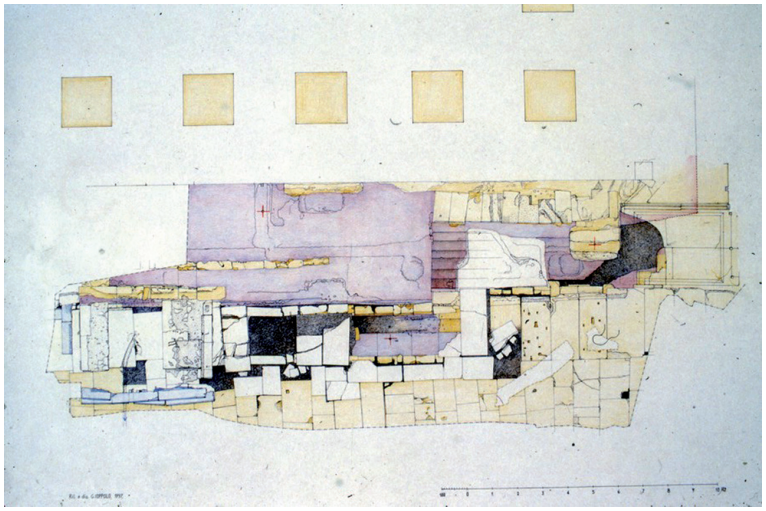


Fig. 14: Planimetria dell'area dello scavo (Rilievo G. Ioppolo 1997).

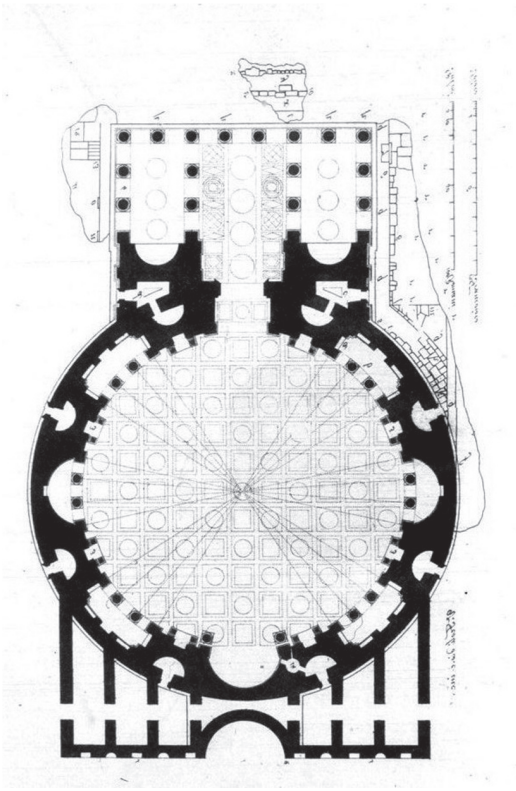


Fig. 15: Fea 1804. Planimetria dell'area dello scavo (Sovraintendenza B.C. Archivio Storico).

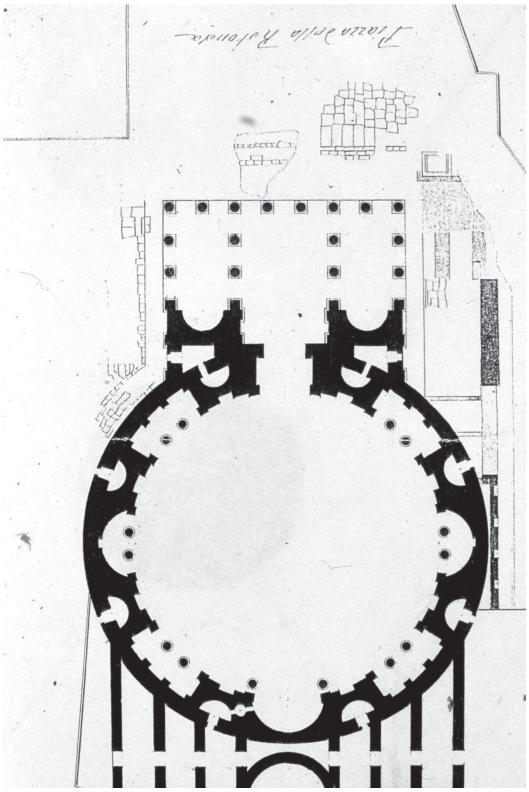


Fig. 16: Lanciani 1874. Planimetria dell'area dello scavo comprensiva anche dei rinvenimenti effettuati dal Fea nel 1804 (Sovraintendenza B.C. Archivio Storico).

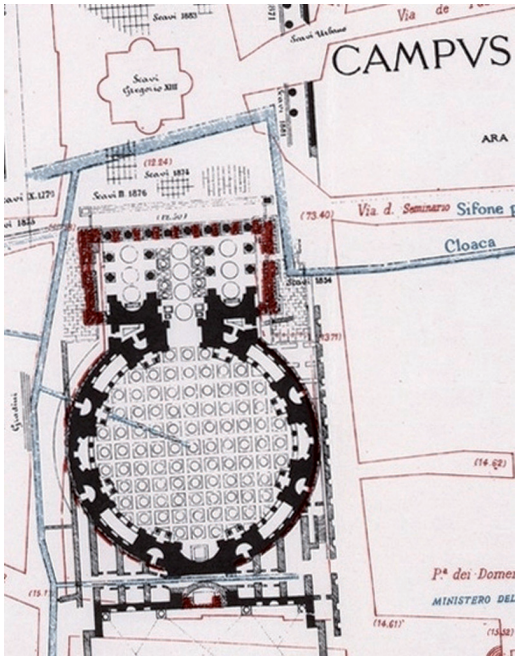


Fig. 17: Lanciani 1964. tav. 8.

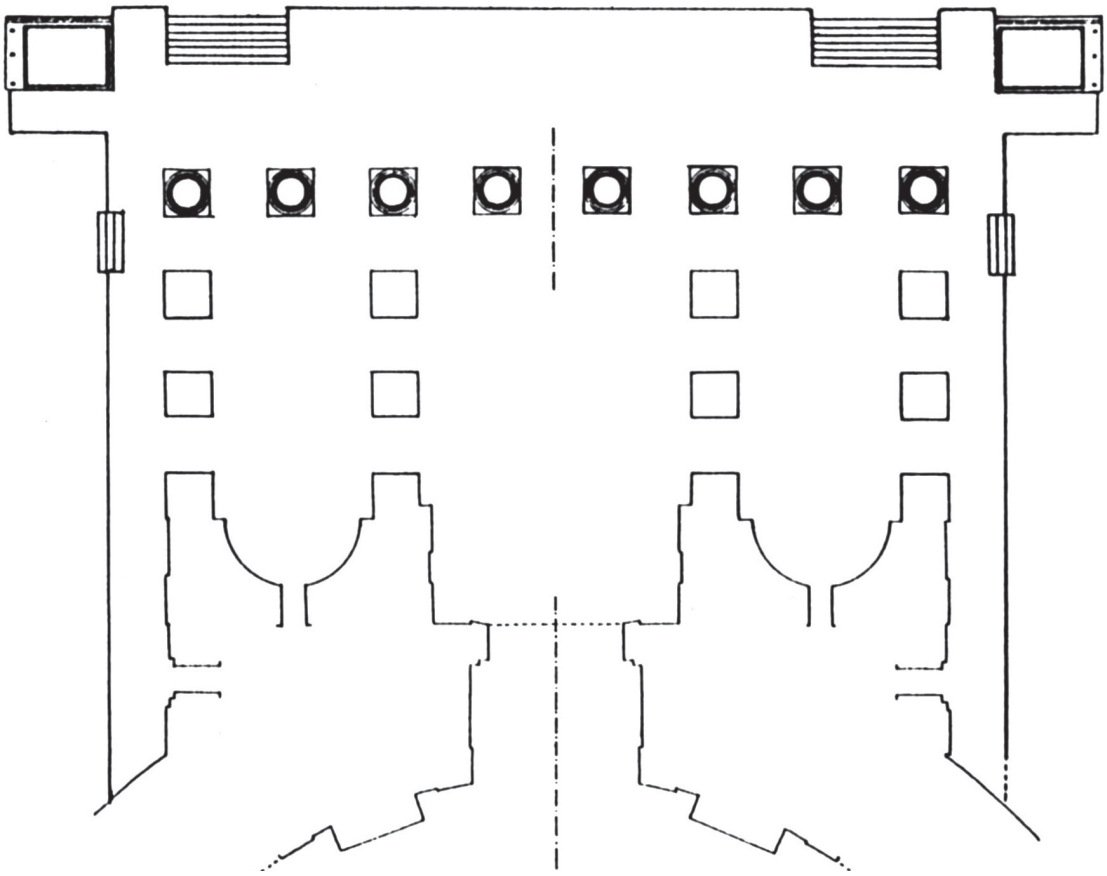


Fig. 18: Planimetria schematica della fronte del Pantheon adrianeo (Rilievo G. Ioppolo 1997).

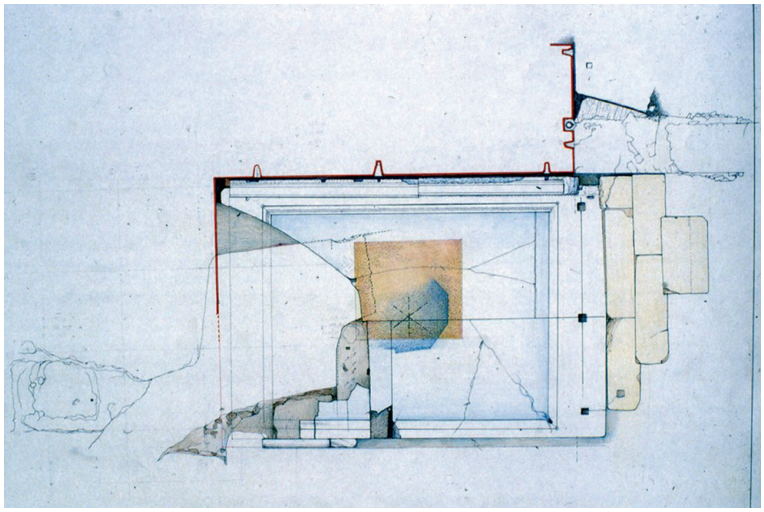


Fig. 19: Planimetria del bacino di fontana del Pantheon adrianeo (Rilievo G. Ioppolo 1997).

Fig. 20: Il bacino di fontana del Pantheon adrianeo (MSh 5754 Foto Colantoni).

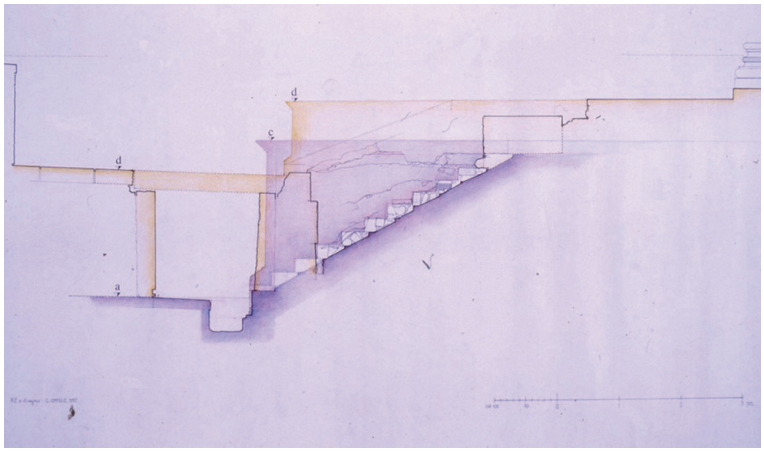


Fig. 21: Sezione dell'avancorpo del Pantheon. In azzurro le strutture pertinenti al Pantheon augusteo: a il livello della piazza lastricata, c il livello di calpestio del podio; in rosa le strutture del Pantheon adrianeo:b il livello della piazza lastricata, d il livello di calpestio del podio (Rilievo G.Ioppolo 1997).

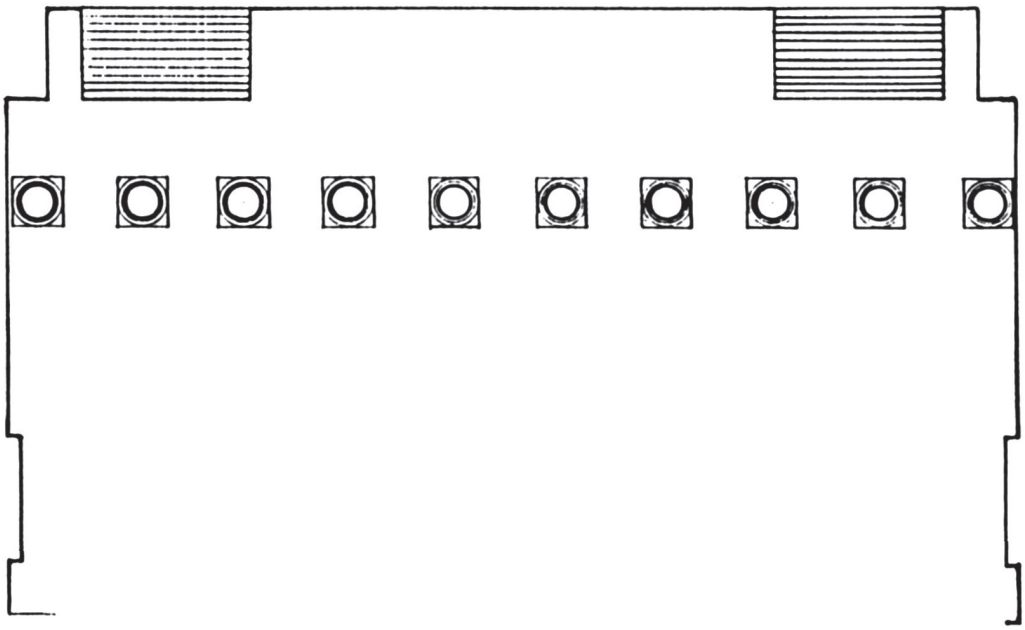


Fig. 22: Planimetria schematica della fronte del Pantheon augusteo (Rilievo G. Ioppolo 1997).

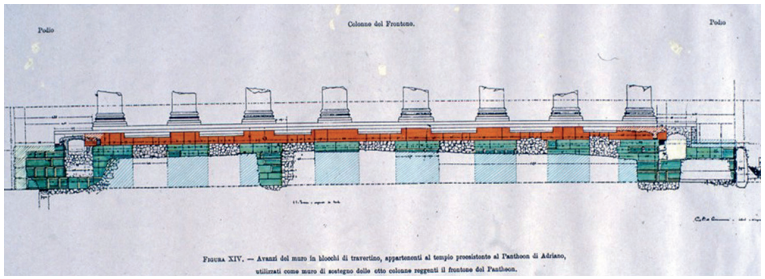


Fig. 23: Beltrami 1898, fig. XIV. Rilievo di P. O. Armanini colorato da G. Ioppolo 1997. In verde la fondazione delle dieci colonne del Pantheon augusteo, in rosso la sopraelevazioe per la posa in opera delle otto colonne del Pantheon adrianeo.

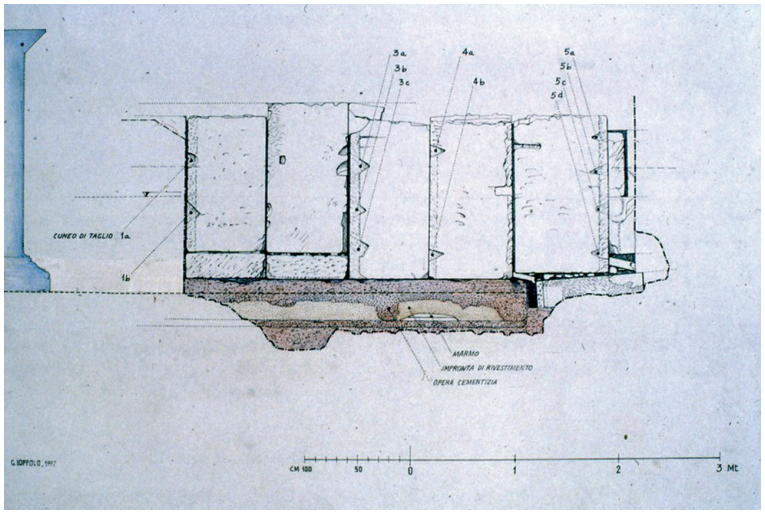


Fig. 24: La cloaca adrianea impostata sui resti del podio augusteo in conglomerato di tufo rosso con lacerto del rivestimento in marmo bianco (Rilievo G. Ioppolo 1997).

Fig. 25: Interno della cloaca adrianea impostata sui resti del podio augusteo (MSh 5717 Foto Colantoni).

Fig. 26: Impronte dei gradini della scala augustea impresse nel conglomerato di tufo rosso del podio e superiormente il riempimento adrianeo (MSh 5747 Foto Colantoni).

Fig. 27: Tratto della lastricatura in travertino della piazza augustea (MSh 5705 Foto Colantoni).

Fig. 28: Basamento di fontana; incasso nel travertino per l'alloggiamento di una fistula (MSh 5765 Foto Colantoni).

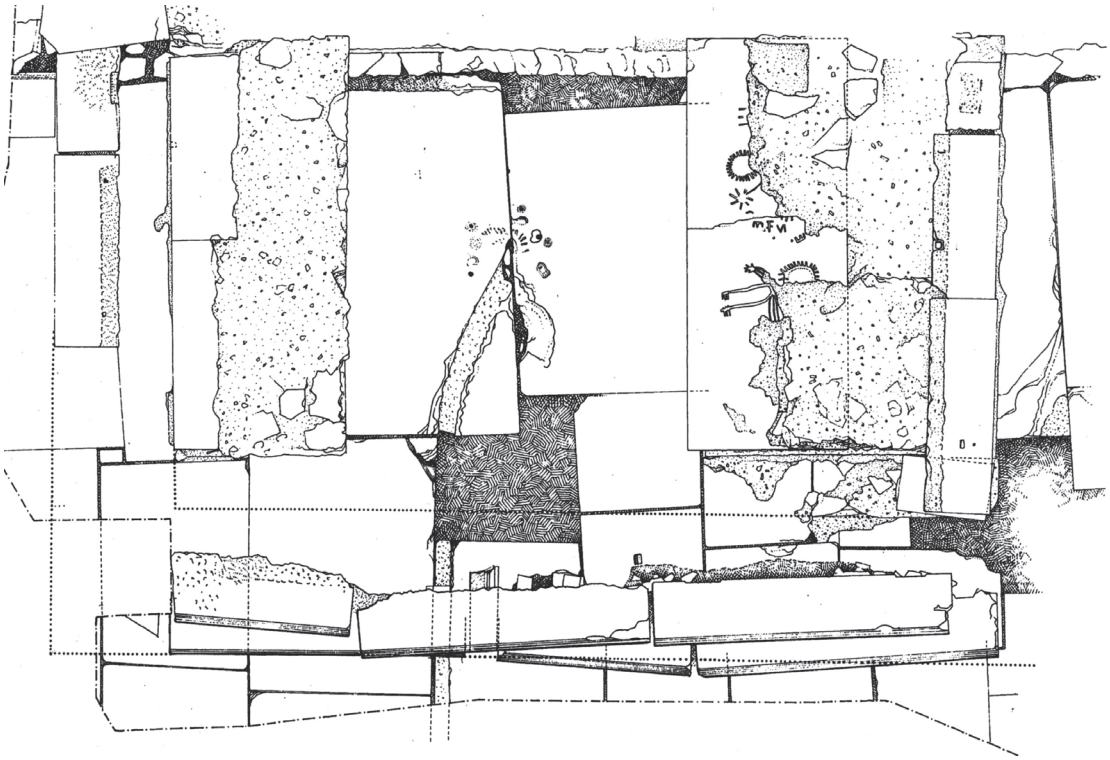


Fig. 29: Basamento di fontana poi trasformato in scalinata d'accesso al Pantheon- S. Maria ad Martyres (Rilievo G. Ioppolo 1997).

Fig. 30: Parte sinistra di una lastra della pavimentazione del podio del Pantheon adrianeo con tabula lusoria graffita. (MSh 6462 Foto Colantoni).

Fig. 31: Parte destra di una lastra della pavimentazione del podio del Pantheon adrianeo con tabula lusoria graffita. (MSh 6465 Foto Colantoni).

A Sustainable Geodetic Network for Documenting and Monitoring the Pantheon

Michael Scherer

1. General recommendations for a sustainable network

The documentation of architectural monuments and sites is carried out using a variety of surveying techniques such as photogrammetry, tacheometry, laser scanning as well as by taking manual measurements. The backbone or frame for all measurement taking in general is a three-dimensional coordinate network that is of high quality and homogeneously accurate.[1]

The traditional way of establishing and working with a network is as follows: points on the floor (ground points) of the edifice are marked with durable targets. A total station is positioned over these points, and traverses between the points are determined by measuring angles and distances. The coordinates are then calculated and an adjustment is made in order to minimize tensions. The recording can then start, using the ground points as stations for instruments such as a tacheometer or laser scanner. During this second, recording step, the points of interest on the building itself are determined, mostly through polar tacheometric measurements. These single points may additionally be used to combine the point clouds from the laser scanning, or they can be used as targets for photogrammetric work. So in general there are two distinct steps: taking the measurements and adjusting the network on the one hand and, based on this, determining the points on the building itself, on the other hand.

A modern network is established in a very different way. Again, measurements are taken using a total station, but no ground points or other artificial points are necessary. The points of the network are exclusively the natural points of the building, points that can be expected to be durable and sustainable. A free-stationed total station measures their polar coordinates. The local networks belonging to these stations are combined with measurements taken from the different stations to form common identical points. Thus, instead of traverses, micro-networks are measured (see fig. 1).

The micro-network as a whole replaces the traverse. Finally, an adjustment is made that includes all the measurements as well as all the point coordinates. So not only do the polygon points acquire adjusted coordinates forming a homogeneous network, as in the traditional

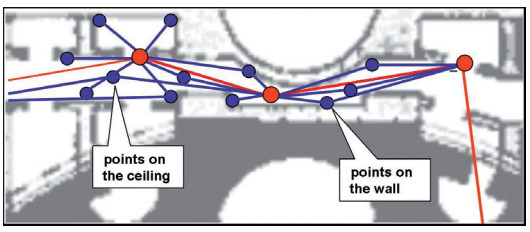


Fig. 1: Object-bound micro-networks replace the traverses (the red lines represent the traverses while the blue lines represent the measurements to natural points on the walls or the ceiling).

1 Scherer 2003.

Characteristics	Traditional way of working	The modern network
Structure of the network	Network built up by traverses; points on the building in general only tied up to the polygon points by polar measurement; linear polygon of traverses	All points are of the same order and homogeneously accurate Micro-networks replace the traverses
Marking of surveying points	In general ground points, which could be damaged	The natural points on the monument itself
Measuring mode	Forced centring, points of the traverses are to be measured to reflectors at a single attempt	Arbitrary stationing every time and measurement of building points with free-stationed total station
Workflow	Sights from point to point	Operator needs to ensure that the different stations have a sufficient number of identical points.
Adjustment	Only points of the traverse	All points
Documentation of the points	Coordinates and graphical description	Coordinates and image database
Use of the network	Stationing over the points of the traverses	Free stationing

Tab. 1: Traditional network compared with the modern network.

method, so do all the points. All the measurements are made in 3D. As the network is formed by natural points, its durability and sustainability are guaranteed. If the network is measured with high precision, the measured points can obviously be used over a very long period of time. The file of known points is then available for the densification of the network using free stationing, whenever this is necessary.

The major advantages of the modern network are that:

- it is well priced (because it is long-lasting);
- it is ideal for all sorts of buildings and monuments as it is unobtrusive and non-destructive;
- it can be used in any place and at any time, with no need for additional complex, expensive and time-consuming measurements;
- its homogeneous accuracy makes it applicable to many purposes, as well as to future uses.

In table 1 the traditional network is compared in detail with the modern network.

2. The network of the Pantheon[2]

2.1 Realisation and present state

The network of the Pantheon was designed according to the principles just described. It is not yet complete, but its thus far realised ground plan is shown in figure 2. The network itself is spread over four different levels.

The natural points, as indicated in section 1, are realised inside the Pantheon by the edges of marble inlay or of bricks, and outside generally by the edges of bricks and the street numbers of the surrounding buildings. To enable comparisons to be made between the traditional and the modern networks, both the traditional traverses were measured and measurements of the natural points were made to establish the micro-networks. In or-

2 I wish to thank Dr M. Juretzko for having taken the measurements using the video total station, and for having calculated and presented the network's adjustment and the dome's deviations. These results are part of his thesis on improving high-quality surveying using a video total station (Juretzko 2005).

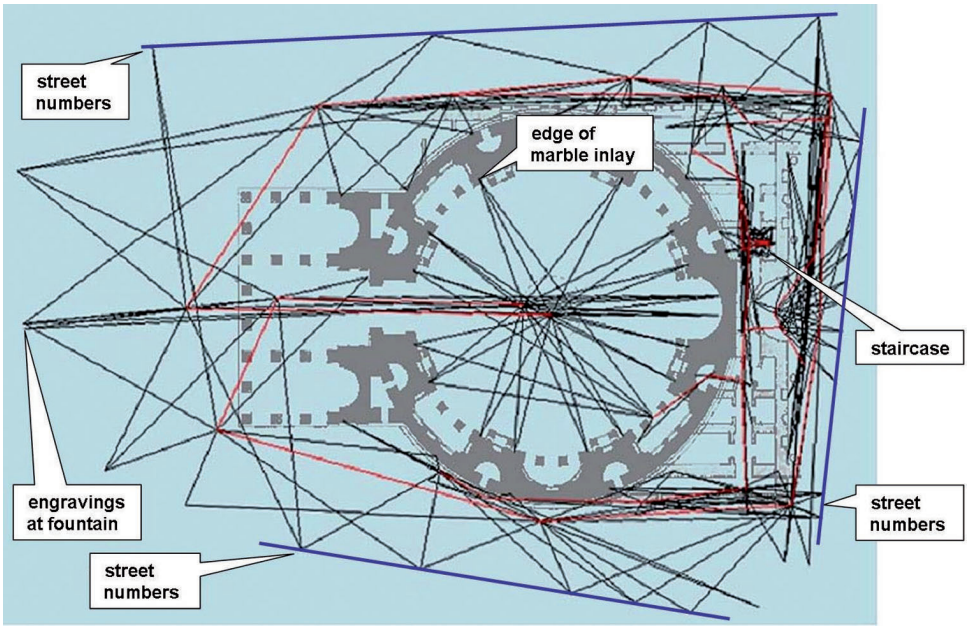


Fig. 2: Actual precise network of the Pantheon.

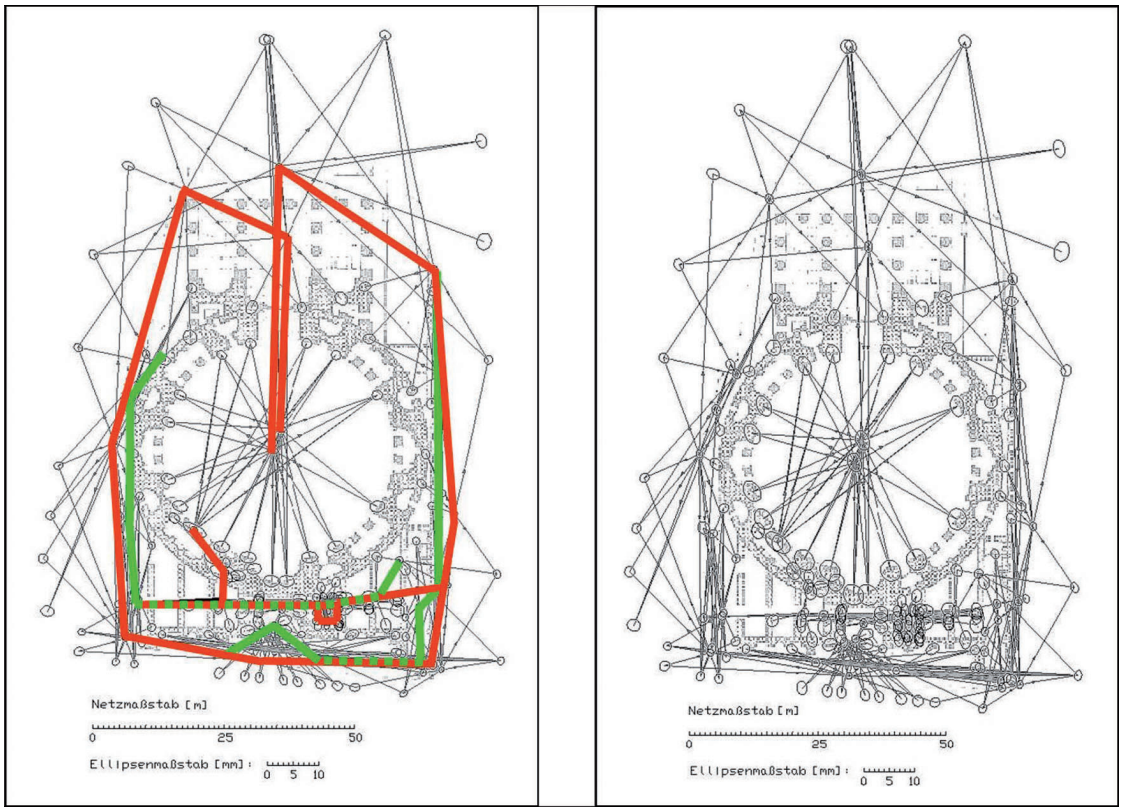


Fig. 3: Comparison of network accuracy obtained including the traverses (left) versus the accuracy obtained using micro-networks alone (right).

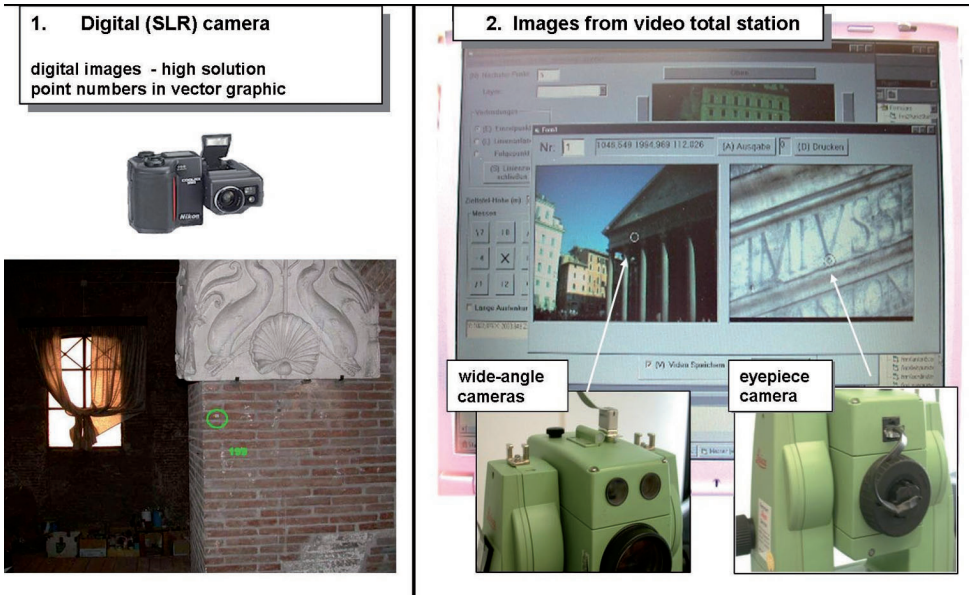


Fig. 4: Alternative ways of documenting natural points: left, with a digital camera; right, using the cameras of the video total station.

der to compare both methods directly, two different adjustments were calculated: first, the traverses were adjusted together with all the other points (see fig. 3, left); and, second, the network was calculated solely using the natural points, that is, without the traverses (fig. 3, right). The resulting error ellipses show that in both cases the accuracy of 2 mm to 3 mm is rather high, especially when one takes into account the fact that only natural points or simple lacquer points were used as targets. Without the traverses the accuracy is only slightly worse than the accuracy reached including the traverses. The entire network was measured in 3D.

Although the advantages of the new method are evident, there are two requirements that have to be taken into consideration when establishing the modern network: one is the necessity of always having a sufficient number of points to form the micro-networks — the operator needs to be aware of this; the other is the fact that, when working with natural points, an archive of photographs of these points is needed if they are to be easily retrieved at a later date.

2.2 Different ways of documenting natural points

The natural points were documented either manually, by means of a digital camera, or automatically, by means of a video total station. The left side of figure 4 shows an image taken with a regular digital camera; the real point was marked on the photograph using a computer program. As it is a high resolution image, one can zoom in to define and identify more easily the exact point. The right side of figure 4 demonstrates how to document natural points using a video total station. The photographs of the points were taken with the three built-in cameras at precisely the same moment as the measurements were made.

Figure 5 shows how to archive the pictures taken with a video total station. Aiming with this instrument was not made visually by using the eyepiece. Rather, it was carried out using the photographs from the integrated cameras, in particular the telephoto images. The instrument was steered by clicking the mouse into the image observed and controlled on the notebook's screen. Further developments aim to use feature extraction to support the auto-

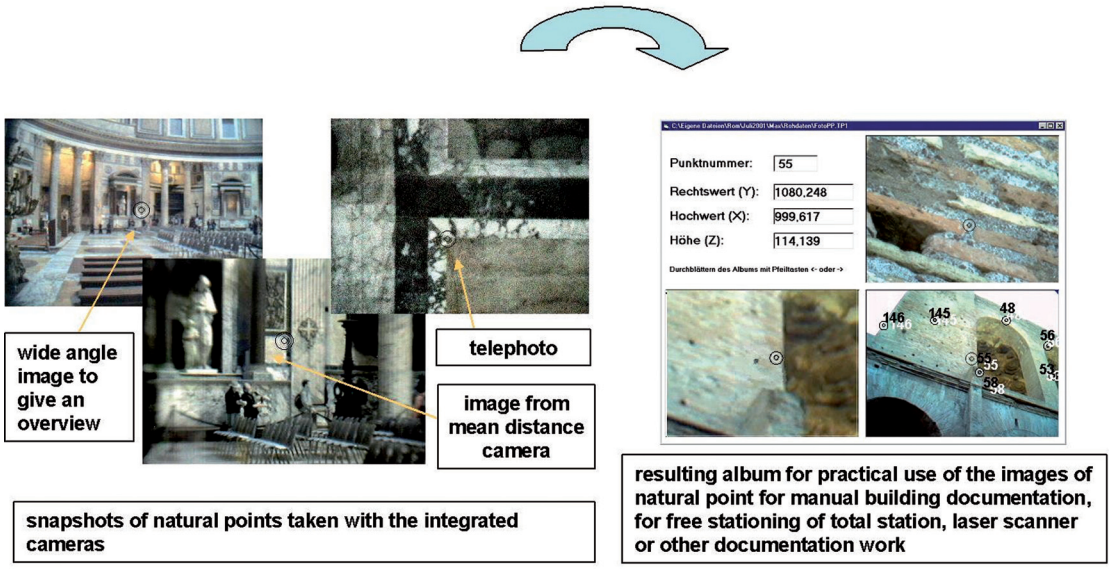


Fig. 5: Left, automatic documentation (from wide-angle to telephoto images) using a video total station; right, album for the practical use of the images, i.e. for identification followed by manual measurements.

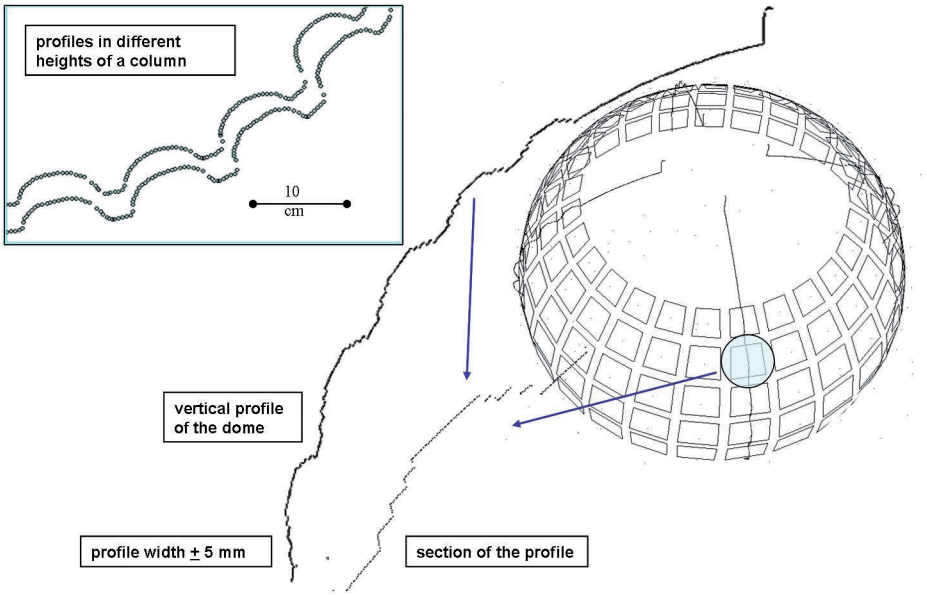


Fig. 6: Horizontal (left) and vertical profiles (right) of high precision.

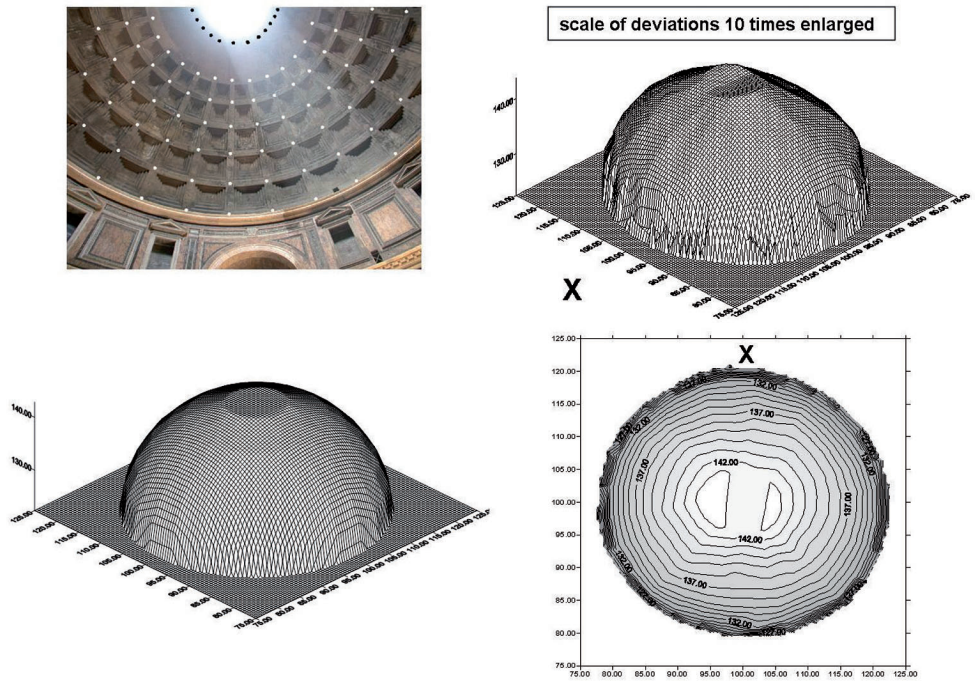


Fig. 7: Analysis of the spherical form of the dome.

matic aiming and matching of actual photographs with the registered situations archived at the moment that the original measurements are made.

3. Monitoring, and results of deformation measurements

Some special investigations were carried out at the Pantheon using the network: measurements of extremely precise profiles for special analyses (intelligent scanning); measurements concerning deformations of the dome; and a first attempt at establishing an image archive.

Some results of the technique of so-called intelligent scanning are presented in figure 6.[3] The profiles were measured with a point accuracy of about ± 2 mm. The points are close to each other (that is, 1 cm or 2 cm apart, where the distance is measured along the wall) and within a profile of a thickness less than 5 mm. Two examples are given. On the left of figure 6 are two horizontal profiles taken of a column at different heights, and on the right a vertical profile of the dome is shown (with a section enlarged). The accuracy of the measurements themselves as well as the correctness within the chosen profile cannot be achieved by laser scanning; this is a domain of intelligent scanning.

The precise measurement of profiles as well as the measurements described later concerning the form of the Pantheon's dome can be regarded as the so-called «zero» measurements, that is, the basis for a deformation analysis. The differences between these coordinates and those measured at a later date may reveal movements, cracks, and so on. Therefore, zero measurements can serve as a basis for monitoring.

In order to gain more accurate information about the exact form of the dome's hemisphere, a network of regularly distributed points was measured with an accuracy of ± 3 mm (see fig. 7). From these coordinates, an ideal hemisphere was calculated by adjustment. The radius of the resulting sphere is 43.21 m. In the graphical pres-

3 Scherer 2004.

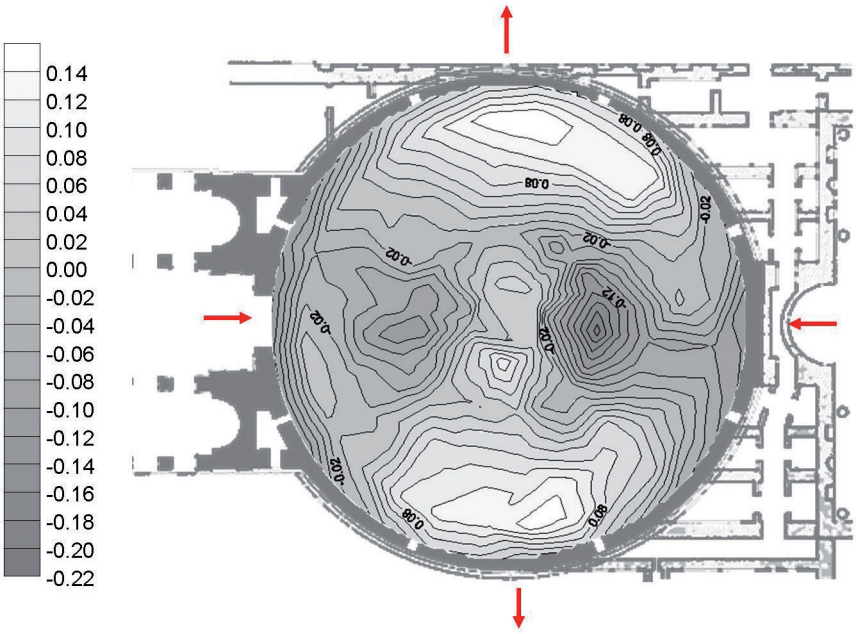


Fig. 8: Mid-distance-conform azimuthal mapping of the deviations of the dome.

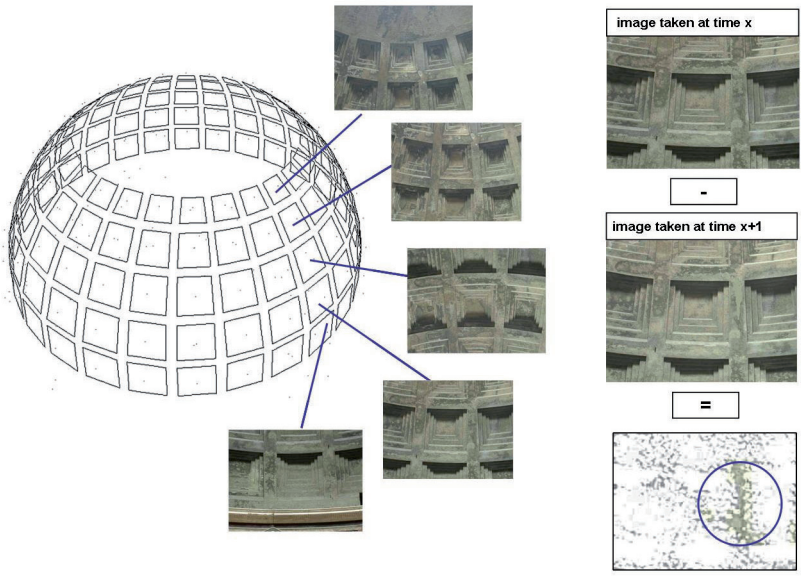


Fig. 9: Monitoring by differential analysis of images taken at different times.

entation on the left-hand side of figure 7, the deformations cannot be seen as they are relatively small. Thus, to make the deviations visible, the differences between the measured points and the ideal sphere were enlarged ten times. The resulting model, shown in the graphics on the right-hand side of figure 7, points out some systematic deviations.

On the bottom right-hand side of figure 7, lines of equivalent heights give an impression of the deviations on the top of the dome. In order to make the differences on the sides of the half

sphere also more visible, the hemisphere was developed into a plane by applying a mid-distance-conform azimuthal transformation (see fig. 8).
The distorting influence of the entrance portico and of the structure at the back of the Pantheon can clearly be seen. The rotunda and dome seem to have been deformed by the amount of about 2 dm, obviously caused by the pressure from these two structural elements.
As a first step towards a more global monitoring of the Pantheon (to detect not only geometrical changes but also other influences on the building), a set of colour as well as black & white images of all the cartridges of the dome was made. As demonstrated in figure 9, photographs taken at more or less regular time intervals enable changes to be detected, for example changes caused by gaps letting in water.
This could herald the beginning of a modern system for carrying out differential analyses of all kinds of changes, such as detecting mechanical deformations, the influences of humidity, fungal decay and chemical influences.

4. Conclusions

It has been shown that a network of natural points that form micro-networks instead of a network of traditional traverses has many advantages: it can serve as a basis for all kinds of documentation work, deformation measurements and monitoring as well as the backbone of an information system devoted to monument management (Monument Information System or MIS). An archive of the images of the natural points was established, which will enable these high-precision coordinates to be used in the future. The network has still to be completed and a final adjustment to be made. The resulting database will be suitable for long-term utilization, and ought to be accessible to everyone. A monitoring concept based on an MIS would help support sustainable management.

A Computing Model for the Pantheon's Cupola: From the Discrete to the Continuous. The Ideal Continuous Model

Graziano Mario Valenti

Introduction

In architectural surveys, the purpose of measuring is to individuate a finite number of significant points that significantly approximates the continuity of the real object, and which can be used to reconstruct a simplified geometric model. The choice of which points to survey is a sensitive procedure, to be performed during the planning of the survey by individuals capable of interpreting the object for its qualitative complexity. The reason for the existence of a form may have roots that are, to cite a few, geometric, perceptual, structural, or functional. The surveyors must, therefore, develop a critical reading of the building that draws from all the sciences and disciplines concerning architecture. They must also hypothesize a plausible model for the object under study, and use measurement as a means for verifying the hypothesis.

The introduction of new computer technology has somewhat inverted this process. The stereo restitution of digital images and three-dimensional laser scans currently makes it possible to capture an intermediate model that lies between the real object and the geometric model, without there being any need to fully understand the object before commencing its survey.

The study of the geometry of an object can be conducted using this intermediate model to advantage by working with the analytical tools provided by computer processing. This course of study is still open to exploration. The application presented here was conducted by the photogrammetry laboratory of the R.A.D.A.A.R. (Rilievo Analisi e Disegno dell'Ambiente e dell'Architettura) department of the University of Rome La Sapienza, and directed by Professor Mario Docci. It is part of a more comprehensive research project, coordinated by Professor Riccardo Migliari, which aims to define a methodology for architectural surveying using 3D laser scanning and software specific to the analysis of virtual models, in all senses of the word. The architectural object of this sample survey is the *intrados* of the Pantheon's cupola.

The survey

The survey was conducted using a Cyrax laser scanner, capturing ten scans on the surface covered by *lacunars* and another two scans on the remaining surface near the *oculus*. In order to optimize the surface frames and resolve some problems derived from the presence of the public in the Pantheon, we set up four survey stations on the main floor level. Each station was situated around the vertical axis that intersects the centre of the *oculus*, every 90 degrees at about 10 m apart.

The cupola's *intrados* surface has five radial courses of twenty-eight *lacunars*. Obviously,

the dimensions of the *lacunars* at the lowest level of the cupola are larger than those of the *lacunars* near the top. We thus adjusted our scans in such a way so that we could record at least three *lacunars* at the lowest level and a larger area towards the top of the cupola. We thereby obtained data redundancy, which was necessary before proceeding with the alignment of the scans.
The scans were executed, taking a sample point every 6 cmq. For each scan we obtained a total of about 800'000 points (fig. 1). The type of information derived from the scans are numeric: it consists of 3D coordinates, which therefore represent a ‹discrete› model of the cupola's *intrados*.

Alignment

The alignment and analysis of the models were realized using the ImAlign and ImInspect modules of Polyworks' software package.
One of the twelve scans was chosen and fixed into the world's reference space; we then aligned all the other scans, following on from one another. The alignment of each scan was executed in two steps. The first step was carried out on the computer, albeit manually, in order to determine a first alignment approximation. The second step, which was needed to optimize the previous alignment, was realized automatically. The two steps were necessary because in the first operation the brain's ability excels, while in the second step the calculation capacity of the computer is unsurpassable. The manual alignment (fig. 3) was conducted using the input of at least three corresponding points (fig. 2), each point individuated on the common surface that an oriented scan must have with a scan that has not yet been oriented.
The automatic alignment (fig. 4) was done by computer, using a Best Fit algorithm, which can find the spatial position that minimizes the differences between common surfaces.
Giovanna Falcone executed the first alignments of all the scans.

Analysis of the model: the cupola's lower surface

The discrete model resulting from the survey was analyzed by data processing in order to understand the form, the correspondence of the built form with respect to the ideal form, and the presence of geometric, or simply metric, characteristics beyond those perceived at first glance. Let us suppose that the dome has a spherical form. The first analysis conducted was geared towards determining its most likely diameter. With the appropriate analytical tool, we digitalized all the points on the surface of the *intrados* belonging to the meridians and the parallels framing the *lacunars*, as well as the surveyed points on the surface that show none of the discontinuities present between the uppermost level of the *lacunars* and the *oculus*.
The processing revealed that the form of the dome faithfully reproduces the geometry of a sphere. Seventy per cent of the points used for the test do not deviate more than 8 cm from the ideal sphere, while another 27 per cent deviates between 8 cm and 15 cm from the same surface, which amounts to 98 per cent of all the points examined.
More in-depth research, examining separately the surface of the *intrados* near the *lacunars* and the surface nearer the *oculus*, has revealed a significant difference in the diameter of the sphere, whose respective calculated measurements were approximately 21.90 m and 21.40 m (fig. 5).

Analysis of the model: the *lacunars*

Analogous analyses were performed on the surfaces of the *lacunars* to verify the geometry. In particular, we examined whether the points chosen on the *lacunars* were closest to a spherical or to a flat surface. The results showed that the outer parts of the *lacunars* are spherical (figs. 6, 7), whereas the surfaces of the inner areas tend to be flat (figs. 8, 9). Furthermore, the diameter of the spheres nearer the outer-

most surfaces of the *lacunars* is not congruous with that of the dome. This condition has led us to hypothesize that the execution of the two architectural elements was treated differently.

The lacunars: form and perception of perspective

The best position for observing symmetrical *lacunars* is clearly from the centre of the cupola, which is generally located on the plane of the impost. But no observer can see the cupola from this privileged viewpoint. In the Pantheon's case, the *intrados* and its *lacunars* can only be observed from the floor, at a much lower level than the plane of the impost. Therefore, by using the data analyses based on the statistical distribution of the points surveyed, we extracted several ideal sections, from which we derived further information for formulating a hypothesis on the geometric origin of the *lacunars*. In particular, we performed several analyses in order to understand whether their asymmetrical form could be explained by the wish to correct the optical distortion that would be observed by visitors standing on the floor immediately below the *oculus*, as already stated, at a much lower level than the plane of the impost.

The experimental analysis was articulated in two steps. Initially, the section lines of the *lacunars* were extended to find convergence points (fig. 10). On examining the images, it is clear that the straight lines suggest the presence of two poles, one at the centre of the *oculus*, the other at the bottom of the *intrados*' sphere.

During the second step, we proceeded in an inverse manner with the ‹ideal construction›: we drew construction lines from the poles to the *lacunars* (fig. 10). This proved useful, because it showed that by proceeding in this way it becomes impossible to perceive any meaningful differences between the construction and the section lines.

Another factor that confirms the illustrated hypothesis can be found by carrying out a validation based on the axis of a pyramidal reduction. The extension of this axis intercepts with good approximation the viewpoint of a visitor standing at the centre of the Pantheon (fig. 11).

Conclusion

These considerations were produced from repeated and rigorously carried out experimental analyses, executed on numerics models obtained from the surveys; however, other possible interpretations cannot be excluded. The building's imperfections, the effects of time and other factors can generate errors in the data examined, and thereby conceal the real reason for the dome's form. Confirmation of these considerations through new analyses that are transversal and interdisciplinary in character are needed.

However, for the moment, we consider it meaningful to sustain this hypothesis reached through examining some images of the Pantheon's virtual model, which enabled us to observe the *intrados* and the *lacunars* from every viewpoint.

It is easy to verify that the perspective seen by an observer situated at the viewpoint that is generally considered optimal to someone visiting the Pantheon – that is, standing on the floor beneath the centre of the oculus – generates an image in which the lacunars appear symmetrical and regularly dimensioned (fig. 12).

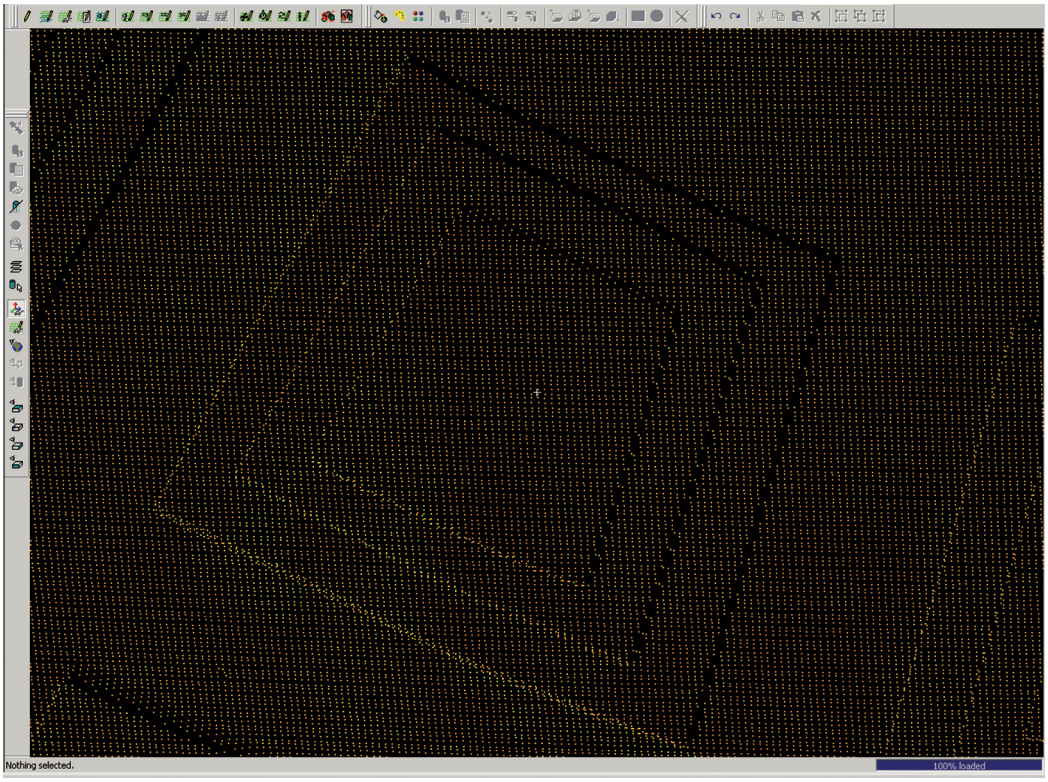


Fig. 1: Scan of the Pantheon's *intrados*: detail of point clouds.

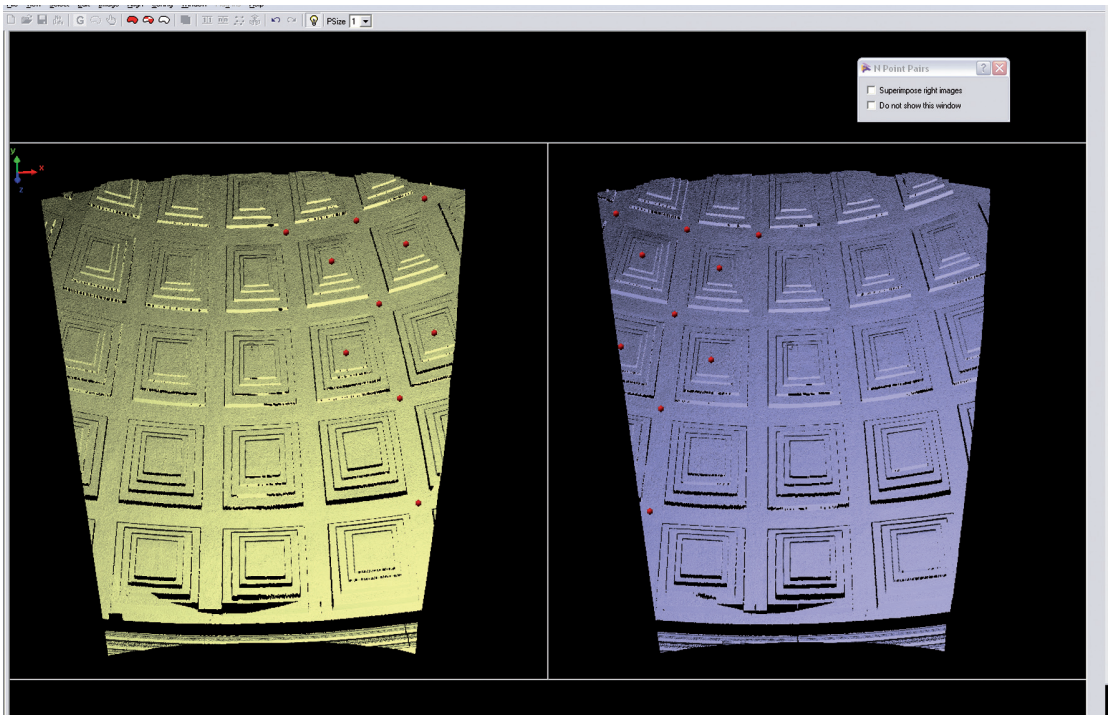


Fig. 2: Scan of the Pantheon's *intrados*: corresponding points.

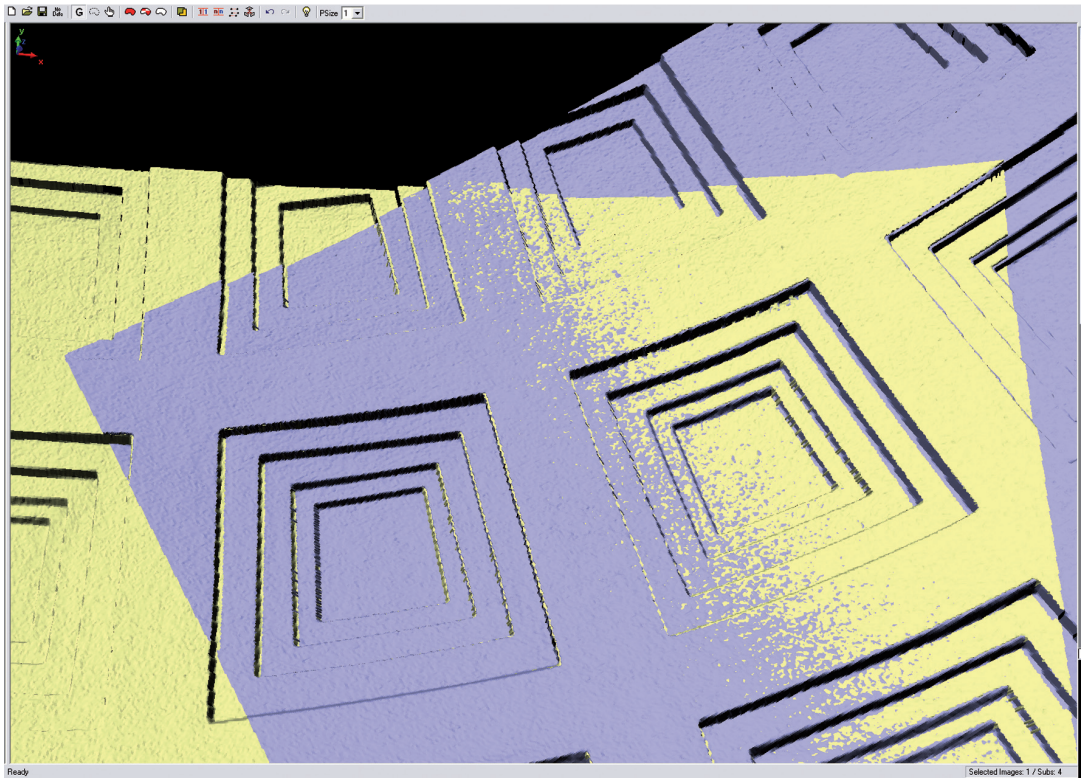


Fig. 3: The surfaces after having been aligned manually.

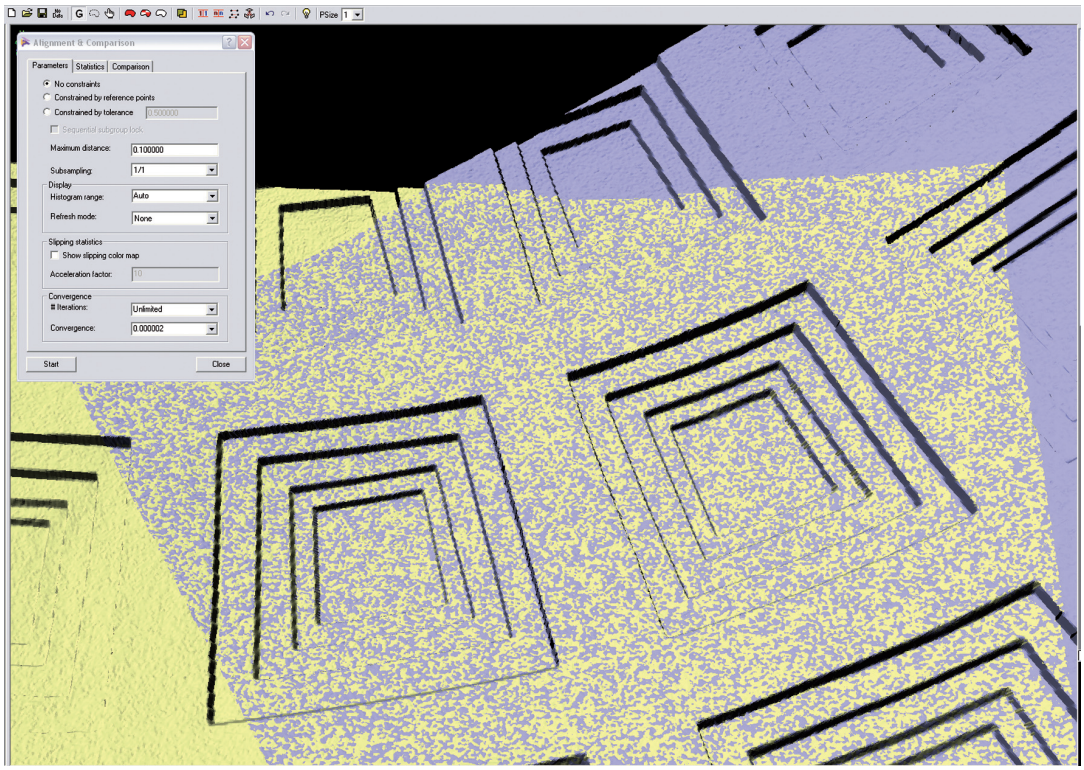


Fig. 4: The surfaces after having been aligned automatically.

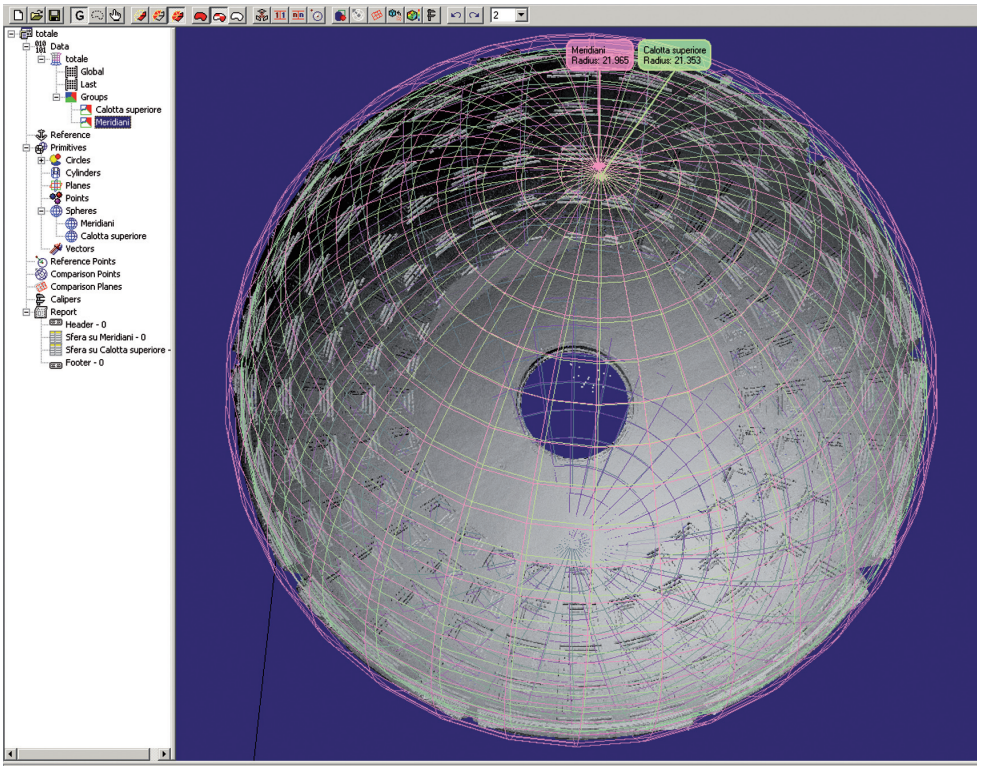


Fig. 5: The diameter of the *intrados*.

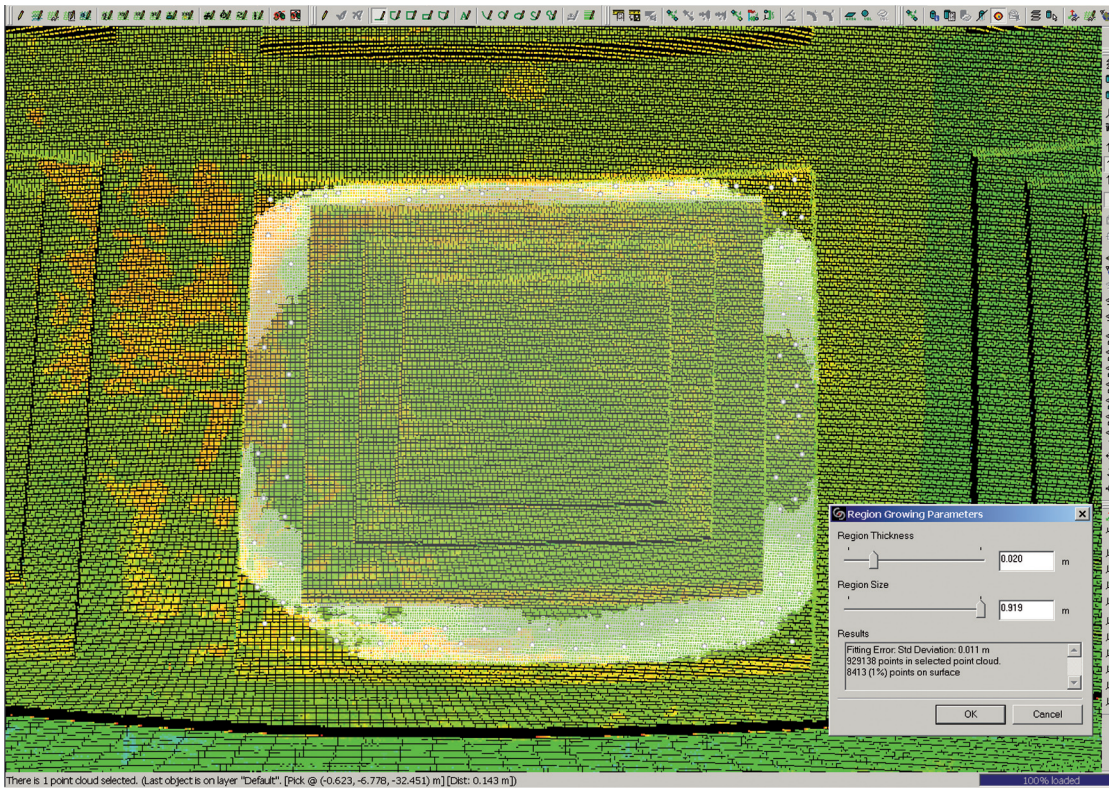


Fig. 6: The external surface of the *lacunars*, approximated by a plane (worse).

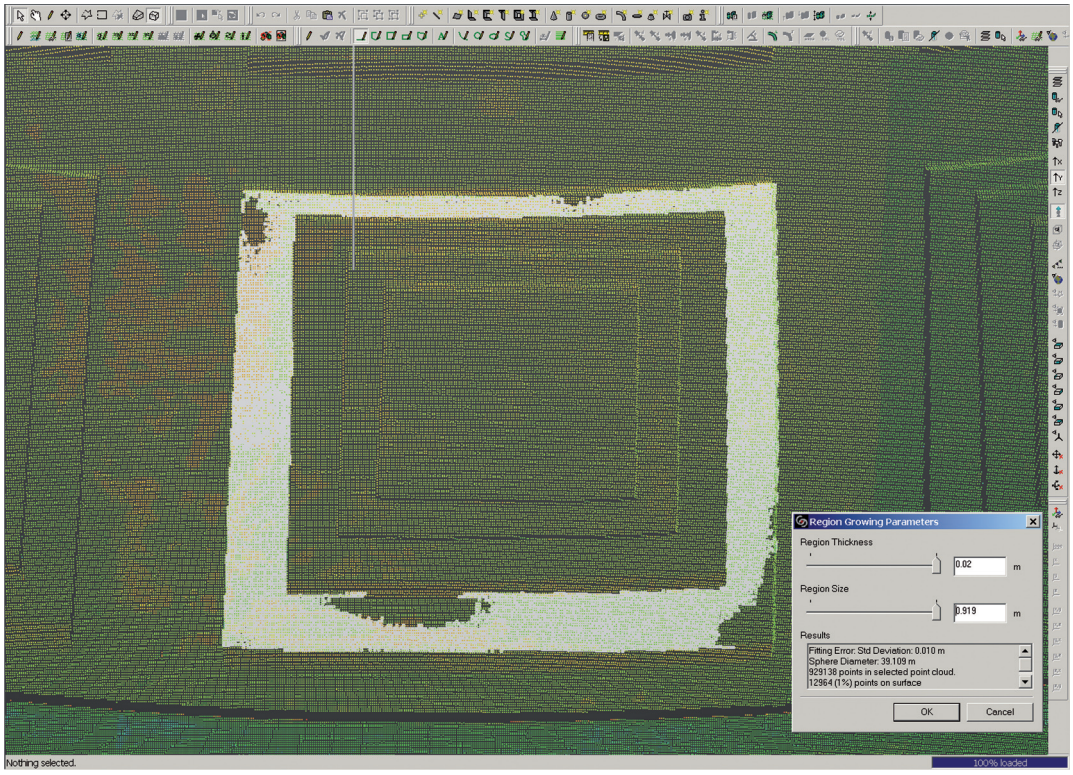


Fig. 7: The external surface of the lacunars, approximated by a sphere (better).

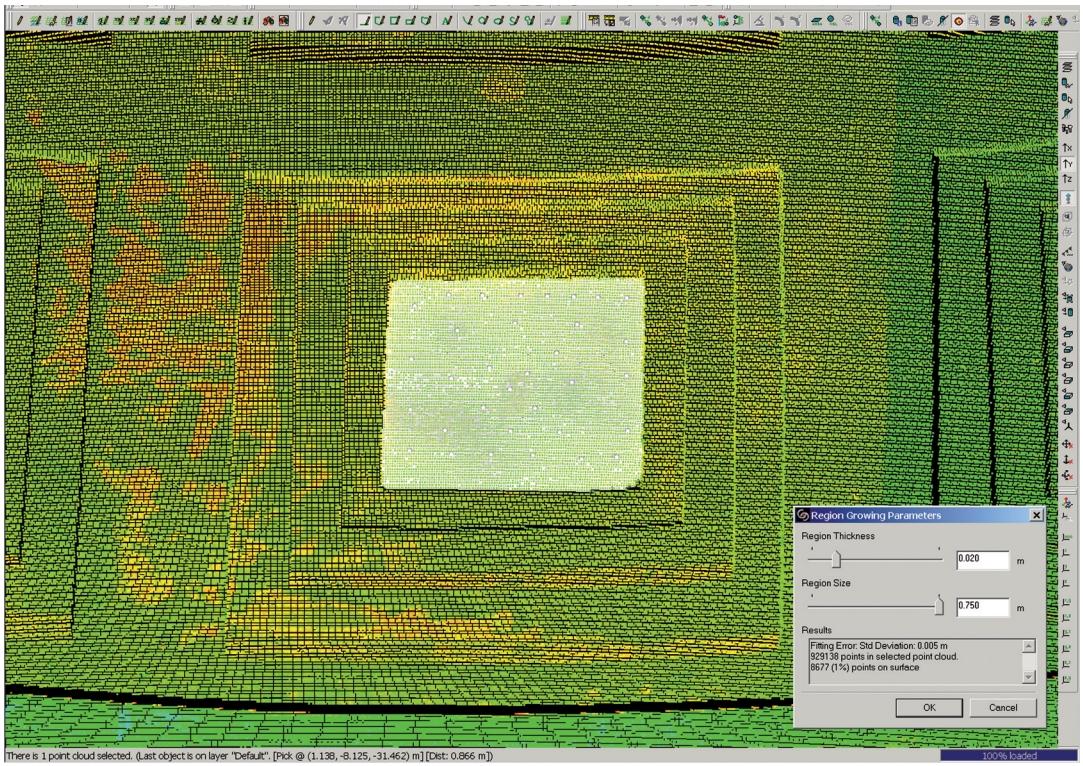


Fig. 8: The internal surface of the lacunars, approximated by a plane (better).

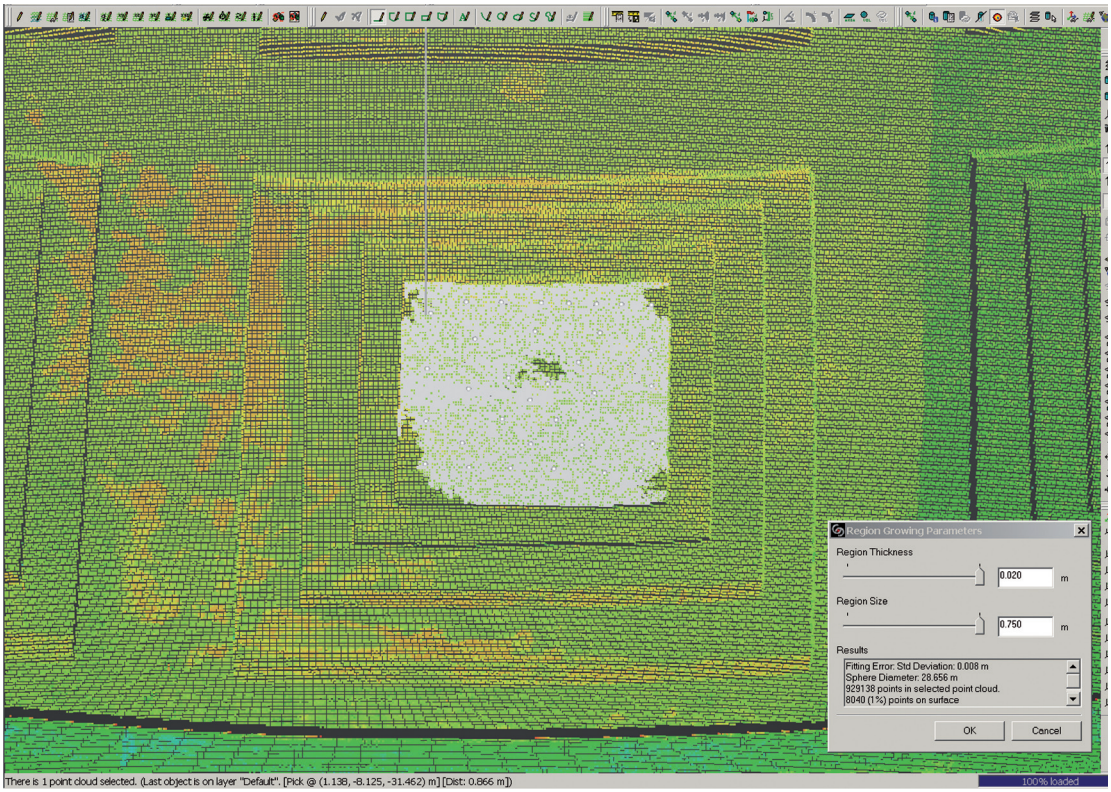


Fig. 9: The internal surface of the *lacunars*, approximated by a sphere (worse).

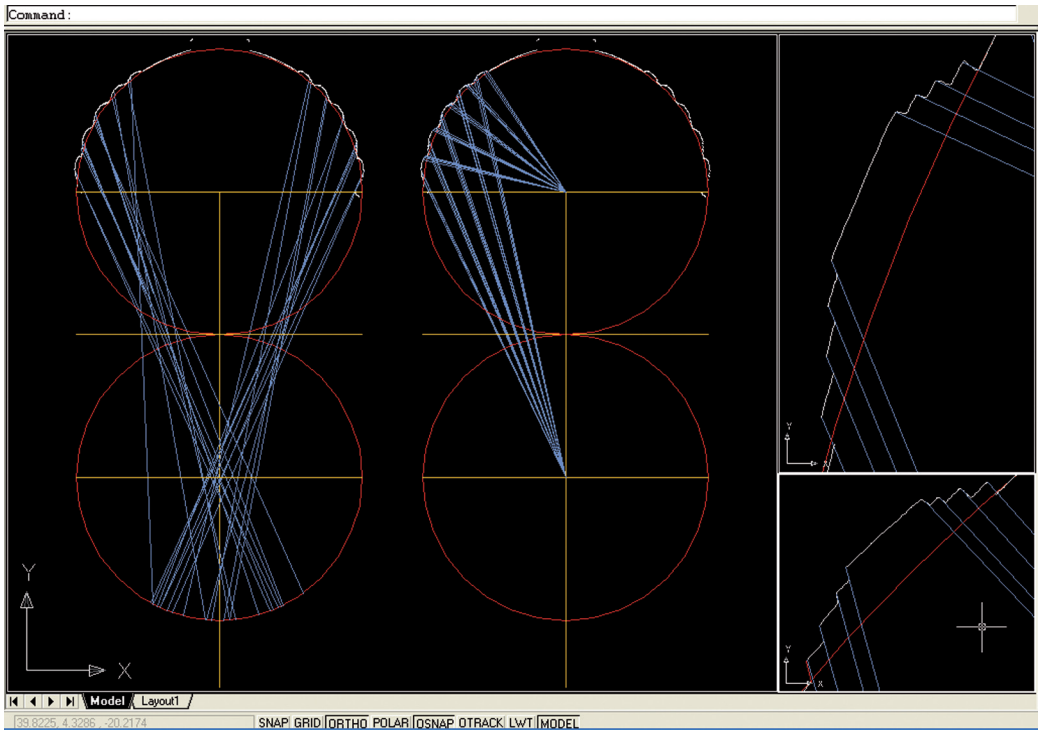


Fig. 10: Drawings examining the direction of the *lacunars*' section lines.

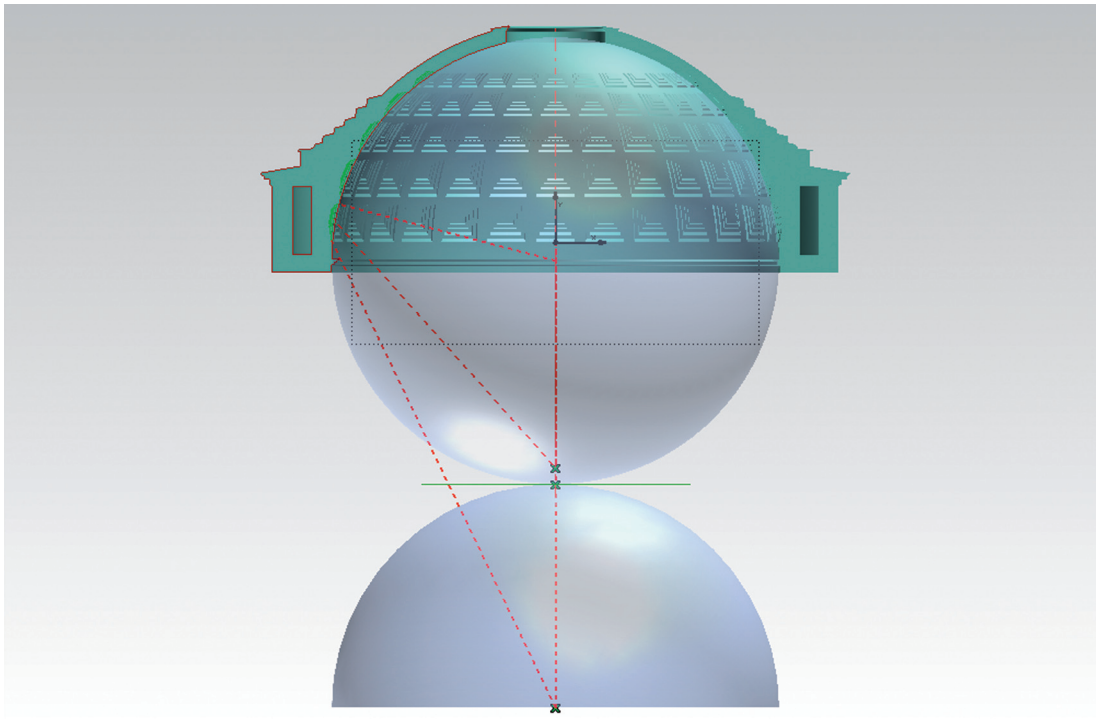


Fig. 11: The main viewpoint of an observer.

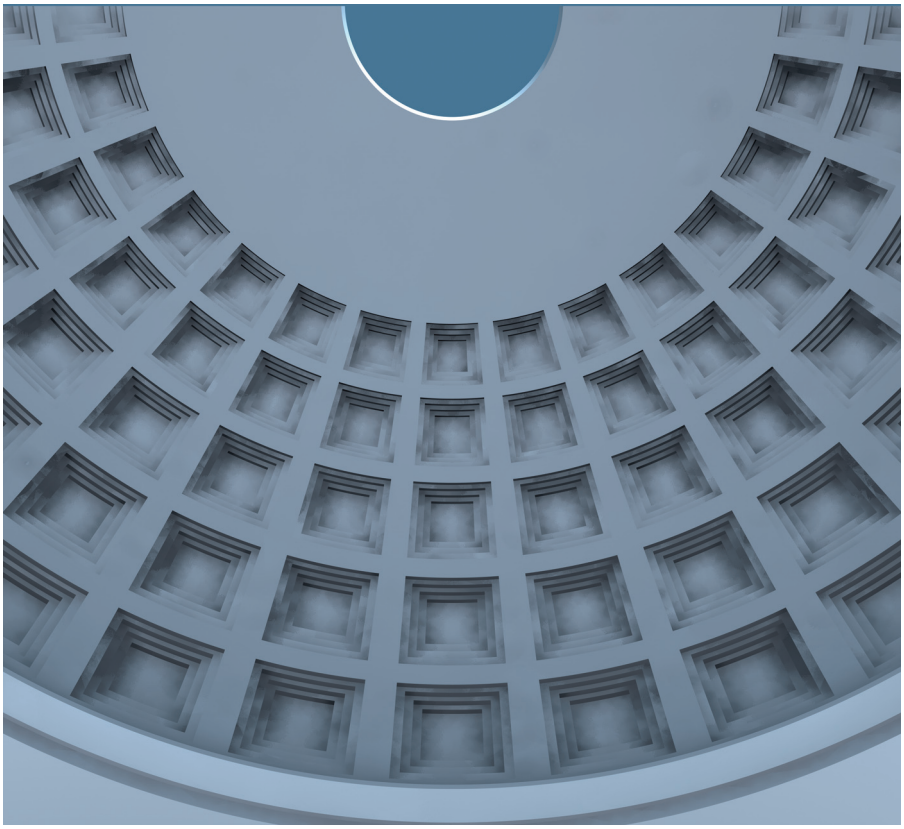


Fig. 12: Perspective of the 3D model seen from the main viewpoint.

A Structural Evaluation of the Pantheon — Envisaged Tasks

Thomas Vogel

Keywords: arch structure, consolidation, finite element method, seismic design, soil settlement, spherical shell, structural evaluation.

Abstract: The Pantheon is treated as the subject of a structural evaluation in order to answer questions raised by the laser scanning initiative of the University of Bern. After an introduction into the techniques of structural evaluation, some structural models are explained in more detail so as to highlight their advantages and shortcomings. With regard to the cupola, spherical membranes, more general shells and radial arches are treated. Finite element methods are suitable for modelling the whole structure and the subsoil. To estimate settlements, some fundamental relations and subsequent calculation procedures are explained, while in respect of seismic loadings two different approaches are put forward. The paper closes with the questions that served as the starting point of the evaluation, and the procedures that were carried out are listed. The results of the evaluation will be published in peer-reviewed journals.[1]

1 Introduction

The promoters of the Karman Center's Pantheon Project approached the author to join and support the application for a research grant to carry out a laser scanning survey of the Pantheon. This gave us the idea to formulate tasks for students undertaking diploma theses to treat previously posed open questions as well as new questions arising from the survey and the subsequent creation of the Bern Digital Pantheon Model.

Because of the given deadlines, we were not able to present any results at the international Pantheon conference held in Bern in November 2006. Rather, for the author, his co-workers and the two diploma students involved the conference served as an introduction to research on the Pantheon.

This paper covers the general aspects of the structural evaluations of historical buildings as carried out by structural engineers and basic knowledge on the structural systems that are applicable to modelling the Pantheon and its foundations; it also lists the questions asked and the procedures for answering them.

2 The multidisciplinary approach

As far as the author understands, any collaboration across disciplinary borders means first of all trying to understand the methodical approach of the partners; not to follow suit but

1 The author wishes to thank Gerd Graßhoff and Michael Heinzelmann for having initiated the Bern Pantheon Project and for having invited him to participate in the 2006 Pantheon conference in Bern; Nikolaos Theocharis for exchanging data; Kristian Schellenberg for having carefully organised and supervised the diploma theses; and Boris Jäggi and Simone Cereghetti for their diligent work.

to understand their way of thinking. In other words, it entails one trying to explain one's own methodical approach and the best practices of one's own discipline, which enables the partners to appreciate the reliability and accuracy of the final results.

3 Structural evaluation of existing buildings

3.1 Understanding the history of a building

The structural evaluation of existing buildings has only become a common undertaking for structural engineers in the past few decades. Prior to then, structural engineers were more commonly and more demandingly involved in the design of new structures. This led to a broad knowledge base that was largely codified and accessible to practitioners, for whom it was not necessary to understand all the related facts and processes in depth.
Another aspect of understanding the history of a structure is to establish whether our ancestors did what they did because they knew how it worked or because it had always been done that way.

3.2 Modelling a structure

In engineering, a structural model or a static system is a simplified mathematical description of the physical reality. It should explain the relevant aspects with adequate accuracy and neglect those that are of minor importance, given a specific question. The simpler a model is, the easier it can be cross-checked and validated, but a simple model may fail to explain all the relevant aspects. More refined models may reflect known results better, since in the modelling process there are many opportunities for choosing parameters according to the expected results. In the case of a historical building, the fact that the structure has survived so long is important evidence, and any applicable model should be able to cope with this fact.

The true test of a structural model is forecasting its behaviour with future loadings. In the evaluation of historical structures, however, any intentional additional loading is usually impossible, because load tests either may not reach a relevant load level or they may risk damaging an object of cultural heritage. Nevertheless, engineers are supposed to verify the reliability of the respective structure and even take responsibility for this testimony.
An approved procedure in structural modelling is to start with simple analytical models that have a sound physical background, then to continue with more refined models that can only be interpreted numerically and to test them, initially with the properties of the simple ones. To take into account additional effects, they may need additional parameters. As far as is possible, additional paramenters are chosen on the basis of physical relevance and best practice. Only when it comes to making final adjustments to the model and reality, may parameters be chosen to give the best coincidence. In the engineering community, this procedure is known as «curve fitting» and has a questionable reputation.

3.3 Drawing conclusions

The results of modelling are subject to general questions such as:
- Do the results fulfil the requirements regarding accuracy?
- Are there any indications that the model might be incorrect or incomplete?
- What consequences do the chosen simplifications have?

Depending on the answers to these questions, the model is adjusted or the results are accepted and used to verify the structural safety, the serviceability and the durability of the structure. In cases where the evidence that these requirements will be met cannot be provided, organisational and/or structural countermeasures need to be taken.

4 Structural systems and their loading

Structural analysis is based on three principles:

- Equilibrium:
  However a structural system is chosen, all the loads acting on the system and all the reactions of the system (formulated within its limits) must equilibrate each other. On the infinitesimal level, forces are replaced by stresses, and for each point a stress state can be formulated (the stress field).
- Kinematic relations:
  By describing the (small) displacements of each point of a structural system and assuming that adjacent points remain adjacent after a loading, strains can be formulated for all the points of the structure (the strain field).
- Constitutive laws:
  For each involved material there exists a relation between stresses and strains.

These three principles can all be expressed as partial differential equations in the general case. In special cases, they can be expressed as ordinary differential equations or even simpler relations between generalized terms.
We will now look at the structural systems and methods that will be applied to model the Pantheon and its subsoil.

4.1 The dome as a shell structure

Shell structures have extensions in two directions: the surface, and a small extension pendicular to it, the thickness h. Unlike plate structure, the surface of shell structures is not flat but cambered, which is why shells can bear loads perpendicular to their surface without bending. A basic reference is Timoshenko et al. 1959.

4.1.1 The membrane theory

Thin shells are called membranes, which carry loads with normal forces (n_x and n_y) and shear forces (n_{xy} and n_{yx}), inplane only. These forces are called membrane forces (fig. 1a). If the coordinate system is rotated, there will always be a point at which the shear forces vanish and the normal forces become extreme (principal directions 1 and 2, principal normal forces n_1 and n_2, fig. 1b). In this coordinate system, equilibrium can be expressed as a relation of the distributed load perpendicular to the shell p_n, the normal forces in the membrane n_1 and n_2 and the curvatures of the surface, expressed by the respective radii r_1 and r_2:

$$\frac{n_1}{r_1} + \frac{n_2}{r_2} + p_n = 0 \qquad (1)$$

Both tensile and compression forces are limited by the tensile and compressive strength of the material, respectively. Compression can also lead to local buckling in thin shells, depending on the thickness and elasticity of the material.

4.1.2 Rotational symmetry

The shells that are easiest to analyse are those that have the form of a surface of revolution and are loaded symmetrically with respect to their axis. Due to this rotational symmetry, the principal directions are those of the meridian (φ) and those perpendicular to it (θ). The radius of the meridian at the examined location is r_1. The radius of the corresponding circle of latitude is r_0. Due to rotational symmetry, the centre of curvature in θ-direction lies on the rotational axis, which leads to the radius r_2 (fig. 1c). By adjusting the indices, equation (1) reads:

$$\frac{n_\varphi}{r_1} + \frac{n_\theta}{r_2} + p_n = 0 \qquad (2)$$

For a sphere, both radii are equal and called r. This leads to:

$$\frac{n_\varphi + n_\theta}{r} + p_n = 0 \qquad (3)$$

In a shell with rotational symmetry and a vertical axis, the sum of gravitational forces ρg above a certain level expressed by the angle φ

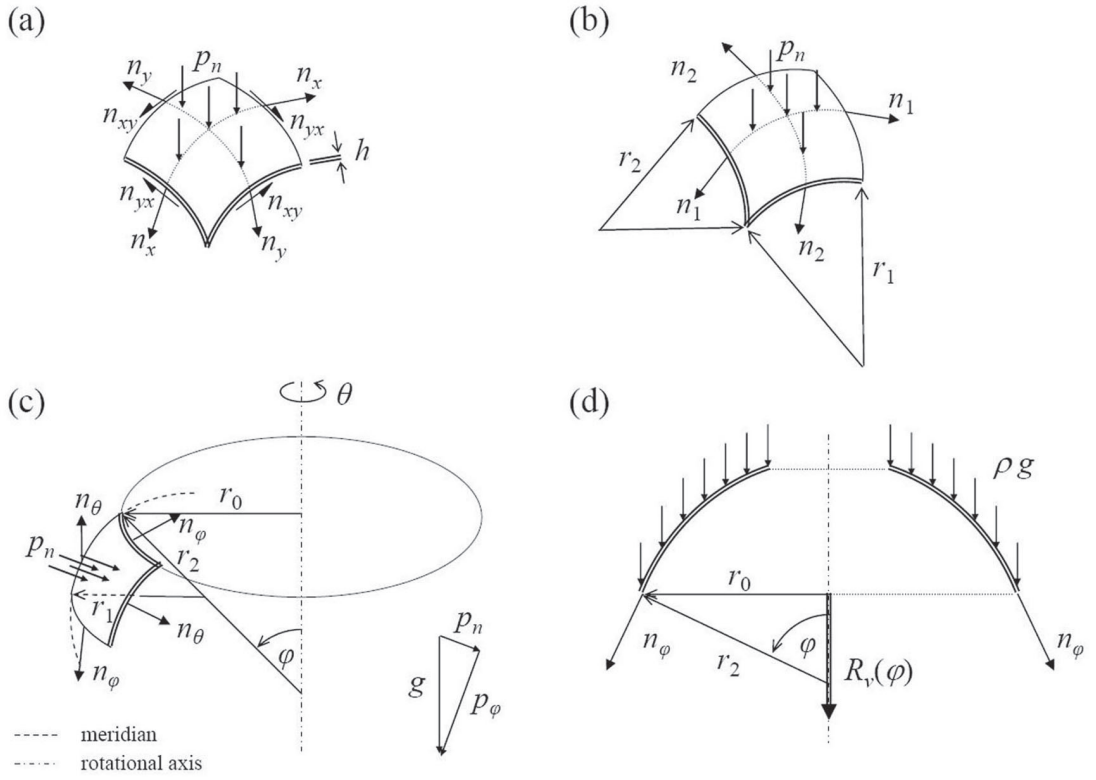


Fig. 1: Membrane theory: (a) out-of-plane loading and membrane forces, (b) principal normal forces and according radii, (c) denominations of shells with rotational symmetry, (d) radial normal forces due to gravity loads above.

is called $R_v(\varphi)$. It is equal to the vertical components of the inner forces on that level, which in this case are the membrane forces n_φ along the examined circumference $2\pi r_0$ (fig. 1d):

$$R_v(\varphi) = \int_V \rho g dV = 2\pi r_0 n_\varphi \sin\varphi = 2\pi r_2 n_\varphi \sin^2\varphi$$

$$n_\varphi = \frac{-R_v(\varphi)}{2\pi r_2 \sin^2\varphi} \tag{4}$$

By applying equation (2), the normal force n_θ can also be calculated:

$$n_\theta = n_\theta \frac{r_2}{r_1} - r_2 p_n \tag{5}$$

The membrane theory can take into account different thicknesses h and different densities ρ, which lead to varying gravity forces. Any abrupt changes in these properties or sharp bends in the shape of the meridian can cause — due to the relations explained above — discontinuities in the calculated membrane forces.

4.1.3 The bending theory

All the calculations carried out so far are based on equilibrium only and are appropriate for any material as long as neither its strength is exceeded nor local buckling occurs. By assuming a constitutive law for the material — for instance, linear elastic behaviour — strains can be calculated and integrated into displacements. By requiring continuity, that is, stipulating that adjacent points remain adjacent even if deformations have occurred, strains must be continuous even if stresses are not. To fulfil this requirement, additional stresses due

to bending moments occur; these can be calculated using more refined methods.
Bending moments also occur on the boundary of a structure, for instance the lower edge of the shell, where conditions may have to be met that do not comply with the displacements of a pure membrane. For some well-defined surfaces, such as cylinders, cones and spheres, there are differential equations that can be solved to satisfy simple boundary conditions. The resulting bending moments depend on the stiffness of the shell. The stiffer the shell is, that is, the more it resists flexure, the larger are the bending moments that cause bending stresses.

4.2 Arch structures

Masonry and concrete are well suited to carrying compression forces but very limited when it comes to tension. Cracks occur, mostly in the matrix, that is, between stones or bricks in the masonry and between the aggregates in concrete. As long as the crack openings stay in the range of a millimetre, they do not harm. Compressive forces and even shear forces can be transmitted across the cracks.
A spherical shell that has no rigid base always exhibits tension stresses in the lower part of the shell. They are directed in the circumferential direction and lead to radial cracks. By accepting these cracks as the boundaries of structural elements, a cupola, together with its supporting cylindrical wall, can be regarded as a set of radial arches (fig. 2).

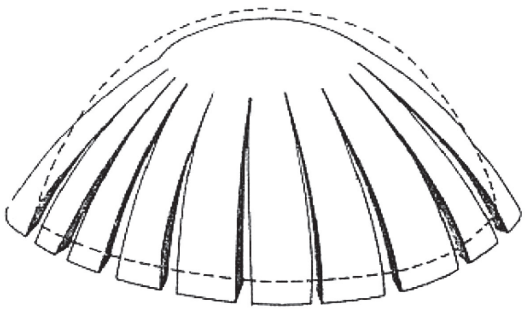


Fig. 2: Cracked cupola, according to Lucchini 1996.

The flow of forces in an arch can easily be described by locating the respective resulting force *R*, known as the thrust line. Poleni, who evaluated the cracks in the cupola of Saint Peter's Basilica in Rome, modelled the thrust line by using spheres that touch each other at a single point, which must therefore be the location of the thrust line (fig. 3).[2] He also used a catenary as the analogy in tension that is more suited for getting a stable physical model.
Analytically, the thrust line can be calculated by replacing the arch with a simply supported beam and determining its bending moments *M(x)*. The shape of the thrust line is similar to that of the bending moment (fig. 4a). By requiring that the bending moment vanishes at one point of the arch, for instance its crown, the horizontal reaction *H* at the imposts can be calculated:

$$H = \frac{M(l/2)}{f} \qquad (6)$$

Note that a thrust line cannot be vertical because its slope is given by the relation of horizontal and vertical components of the resulting force, *H* and *V* respectively. In the case of the Pantheon, heavy loads on the circumferential wall may increase the slope of the resulting force; the horizontal component *H*, however, is not reduced. Only a horizontal tension ring could carry the load, but it would need a material suitable for tension, such as forged iron or steel.
If the thrust line (that is, the action line of the resulting force *R*) is kept within the core of the cross-section, which for solid shells means within the central third of the thickness, the whole cross-section acts in compression and no cracks occur (fig. 4b). When the thrust line moves outside the core but still lies within the cross-section, cracks open, but a stable state may still be found, provided that the compressive strength of the material is not exceeded (fig. 4c and d).

2 Poleni 1748.

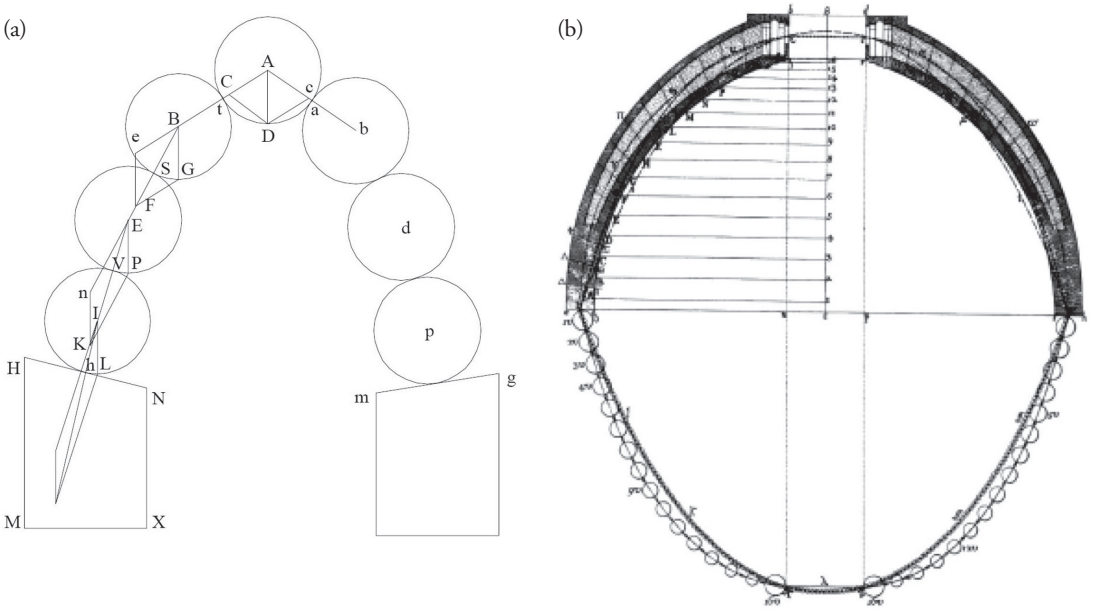


Fig. 3: Construction of the thrust line according to Poleni 1748; (a) represented by spheres, redrafted by Câncio 1996; (b) represented by a catenary, loaded proportionally to the cupola's weight.

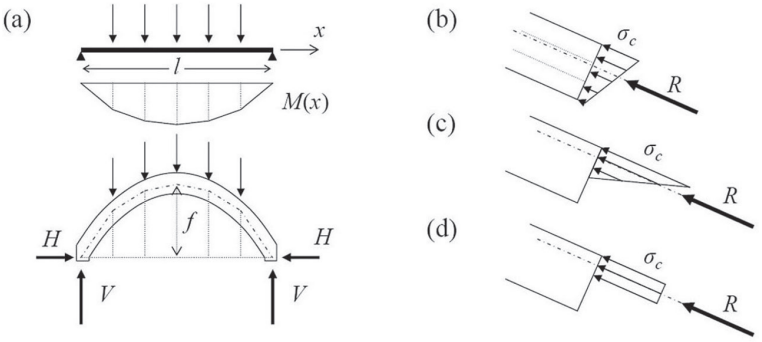


Fig. 4: Arch with thrust line; (a) beam analogy; (b) resulting force within core; resulting force outside core for (c) linear elastic and (d) perfect plastic material behaviour.

4 .3 The finite element method

Unlike the analytical methods described so far, the finite element method does not claim to fulfil equilibrium, kinematic relations and constitutive laws at each point of the structure. Elements of a certain size are modelled, and the displacements of the corners and eventually other points of the edges of the elements (called nodes) serve as the unknowns. Within the element, the stress state can be formulated, depending on the relative displacements of the nodes, and — by applying the constitutive law of the respective material — the resulting reactions in the nodes can be calculated. These relations are known as the element stiffness matrices. For each node, equilibrium between the reactions of adjacent elements and the external loads can be formulated. As all mathematical operations are represented by matrixes, this operation aims to assemble a global stiffness matrix out of all the elementary stiffness matrices. The global stiffness matrix has to be inverted to calculate the unknown displacements.

By reducing the size and increasing the number of finite elements, the numerical solution converts to the exact one. Since in the general case

each additional node produces another six unknowns (a translation and a rotation for each of the three spatial directions), it makes sense to keep the number of elements as low as possible without the loss of too much accuracy and to use more specific elements with fewer unknowns per node. Fig. 5 gives an overview of the elements that can be applied, which depends on the kind of structure to be analysed.

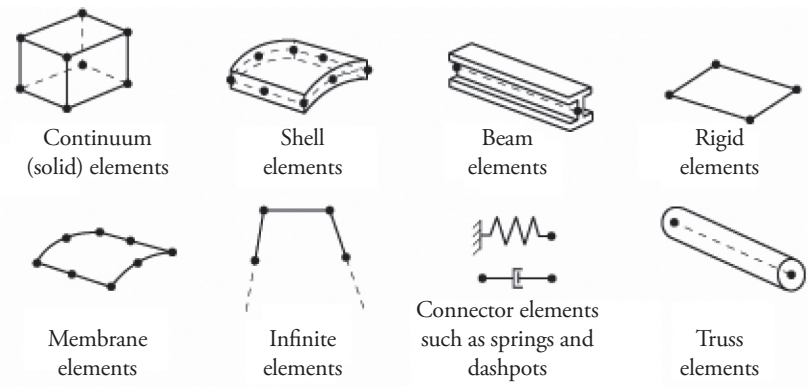


Fig. 5: Commonly used families of finite elements, from ABAQUS 2004.

In the case of a cupola, shell elements can be used to model both the membrane action that produces in-plane forces and the plate action that acts with bending moments and shear forces. A disadvantage of shell elements is that, perpendicular to the shell surface, only the thickness can be defined, and no asymmetrical properties or geometrical shapes, such as cavities, chambers, coffers, and so on. That is why defining the shell surface in a complicated shell like the Pantheon is always a trade-off.

An alternative is to use continuum elements that can be extended and assembled in all three spatial directions. The disadvantage of such a model is that generalised stresses, such as membrane forces and bending moments, are no longer defined and thus the results cannot be easily compared with simpler models. Only local stresses, which depend heavily on the element mesh and the applied constitutive law, can be depicted.

As long as rotational symmetry is given, it can be taken into account: this reduces three-dimensional problems to two-dimensional ones, because all the properties and values vary only in the radial and axial directions, not in the circumferential one. In the case of the Pantheon, this scheme can only be used as long as the different cavities, the intermediate block and all the other annexes are ignored.

4.4 Time-dependent soil settlements

A first approach is to model soil settlements assuming the soil to be a linear elastic material. For homogeneous subsoil with a flat surface (elastic half-space) and a point loading, an analytical solution exists that is formulated in cylindrical coordinates.[3] Numerical integrations for other loadings were executed before powerful computers became available and published in tables and charts for practitioners.[4]

Not all settlements occur as soon as the additional load has been applied. Due to the low compressibility of water, the additional stresses in saturated soils are at first carried mainly by the pore water and only subsequently transferred to the granular structure, when water drains out of the pores.[5] For soils with low hydraulic conductivity, such as clay, this process can last for years, and settlements that are calculated with the properties of the granular structure are only reached at the end of the process.

According to Lang et al. 2002, the basic equation for the consolidation time t reads:

$$t = T_v \frac{d^2 \gamma_w}{k M_E} \qquad (7)$$

3 Bousinesq 1850.
4 Grasshoff et al. 1982.
5 Terzaghi/Fröhlich 1936.

with the symbols having the following meanings:

- T_v dimensionless factor, taking into account the median degree of consolidation U_m (see below)
- d drain length, equal to the depth of the soil layer in the case of unidirectional drain and half the depth of the soil layer in the case of permeable layers, above and below the soil layer
- γ_w density of water
- k hydraulic conductivity
- M_E modulus of soil compactibility

Equation (6) shows that calculating a consolidation time gives only an estimation, because the *k*-value of soils can vary over several orders of magnitudes. By assuming different degrees of consolidation U_m, the respective times t to reach them can be calculated with:

$$T_v \approx \frac{\pi}{4} U_m^2 \qquad \text{for } U_m < 0.526 \qquad (8)$$

$$T_v \approx -0.933 \ln (1-U_m) \qquad \text{for } U_m \geq 0.526 \qquad (9)$$

The resulting time settlement curves show a steep rise at the beginning, becoming flatter over time. When more than one consolidating layer is employed, more refined methods are used.

Nowadays such problems are solved using finite element programs, which can take into account different layers of soil with different stiffness properties, non-linear behaviour, and so forth.

4.5 Seismic loads

In the last two thousand years Rome has suffered from several earthquakes but obviously none of them severely damaged the Pantheon. Once finite element models of the Pantheon have been generated, one can then apply seismic loads. Two methods of earthquake engineering will be highlighted:

The first technique is to apply realistic ground accelerations in the time domain to the foundation model and to observe the resulting strains and stresses in the structure (fig. 6 a). The precondition is a finite element program that allows time-domain calculations.

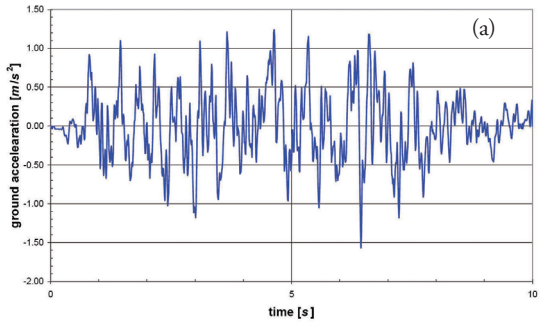
A more common procedure that is also covered by the respective code[6] is to calculate strains, stresses and deformations caused by an earthquake with quasi-static forces, which depend on the lowest natural frequency of the structure and consider the amplification characteristics of the subsoil. This means that, first of all, the natural frequencies of the structures have to be determined. The applied design spectra are based on a standard return period of 475 years and take into account different subsoil conditions (fig. 6 b). Provided that the assumed seismicity is appropriate, the probability that the Pantheon has suffered such a design earthquake during its service life so far is more than 98 per cent.

5 Questions asked and procedures to answer them

The aim of the structural evaluation of the Pantheon was to answer the following questions:

- Which parts of the rotunda are subject to tensile stresses and are therefore cracked?
- Do these results comply with crack patterns documented in the literature or were they detected only during the laser scanning operation?
- Can deviations of the inner surface of the ideal sphere be explained by deformations caused by loading or the favourable/unfavourable influence of the intermediate block and other subsidiary structural elements?
- How can the actual variations on the floor level be explained?
- Does the structural evaluation reveal anything about the construction methods applied at the Pantheon?

6 NABau 2006.



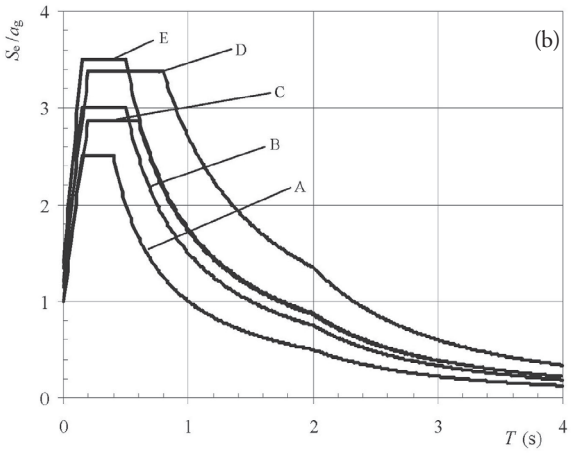


Fig. 6: Properties of an earthquake that could occur in Rome; (a) variation of ground accelerations with time, (b) elastic response spectra for different soil conditions A to E, from NABau 2006.

– How would the structure behave during an earthquake?

As tasks for their diploma theses, the two students Boris Jäggi and Simone Cereghetti had to try to answer these questions. Their structural evaluations covered the following procedures:

– Choose appropriate properties for the occurring building materials and soil layers from the literature.
– Choose an appropriate geometrical representation.
– Model the rotunda as a sphere on a cylinder using both the membrane theory and the bending theory of rotational symmetric shells.
– Model the rotunda as a set of radial arches.
– Implement the geometry of the Pantheon using two different finite elements programs, one working with shell elements, the other with continuum or volume elements.
– Estimate the soil settlements due to the loads of the actual Pantheon and their development over time.
– Evaluate the behaviour of the structure during an earthquake, on which design codes are based.

6. Outlook

Finally, the results of the completed diploma theses remain to be published. Papers are planned in the *Journal of the International Association for Shell and Spatial Structures* (IASS) and the *Journal of Cultural Heritage*.

The Technical Session

Bernd Kulawik

At the end of the Pantheon Conference a technical session was held at the Karman Center, with the aim of presenting different approaches and projects connected to the Bern Digital Pantheon Project and discussing the experiences of other projects that are having to deal with large amounts of digital data in relation to topographic situations and the measuring of large architectural objects.
Because of the workshop nature of the session — extended discussions, the use of large images, animations and the presentation of techniques and huge amounts of data — we decided to give a short overview of the contributions presented rather than extract «papers» from the contributors to the four presentations. Readers interested in finding out more should contact them directly for additional information about the projects.
The session, which was moderated by Bernd Nicolai, Professor of Architectural History at the Institute of Art History, University of Bern, was well attended and comprised participants from the conference as well as guests from the departments of Archaeology, Art History and the History of Science, many of whom took an active part in the lively discussions during and after the four presentations. First, Nikolaos Theocaris gave a demonstration of the 3D Bern Digital Pantheon Model; this was followed by Marina Döring-Williams from Vienna, who spoke about her experiences laser scanning large and complicated archaeological sites, namely the Theatre of Epidauros and a residential house in its vicinity. Geoffrey Taylor then talked about the Vatican Topography Project, carried out between 1998 and 2005 at Harvard University's Graduate School of Design. The technical session ended with the presentation of a program for integrating laser scanning data with stereo-photogrammetric measuring systems given by Frank Henze (Cottbus) and Gunnar Siedler (Leipzig).
The discussions covered several subjects — from the technical means used to produce, reproduce or visualise the data gathered from the objects, the different approaches to their accessibility (over the Internet or in closed networks limited to project participants) and to questions about open and commercial licences and data preservation. In addition, we looked at why and to what ends such digital data could be used in actual research. It is hoped that these aspects will be discussed in greater depth at a Bern Digital Pantheon Project workshop planned for 2008, at which the main topic will be how to deal with large amounts of 3D data and their usage in archaeology, art history and monument preservation.

Demonstration of the 3D Bern Digital Pantheon Project and the Interpretation of the Measurements by Nikolaos Theocharis (Bern):

Although Nikolaos Theocharis had already shown how the 3D Bern Digital Pantheon

Model might help scholarly research in his presentation of answers to two of the «nagging» questions that Lothar Haselberger had brought up in his contribution to the conference, his presentation at the technical session gave him the opportunity to provide the conference participants with a more in-depth account of the project's technical aspects and its (already realised) prospects as well as to elaborate on plans for the future.
Nikolaos Theocharis, who was involved in all the phases of the project, from the scanning and recording of the data to their evaluation, merging and the generation of images and plans, demonstrated how he went about making the data useable for non-architects. He also explained some of the methods that were employed to generate the data during the different scan periods and revealed the results and conclusions that have already been drawn directly from the initial set of raw data and their visualisation. (A second volume from the series of publications by the Bern Digital Pantheon Project Group will be dedicated to the information generated from the visualisation techniques).

The surveying of antique architecture (the Basilica Maxentius in Rome, the Theatre of Epidauros and a residential house in Epidauros) with the help of modern laser techniques by Marina Döring-Williams (Vienna):

Marina Döring-Williams used 3D laser scanning techniques on several occasions when she and her team took part in excavations at Epidauros and, as part of a monument research campaign, at the Basilica of Maxentius (Constantine) in Rome. A particularly interesting aspect of her presentation was the establishment of interrelations between the results generated from different measuring methods and the merging of these results in order to gain specific information about the building and the building ensemble, its possible relationship to surrounding buildings or the urban space and even details of its construction. At the monumental Basilica of Maxentius, for example, they were even able to reconstruct the structure of the largely lost surface of applied precious stones and marble plates. But in all these interesting cases the usage of these huge amounts of data, often generated during the course of several campaigns over the years, requires high-level computing techniques and expensive hardware, which in some cases has only recently become available for non-commercial research.

Three-dimensional modelling of complex historical architectural structures: Vatican Topography Project by Geoffrey Taylor (New York):

From 1998 to 2005, the Vatican Topography Project of Harvard University's Graduate School of Design created a large and complex 3D digital ‹image› of the Vatican Hill area through the centuries. Geoffrey Taylor, who as the research associate led the project, demonstrated the impressive abilities of this model: documents, sources and images (in digital form) can, for example, be linked with any special point or area in the graphical model, allowing the user to browse over or even below the surface of the Vatican Hill at any given time and find all the available information that exists on a place, object, building, archaeological artefact, and so on, in that area. Unfortunately, because of technical and also licensing restrictions, for the time being the interactive usage of the model is only possible inside a closed network: at least the problem of transferring large amounts of digital data between the server and user computers over the Internet can soon be expected to be solved.

Integrating laser scanning data into a stereophotogrammetric system for archaeology and building research by Frank Henze (Cottbus) and Gunnar Siedler (Leipzig):

Scanning techniques are becoming more and more important when it comes to recording objects in the fields of archaeology and build-

ing research. The scale and size of the objects to be measured range from the small single parts of a building and its ornamentation to large building ensembles of high structural complexity. According to a researcher's specific field of enquiry and the size of the objects to be scanned, different technologies are available. Besides primary scanning techniques such as laser scanning, there are ways of determining automatically 3D images from stereoscopic images by calculating plane object points via correlation techniques from the associated image points. But the pre-condition for this is a sufficiently textured surface, as can be found in many natural materials. In addition to extracting geometric information from the stereoscopic images, these images can also be used for image-based object documentation, as is common in archaeology and building research.

By integrating laser scanning data into a stereoscopic system for analysis, the advantages of both techniques can be combined. While laser scanners provide discrete surface points in a very short space of time, the stereoscopic analysis of images provides a continuous presentation of the object's surface and allows for an image-based spatial presentation of the objects. In addition, structures that cannot be derived from the geometry of the scanned data, because they lie below the scanner's resolution or can be recognised only through changes in colour or material, can also be recognised and/or captured.

The Leipzig-based company fokus GmbH and the Department of Surveying of the Brandenburg University of Technology at Cottbus (BTU) have together developed a user-oriented software system for archaeology, building research, preservation and restoration work that allows analysis of the combined techniques of stereo-photogrammetry, laser scanning and tachymetry. The integrated techniques for automatised image orientation and the reconstruction of objects facilitate interactive stereoscopic image analysis and provide high accuracy when it comes to determining the (measured/scanned) points. In addition to the gathering of single measurements and the creation of 3D object maps, complex object models for reconstruction, research and visualisation can be generated automatically from the measured profile and surface points.

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