

# Still higher and more audacious: The architecture of the imperial palaces on the Palatine in Rome

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“The most important technical advances in architecture during the Roman period emerged from the combination of concrete (*opus caementicium*) as a building material and vaulted forms of construction. The consequence was a style of monumental spatial character best exemplified by the palaces or large Imperial baths of Rome”<sup>1</sup>. This is how Robert Lindley Vann in 1976 described the introduction of various forms of vaulting in Roman architecture. In the case of baths, the barrel vault and the dome had established themselves as the most common means of covering the major halls and spaces by the 1st century B.C. at the latest<sup>2</sup>. New impetus came—if the prevailing opinions in research are accepted—with the construction of the first great bath complexes in Rome. The new departure is seen as beginning with the building of the baths which Marcus Vipsanius Agrippa constructed in the last quarter of the 1st century B.C. in Rome and which were inaugurated in A.D. 12<sup>3</sup>. The *Thermae Agrippae* burned in A.D. 80. (Dio Cass. 66.24) was restored under Hadrian and again in Severan and Maxentian times and the time of Constantine<sup>4</sup>. The standing remains consist largely of the north half of the central rotunda shown in renaissance drawings<sup>5</sup>. The central part is displayed on a fragment of the Marble Plan, which is dated by Coarelli to the time of Vespasian<sup>6</sup>. If this is true, the state before the renovation under Hadrian would be presented and therefore the original plan. The central hall is considered to be Rome’s first domed rotunda (Fig. 1, 2b). With a diameter of an impressive 25 m it is even larger than the so called Temple of Mercury in Baiae, which has an internal diameter of 21.63 m<sup>7</sup>. The dome of the latter edifice is generally held to be “the oldest surviving monumental *caementicium* dome”<sup>8</sup>.

The second significant construction in this respect—and even “a huge improvement over the Baths of Agrippa”<sup>9</sup>—was the Baths of Nero (*Thermae Neronianae*) built under Emperor Nero on the Campus Martius to the north of the Baths of Agrippa in A.D. 62 (Fig. 2c). The baths were renovated in A.D. 227 under Severus Alexander, which is why the edifice is also called the *Thermae Alexandrinae* and makes it therefore problematic to study the Neronian design. Renaissance drawings suggest that some of the rooms in it were roofed by a groined vault<sup>10</sup>. “Trusting that the rotunda of the *Thermae* of Agrippa and the rooms of the *Thermae* of Nero essentially retain their original shape and layout, it foreshadows the dy-

1 Vann 1976, 2.

2 As a precursor of audacious barrel vaults and domes the *caementicium*-vaults of Roman substructures and cisterns can be considered. Rakob 1985, 285.

3 Ghini 1999, 40–2.

4 Ghini 1999, 41.

5 For the discussion of the sources see: Ball 2003, 232–8. Fig. 81.

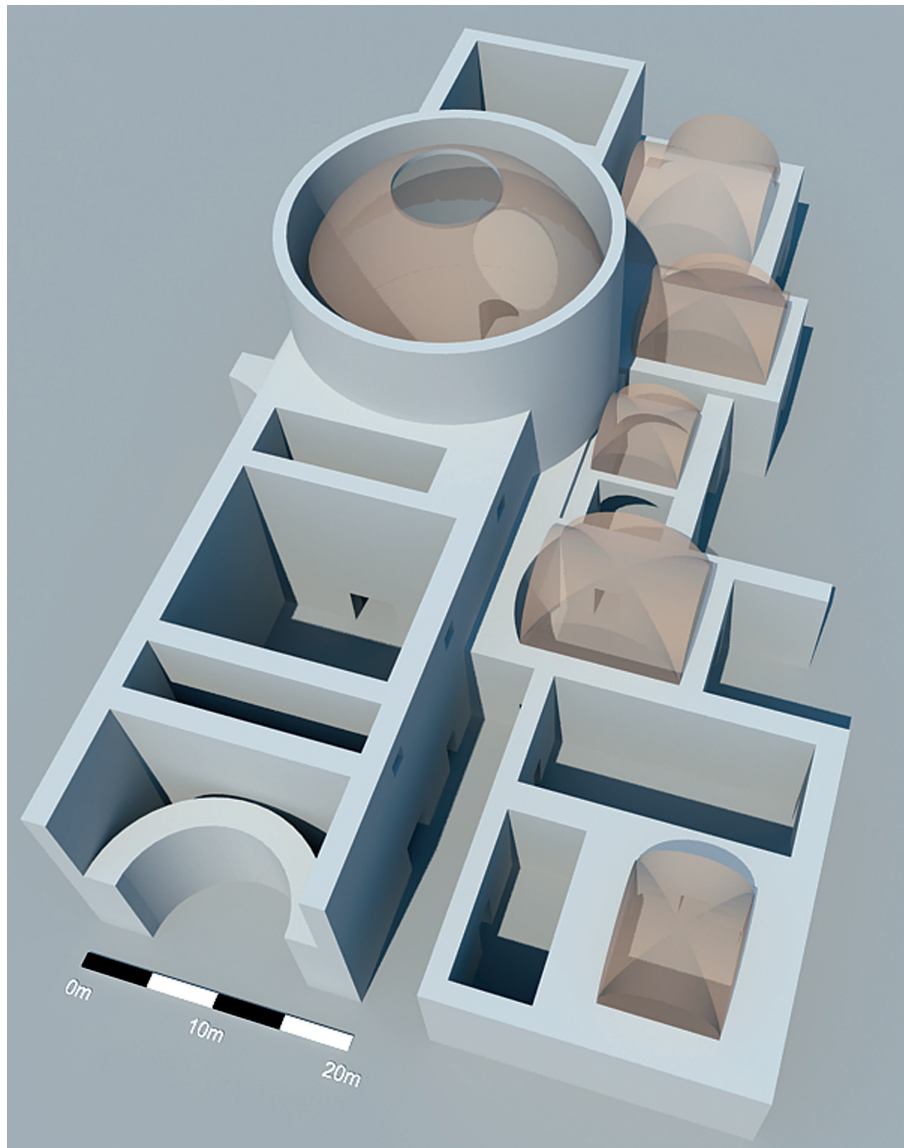
6 Ghini 1999, 41.

7 Rakob 1988, 256–65.

8 Rakob 1988, 285 with footnote 59.

9 Ball 2003, 238.

10 For the reconstruction plan see Ball 2003, 240–9. Fig. 241. Ghini 1985, 395–9.



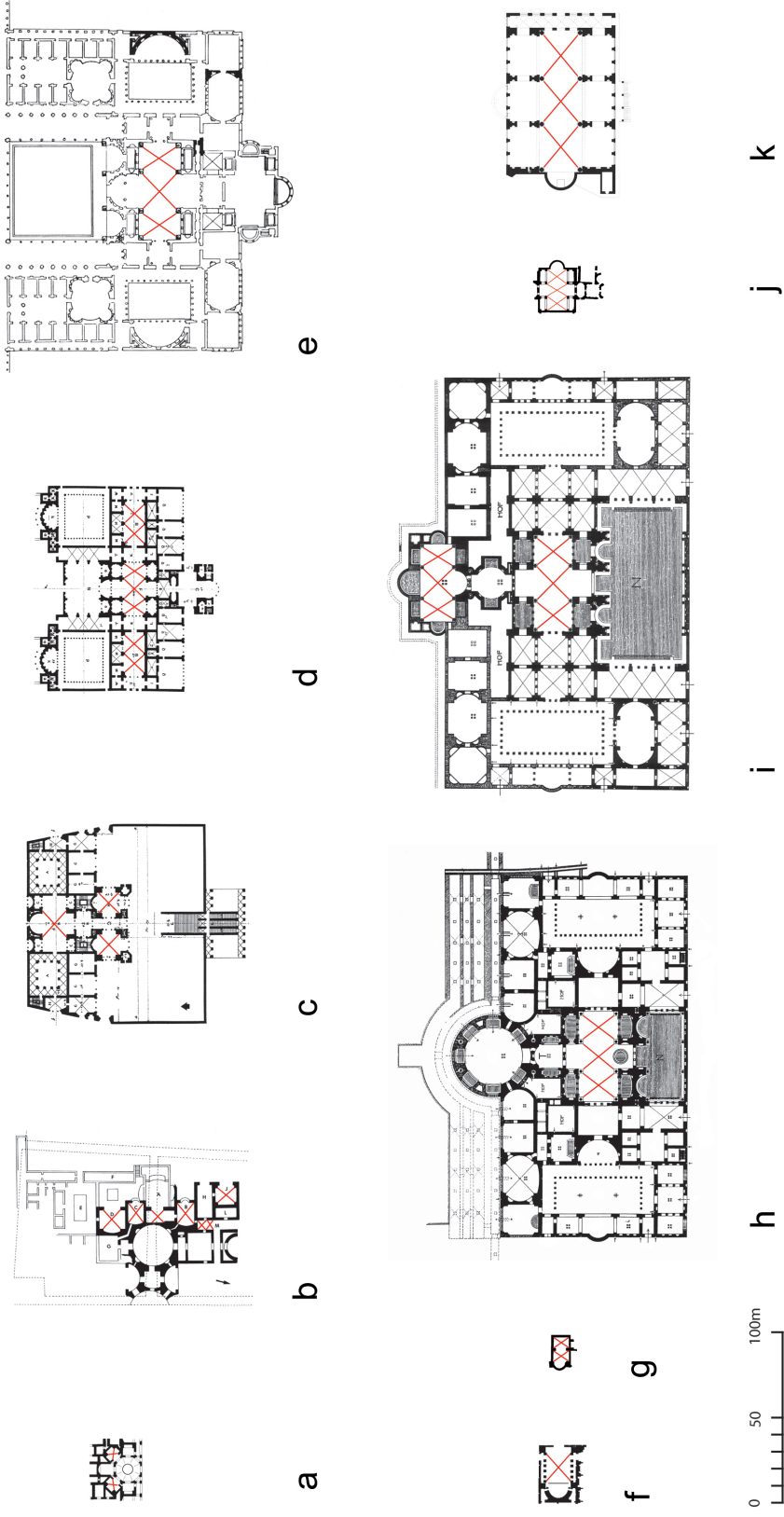
**Fig. 1:** 3D-model of the Thermae Agrippae. Hypothetical reconstruction.

namic manipulations of space and structure in Nero's Golden House and Domitian's Flavian palace on the Palatine"<sup>11</sup>.

As far as palaces are concerned, no dome constructions are yet known to us from the pre-Neronian era, either on the Palatine or in the imperial villas outside Rome. It can therefore be assumed that spaces covered by domes first appeared in palatial architecture during Nero's reign. It is all the more extraordinary, then, that as soon as domes were introduced, so sophisticated a spatial composition as the octagonal hall of the Domus Aurea should have been conceived<sup>12</sup> (Fig. 2a, 3a, 4b): The octagonal hall, which is likely to have been used for dining, is entered through openings in three of its eight sides. Openings in the five other sides

11 Yegül 1992, 136.

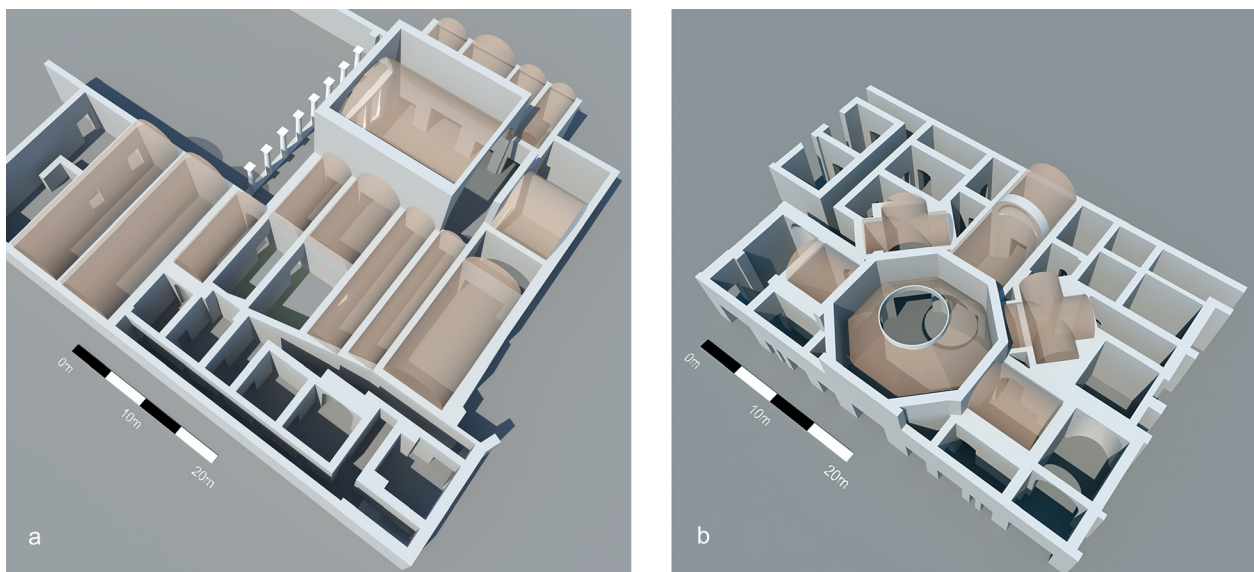
12 Ward-Perkins 1956, 217–19; Ward-Perkins 1981, 100–1; MacDonald 1982, 38–46; Sear 1982, 101–2.



**Fig. 2:** Comparison of thermal and palace rooms with groin vaults in Rome. a: Domus Aurea; b: Bath of Agrippa; c: Bath of Titus; d: Bath of Nero; e: Bath of Domus Flavia, 'Basilika'; f: Domus Severiana, Severian bathing complex; g: Domus Severiana, Severian bathing complex (detail); h: Bath of Caracalla; i: Bath of Diocletian; j: Domus Severiana, Maxentian bathing complex; k: Basilica of Maxentius.



**Fig. 3:** a. Domus Aurea, the octagonal hall; b: Domus Augustana 'sunken peristyle', the northern octagonal hall.



**Fig. 4:** Domus Aurea. 3D-model of the western part (a) and the octagonal hall with the surrounding rooms (b).

lead into five separate chambers. The barrel-vaulted chamber at the rear served as a fountain room. To the left and right are two cross-vaulted chambers and at either side of the hall are two barrel-vaulted chambers with end-recesses. The chambers also communicate with one another directly by means of a series of apertures which forms a continuous passageway around the hall, thus isolating the piers supporting the dome. The ingenuity of the planning is matched by a remarkable structural daring. Wall thicknesses have been reduced to a minimum, and the wall itself, pierced by numerous openings and recesses, is conceived more as the infill between neighbouring spaces than a partition of constant breadth. The thrust from the eight-faceted dome, which is very broad for its height, is buttressed by the peripheral chambers allowing the eight supporting piers to be exceptionally slender, and the eight openings of the drum which are daringly spanned by brick flat-arches to be exceptionally wide (Fig. 3a).



Although the octagonal hall, with a diameter of 13.48 m and a height of 10.53 m, does not reach the dimensions of the central halls of the baths or the domed interiors at Baiae<sup>13</sup>, the suite of rooms nevertheless boasts a number of remarkable features (Fig. 4b). The round-  
ed cloister vault of the octagonal hall is an innovation unknown in *thermae* architecture until the beginning of the 1st century AD<sup>14</sup>. Also, a dome is used for the first time to cover an octagonal space. The rectangular rooms in the diagonal, furthermore, are cruciform in plan, with a slightly elevated groin vault over the central rectangle and barrel vaulted rectangular alcoves. So in the third dimension these rooms are more complicated than their ground plans might suggest<sup>15</sup>.

The rooms of the 'sunken peristyle' of the Domus Augustana are widely seen as representing a further stage of development in palace architecture. These rooms are generally thought to belong to the private part of the Domus Augustana – hence to the new palatial residence which Emperor Domitian erected for himself with his architect Rabirius on the Palatine Hill and which was inaugurated in A.D. 92<sup>16</sup>. The peristyle court with a square water basin and the rooms surrounding it lie about ten meters below the level of the principal storey of the Flavian palace complex (Fig. 5). Flanking the peristyle court is an L-shaped arrangement of rooms. The set of three large rooms on the north-east side deserves particular attention. Two octagonal halls, one the mirror image of the other, stand on either side of a central hall on the axis of symmetry. The octagonal ground plan of these two halls is extended by alternately rectangular and semicircular floor-niches in seven of the eight sides. Each hall is crowned by an elaborate vault (Fig. 3b, 4b). The suite of rooms is thus distinctly reminiscent of the octagonal hall of Nero's Domus Aurea (Fig. 3).

In the last few years, the entire complex of the Domus Augustana including the 'sunken peristyle' has been documented and analysed in detail<sup>17</sup>. The results have yielded completely new insights into the sequence of building phases. It is very probable, for instance, that the 'sunken peristyle', in the initial construction phase, was not furnished with an upper storey. The upper-storey rooms appear to have been erected only in the reign of Hadrian. Until then there seems to have been a terrace or garden on the main level here (Fig. 7). This suggests that the octagonal halls originally possessed skylights in the form of oculi, and were illuminated by these apertures in the cupola in addition to the windows in the south wall (Fig. 3b, 4b). Thus in typological terms, too, the rooms closely resemble the Neronian complex.

The central hall on the north-east side was originally roofed by a groined vault (Fig. 5, 6). Also the central hall to the west, which opened with its full width on to the peristyle court, possessed a groined vault. With a span of up to 8 m these halls in the 'sunken peristyle'

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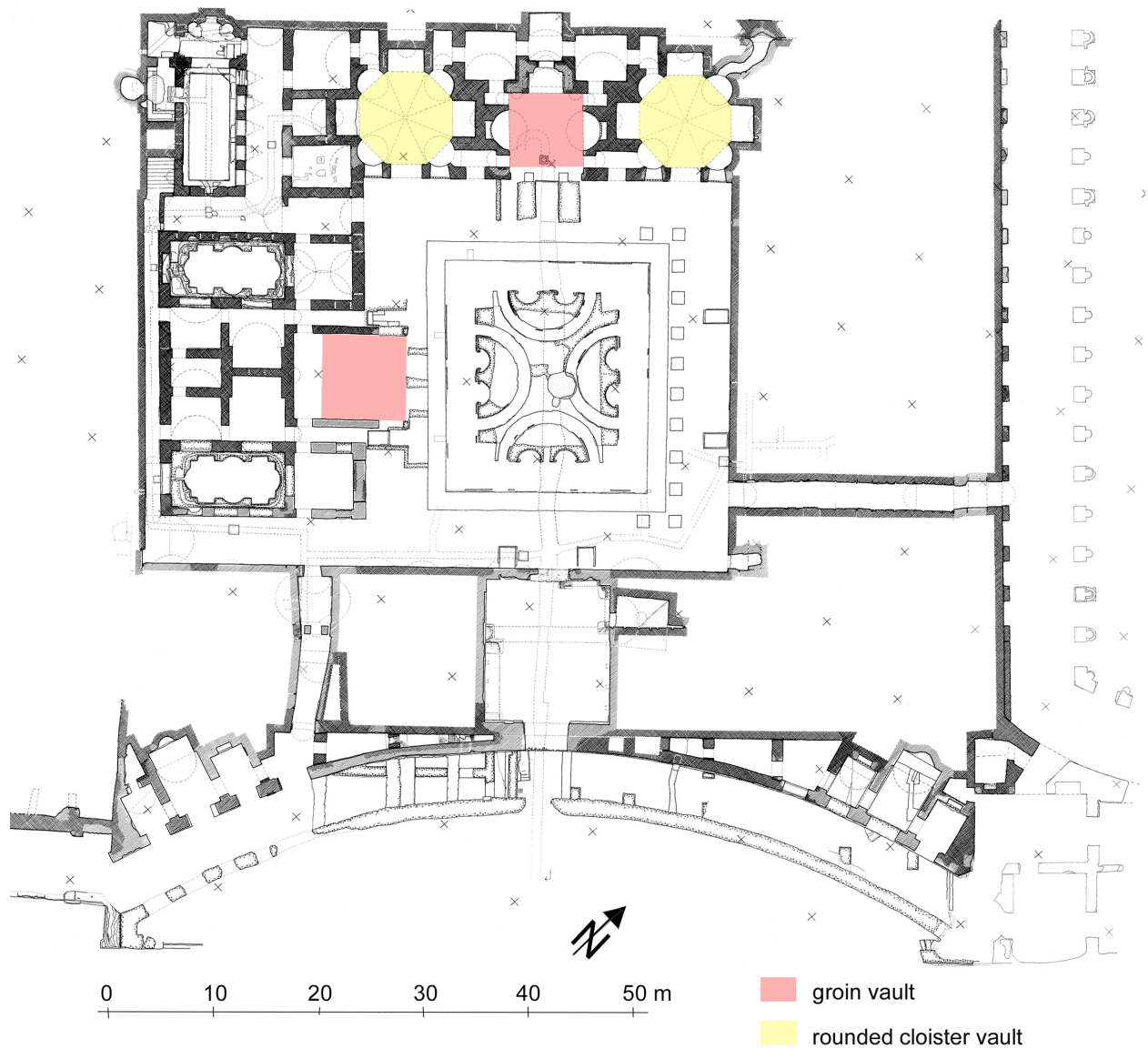
13 See Ball 2003, 230–3.

14 Rivoira 1925, 78. Rasch 1989, 17. In his opinion the vault above the octagon of the Domus Aurea is an evolution of the cone vault with diameters up to 6.50 m of the baths at Pompeii and Herculaneum from the beginning of the 1st century.

15 For the discussion of these rooms see: Ball 2003, 227–9 with Fig. 73. 76.

16 See: Richardson 1992, 114–7. D'Elia 1995 with further literature.

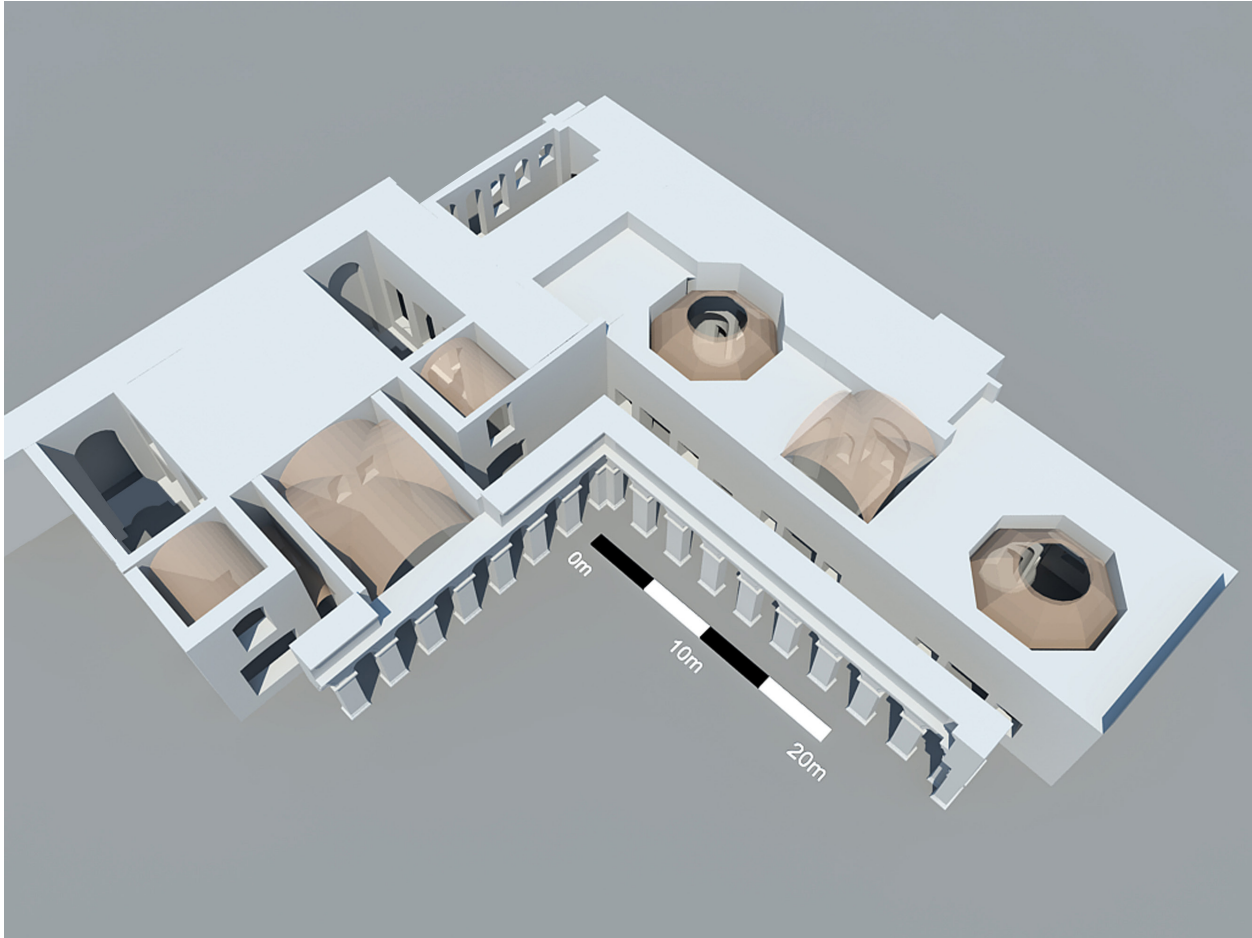
17 The construction phases of the Domus Augustana will be handled by Jens Pflug, German Archaeological Institute Berlin. For the first results of the Flavian phases see Sojc 2005/2006; Wulf-Rheidt – Soc 2009, 268–72; Wulf-Rheidt 2011, 7–13; Wulf-Rheidt 2012; Pflug 2013, 188–98; Pflug forthcoming.



**Fig. 5:** Domus Augustana, 'Sunken peristyle'. Ground plan. Red: Rooms with groin vaults. Yellow: Rooms with rounded cloister vaults.

are considerably larger than those of the Domus Aurea. The rooms of the east wing of the 'sunken peristyle', in particular, are characterized, in their first building phase, by large apertures in the walls, which, as in the Domus Aurea, are spanned by horizontal arches. The walls appear to be dissolved, reduced to slender piers. Here, too, there are evident analogies to the rooms of the Domus Aurea.

The first-ever detailed documentation and analysis of the surviving architectural structures of the Domus Augustana has proved that the 'sunken peristyle' was not built in the same phase as the main rooms of the upper storey. It is of earlier date. The brick stamps unfortunately do not allow any more precise dating than the period from A.D. 60 to 94. But all



**Fig 6:** Domus Augustana, 'Sunken peristyle'. 3D-model of the northern wings.

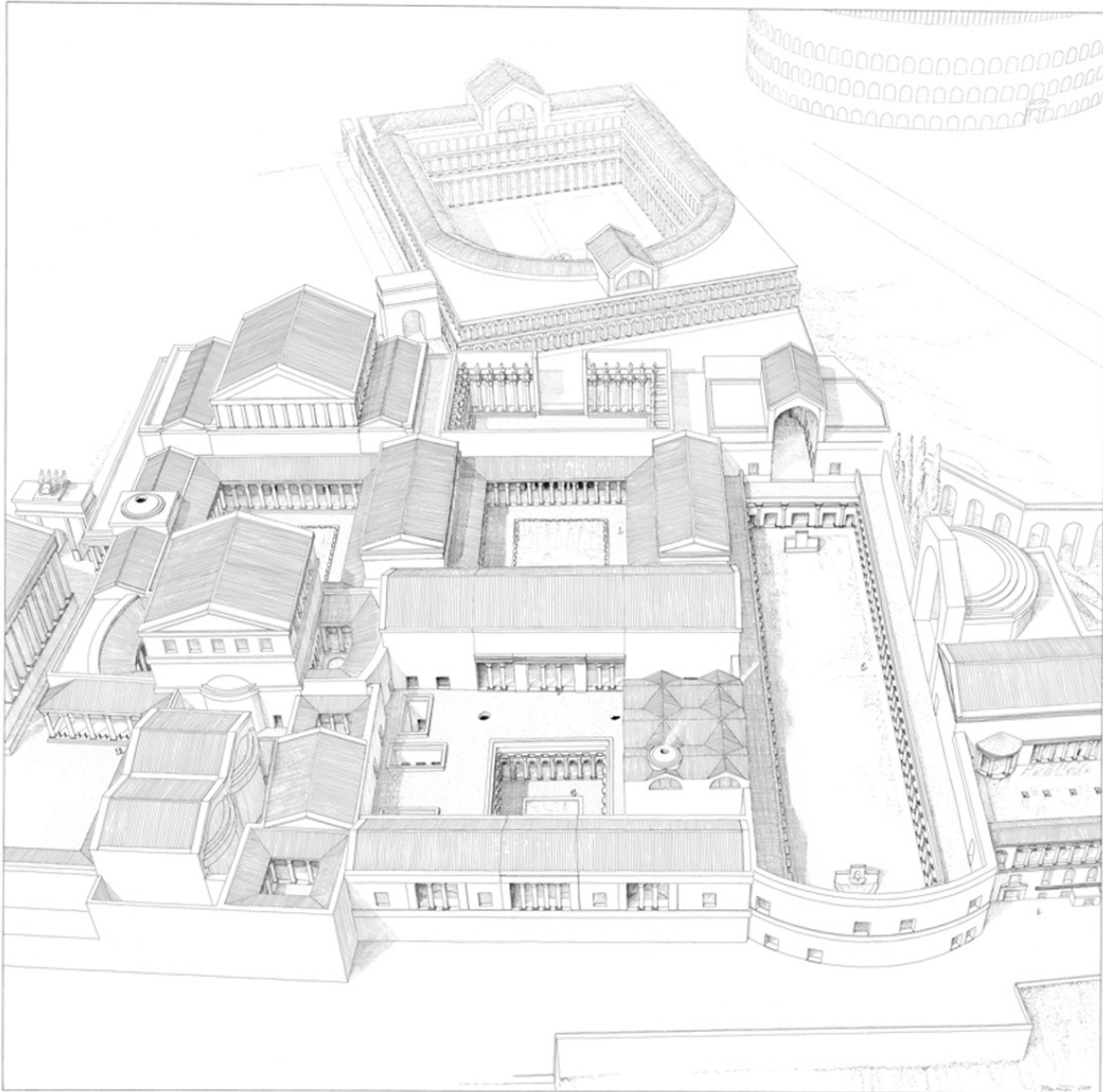
other evidence argues very clearly for its having been constructed in a pre-Domitian building phase, presumably early in the Flavian era.

The same can be said of the brickwork, which significantly displays no layers of *bipedalis* such as are common in the Domitianic but also the Trajanic and Hadrianic phases on the Palatine<sup>18</sup>. It is therefore fundamentally different to the brickwork in the upper storey of the Domus Augustana and to that of the rooms of the Domus Flavia. *Bipedalis* layers are also absent from the brick walling in the eastern section of the Domus Aurea<sup>19</sup>. This fact in addition to the close typological affinity with the latter structure makes it also possible that the 'sunken peristyle' is of late Neronian date.

It has often been pointed out that the western and eastern sections of the Domus Aurea display a very different architectural sense and a different degree of experimentation in spatial planning: The western section is primarily rectilinear; the rooms are arranged around a large peristyle and there is little here that seems either exceptional or unusual. This applies

<sup>18</sup> The *opus testaceum* constructions will be handled by Evelyne Bukowiecki. For the first results see Bukowiecki forthcoming.

<sup>19</sup> See Type F of Balls principal masonry types of the Domus Aurea, Ball 1994, 247.



**Fig. 7:** Hypothetical reconstruction of the Flavian phase of the imperial palace.

also to the vaulting. As a rule the rooms are roofed by means of barrel vaults with a span of up to 8 meters. Only the central room has greater dimensions, with a span of 13.30 m (Fig. 4a).

The eastern half is justly famous for the complexity of its plan, particularly for the octagonal room with its domed concrete ceiling and oculus, with the aforementioned groin-vaulted subsidiary rooms and an apsed nymphaeum (Fig. 4b). For Larry F. Ball it is “crucial, not just because it was complex and challenging to build, but also because its influence profoundly changed the history of Roman architecture”<sup>20</sup>. Gregory Warden therefore called the plan of the eastern half “more radical or innovative”<sup>21</sup>. This fact, together with the

20 Ball 2003, 24.

21 Warden 1981, 276.



very different methods of *opus testaceum* construction in the walls, even persuaded him to date the eastern wing to the Flavian period<sup>22</sup>: “The complex spatial planning of the eastern half would accord well with our view of Flavian architecture; thus, the sophisticated spatial planning of the eastern section should be attributed not to the Neronian planners, Severus and Celer, but should be viewed in the context of the kind of planning that was in fashion during the Flavian period. In this context it is intriguing to revive the hypothesis that the eastern section of the Esquiline wing is the work of Rabirius”<sup>23</sup>. A brick stamp that was found in the canal of the nymphaeum and dates to A.D. 64–68<sup>24</sup>, however, suggests that the complex dates from the reign of Nero. Also Ball emphasized that the ‘West Block’ originally belonged to Nero’s *Domus Transitoria* and that the alterations and the ‘Octagon suite’ are belonging to the same Neronian phase after the fire A.D. 64<sup>25</sup>. If we now take into account the possibility that the rooms of the ‘sunken peristyle’, which are comparable in terms of spatial character, may date to the late Neronian or early Flavian period, then it seems likely that these two complexes were built at approximately the same time.

Since there’s no masonry without *bipedalis* layers surviving anywhere in the Flavian palace complex on the Palatine, the comparable mode of brickwork construction may even indicate that both complexes were built by brigades of builders who employed the same methods and principles. Therefore in my view it cannot be ruled out that both complexes had the same architects—Severus and Celer and not Rabirius—and also that the masons were from the same school. In any case, the masons must have possessed considerable skill in designing the intricate wooden centering for the erection of complicated vaults, especially as, at that time, there was little expertise to draw on in this field.

The Domitian-era structures on the principal level of the palace, in the area of the *Domus Augustana* and the *Domus Flavia*, have masonry constructed in a very different manner. It features *bipedalis* layers laid at regular intervals respectively. The highly uniform character of the masonry, verifiable over a very wide area, suggests that here, too, the building work was carried out by teams following uniform instructions and principles and using the same brick and mortar material.

But it is not only in masonry techniques that the upper-storey structures speak a different language to the rooms of the ‘sunken peristyle’. The conception of space is altogether different as well. There were no further developments in the form of domes on the upper storey. Even the ‘Vestibule’ in the west wing of the *Domus Flavia* is no exception: while it, too, is octagonal with round niches in the diagonals, it merely imitates in simplified form the earlier octagonal rooms of the ‘sunken peristyle’ (Fig. 8). It may well be that the ‘Vestibule’ was roofed by an *opus caementicium* dome, possibly also with an oculus. Its span of 12.50 m exceeds that of the early Flavian central halls of the ‘sunken peristyle’.

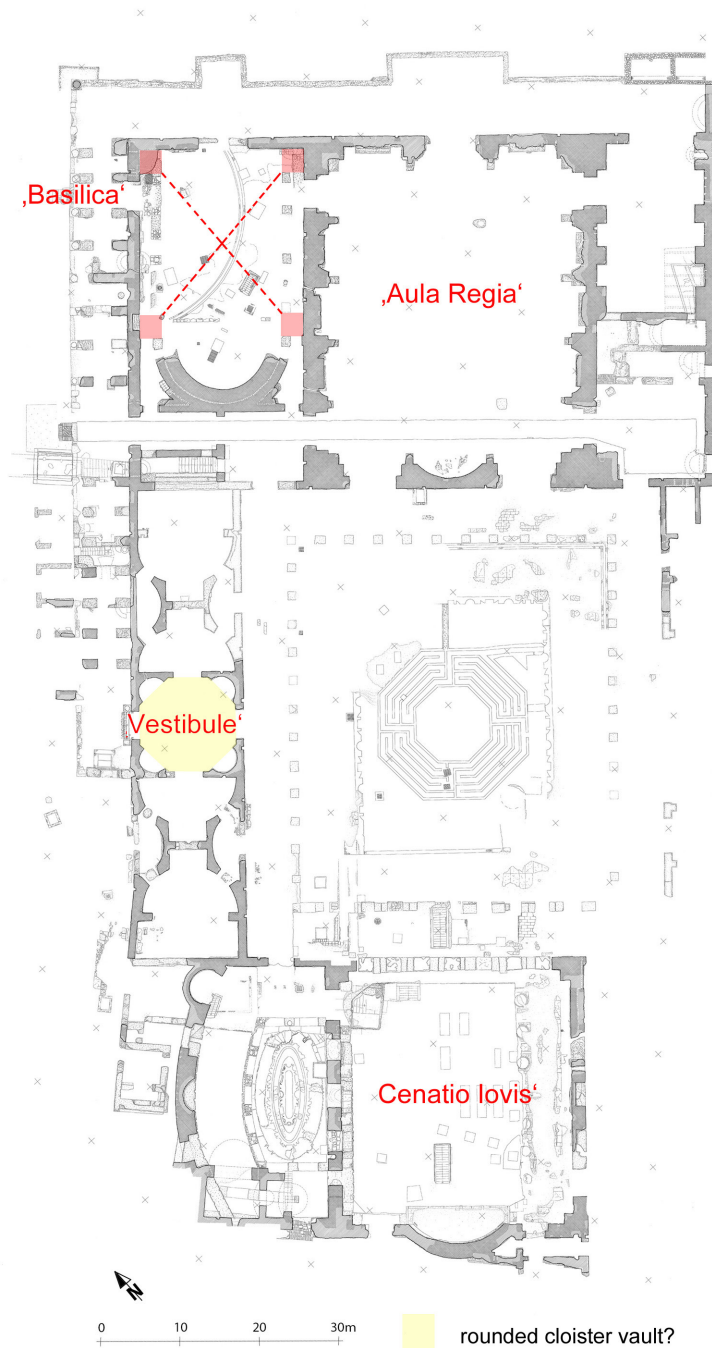
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22 Warden 1981, 277.

23 Warden 1981, 278. Crema 1959, 313; MacDonald 1982, 47–74; Brick stamps: Bloch 1947, 44–6. Nero’s architects are named by Tacitus, *Ann.* 15.42.

24 I have to thank for this information E. Bukowiecki.

25 Ball 2003, 219–23. Ball 1994, colour plan 5 and 6. For the problems with his dating see Stinson 2006, 513–6; Moorman 1995.



**Fig. 8:** Domus Flavia. Ground plan of the main level. Red: Hadrianic pillars for a groin vault in the 'basilica'.

The 'Vestibule' here displays another tendency that is characteristic of Domitian-era architecture: the striving for ever greater dimensions. This is especially evident in the two major halls of the Domus Flavia which are situated on opposite sides of the large peristyle court and are known as the Aula Regia and the Cenatio Iovis (Fig. 8). The width of the Cenatio Iovis is 29 m and of the Aula Regia 30.40 m, making these halls larger than any other we know of before this date in Roman palatial architecture. Even the central spaces of the early *thermae* have substantially smaller dimensions than these. The architect of the new Domitianian palace building—believed to be Rabirius—is therefore not concerned with original and ingenious spatial composition in itself, but rather with audacious spaces of unprecedented dimensions. It was not the imaginative sophistication of the layout and vaulting that was meant to impress visitors—as in the Domus Aurea or the rooms adjoining the 'sunken peristyle'—but instead the sheer size of a particular

space. It remains unclear until now how these spaces were covered. The reconstructions range from no roof at all, through a timber roof, to barrel vaults<sup>26</sup>. Whether it was a timber structure or a barrel vault, roofing such vast spaces was at any event a remarkable feat of structural engineering. But in my opinion it was not primarily about inventing especially innovative means of roofing; instead, the ambition to create audacious spaces of the largest possible dimensions is what led to such bold experimentation in roofing technique.

26 For example Rivoira 1925, 103. Fig. 115.

So, in the palatial architecture of the second half of the 1st century AD we can discern two different tendencies in the conception and handling of space: firstly an experimental approach, which leads to the creation of entirely new spatial forms<sup>27</sup>. Barrel vaults come to be joined by innovative cupola forms and groined vaults.

In the opinion of many scholars, the groined vaults of the Domus Aurea are the earliest known groined vaults in Roman concrete<sup>28</sup>. As already mentioned, we cannot say for sure whether Rome's first large bathing complexes employed this form of vault, too. These buildings, however, are all badly ruined or were renovated at a later date, so that it's difficult to get a clear picture of their former appearance. Still, it would seem that the renovations kept quite close to the original plan. If this were also true of the vaulting, too, then groined vaults with a span of up to 16 m would have existed here—considerably larger, therefore, than the relatively small vaulted spaces of the Domus Aurea<sup>29</sup>. If so, the architects Severus and Celer would deserve the credit of adopting spatial and vault forms devised during the construction of *thermae* and further developing them in the field of palatial architecture, producing exciting new spatial forms in the Domus Aurea<sup>30</sup>.

But we cannot rule out an alternative scenario: in which adventurous architects sought and successfully tested completely new possibilities of spanning highly imaginative interior spaces in the Domus Aurea. And following that, they were repeated on a larger scale in the “sunken peristyle” complex and then enlarged to even greater dimensions in the bathing complexes, for instance the Baths of Titus (Fig. 2c)<sup>31</sup>. Nevertheless *thermae* architecture was surely “a trial-ground for experiments by the Roman architects in the creation and development of their great systems of vaulting”<sup>32</sup>.

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27 After Ball 2003, 25, this is the key issue of Nero's own taste. Nero's patronage is an imprimatur of creativity. He sought out the most creative talent and challenged his artist relentlessly to achieve the best they could imagine. He calls it “the Neronian architectural Zeitgeist” (ibid. 261).

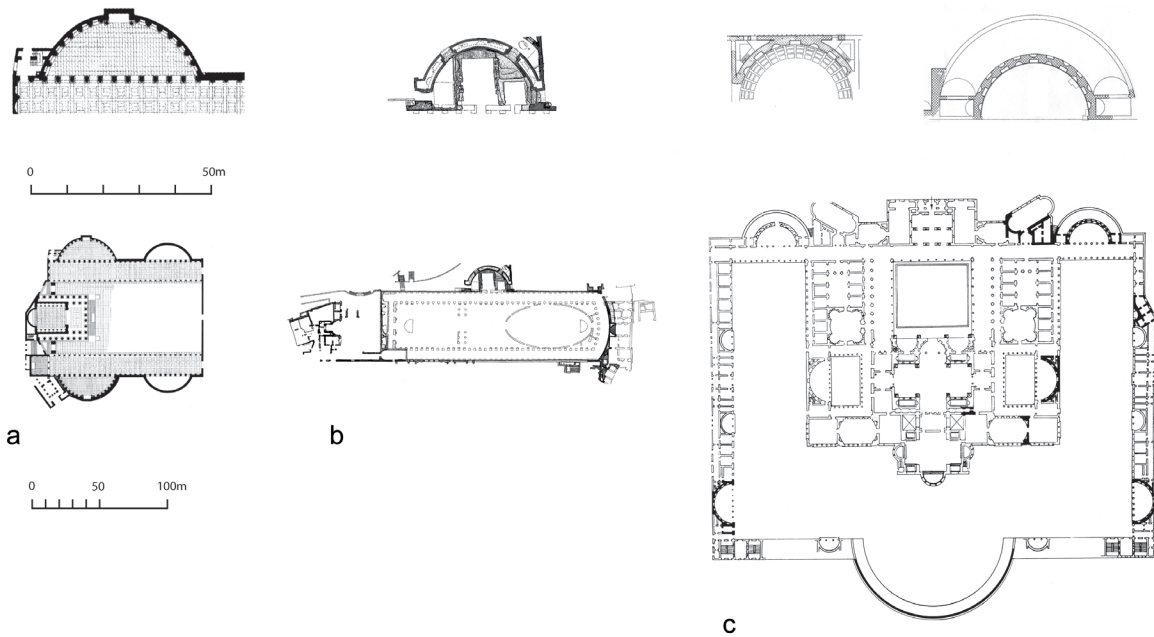
28 For example Ball 2003, 219; Knell 2004, 121–2. They follow for example Rivoira 1925, 76. For the history of groined vaults see Rivoira 1925, 93–7. After Ball 2003, 259, “the groin vault was *the* novelty” first used in the Baths of Nero and just a few years later used also at the Octagon Suite of the Domus Aurea.

29 For the discussion of the Baths of Nero see Ball 2003, 241–2. I do not find his interpretation convincing and are more convinced by the arguments of Ghini for a Severan date (Ghini 1985, 399). Also it is very likely that the original Baths of Nero contributed the basic design to the later *Thermae Neronianae Alexandinae* (Ball 2003, 243) this is no evidence for rooms with groin vaults.

30 This would fit with the opinion of Ball 2003, 24, that “the Esquiline wing was the absolute confidence in the medium (concrete) displayed in the latter. Neronian architects and engineers knew full well what could and could not be built, physically, which allowed them to concentrate exclusively on design issues. (...) They could concentrate on thinking up completely novel designs, confident that the engineers and masons could execute them”. His thesis is “that the groin vault was a crucial motif in the Baths of Nero, that it was used with great success there, and that this success is why Severus and Celer insisted on incorporating it in the Octagon Suite, even though they had no structural or aesthetic need for it, nor even a good place to put it” (ibid. 240).

31 Rivoira 1925, 99 has already pointed out “the large number of cross-vaults, sometimes of very great size”. For the reliability of Palladio's plan and the reconstruction see Ball 2003, 248–54. Yegül 1992, 139–42, echoing many others, suggests that the Bath of Titus is the origin for the groin-vaulted *frigidarium* motif. Ball 2003, 251 argues for a Neronian origin of the motif. This is, in my opinion, not very convincing.

32 Rivoira 1925, 99.



**Fig. 9:** Comparison of the exedrae of a. Forum of Augustus, b. 'garden stadium' and c. Baths of Trajan.

The rather fanciful adventurousness that is to be observed in palatial architecture in devising new ways of manipulating space comes to be replaced, at the end of the 1st century, by an eagerness for experimentation of a more technical sort. Designs betray a tendency towards ever greater, almost exaggeratedly vast spaces and complexes. For the realization of the audacious halls of the Domus Flavia in particular a high degree of engineering ingenuity was necessary in order to roof them. There seems to have been a desire to go to the limits of what was possible. In spite of the enormous height and width of the halls, the walls are not particularly thickly constructed in places. With walls that soar to a height of over 20 m without any intermediate ceilings, the scaffolding for the brick masons building the walls and the centering for construction of the roofs represent remarkable achievements of engineering.

Research conducted in recent years has established that the new palace edifices of the Domitian period are to be reconstructed as much more extensive and differentiated than has generally been supposed in research to date<sup>33</sup>. It can be proved beyond doubt that the 'garden stadium' complex and large parts of the adjacent Domus Severiana, as it is known, were in fact part of Domitian's building programme (Fig. 7). According to recent research the 'garden stadium' is to be reconstructed as single-storey in the initial, Flavian phase. Thus in architectural terms it displays similarities with the 'sunken peristyle'—although with a length of 150 m it is more than four times as long as the peristyle court of the 'sunken peristyle'. The gigantic scale of the complex is also, of course, a reflection of the Flavian taste for 'majestic dimensions'.

33 For the first results see Wulf-Rheidt – Sojc 2009, 272–5; Wulf-Rheidt 2011, 8–10; Wulf-Rheidt 2012, 108–10.



No less audacious is the big exedra of the 'garden stadium' (Fig. 9b). With a diameter of 28 m it almost attains the size of the exedrae of the Forum of Augustus (Fig. 9a). The latter were not spanned by an *opus caementicium* vault. As for the exedra of the 'garden stadium', at the present state of research it cannot be said for sure whether or not it was completed, and vaulted, during the reign of Domitian. Brick stamps found in the upper portion of the exedra wall and dated to Hadrian's reign<sup>34</sup> could indicate later completion or even restoration. What is certain is that the shape and size of the exedra go back to the Flavian building programme. It is therefore likely that in the Domitianic period there were at least plans for a semi-dome on the exedra.

A massive increase in scale is also demonstrated by the Baths of Trajan in comparison to the early Flavian Baths of Titus (Fig. 2c, e), to which they are immediately adjacent. At the time of their inauguration, on the 22nd of June A.D. 109, the Baths of Trajan were the biggest thermal complex in Rome<sup>35</sup>. Exedrae were introduced here as an element new to *thermae* architecture (Fig. 9c). The largest exedra of the central complex has a diameter of 30.6 m, and hence it even outspans the exedra of the 'garden stadium'. It supported a coffered half-dome. Featuring niches with alternately horizontal and rounded headings, it is directly comparable with the exedra of the "garden stadium"<sup>36</sup>. Consequently it cannot be ruled out here either that innovative formal elements developed in palace building were adopted relatively soon in *thermae* architecture. For this reason it is commonly supposed that the Baths of Trajan were in fact a building project of Domitian's, and that after his death they were completed under Trajan. Thus, in James Anderson's view, "the similarity of inspiration and the sheer size of both projects suggest that the same minds, those of Domitian and Rabirius, might have conceived them both"<sup>37</sup>. Even G. Caruso and R. Volpe are against this suggestion<sup>38</sup>; indeed, recently undertaken construction research indicates it is very probable that, on the Palatine too, large sections of Domitian's new palace was only completed during Trajan's reign. It appears that the building programme was altogether too ambitious, and at the time of its inauguration, a large part of the palace must still have been a building site. Despite the *damnatio memoriae* of Domitian, the building programme was continued, and completed, under Emperor Trajan without significant alterations. The same consistency is to be found in construction technique: neither in the brickwork<sup>39</sup> nor in the wooden centering for the vault can any changes be established. It seems as though the building sites continued operating after Domitian's death without any great interruptions. At least as regards the palace architecture on the Palatine, no caesura is observable between Domitianic and Trajanic construction activity.

Interestingly, none of the rooms on the Palatine that can, at the present state of research, be ascribed to the Domitianic building phase were groin-vaulted. The same is true of

34 Le Pera Buranelli - D'Elia 1986, 541-2.

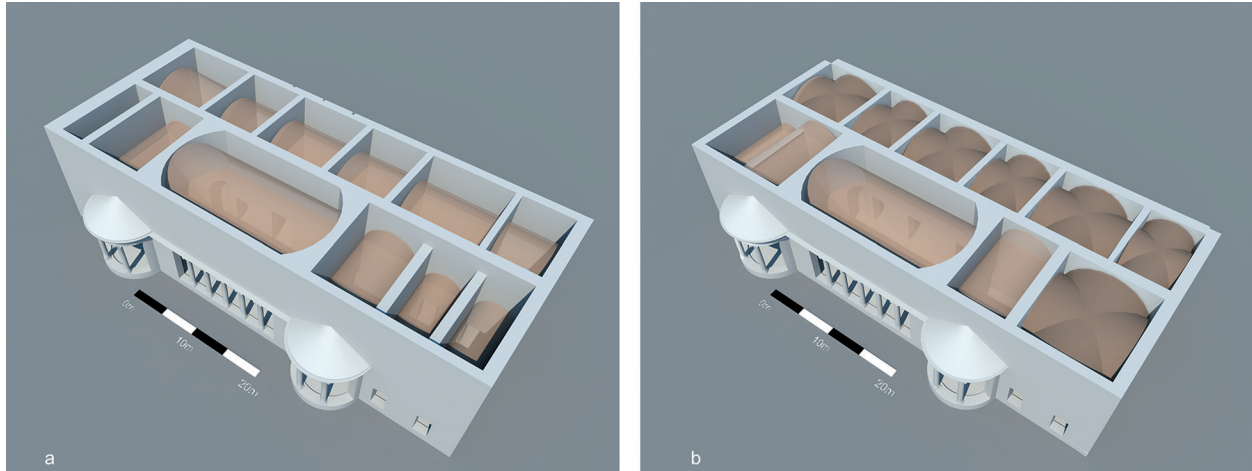
35 Caruso - Volpe 1999, 67; De Fine Licht 1974, 5.

36 See De Fine Licht 1974, 35-43. Taf. 3.

37 Anderson 1985, 509.

38 Caruso - Volpe 1999, 67.

39 This is not surprising, because there is evidence that bricks (particularly *bipedales*) made under Domitian had been stockpiled and were available to the Trajanic builders in the first decade of the 2nd century. See: Lancaster 1995, 38-9.



**Fig. 10:** 'Domus Severiana' 3D-model of the northern wing, a: Flavian; b: Severan.



**Fig. 11:** 'Domus Severiana'. Upper-storey. Coffered flavian barrel vault replaced by a groined vault in severian time.

the so called Domus Severiana, whose core is definitely datable to the end of the 1st century<sup>40</sup>. It consists of two-storeyed substructures which supported a wing on the principal level with spacious rooms opening out on to a large basin (Fig. 7). All rooms in the substructures as well as on the main level possessed barrel vaults (Fig. 10a). The *opus caementicium* vaults were erected on top of wooden frameworks and contain a high proportion of yellow tufa (*tufo giallo*). The span widths reached by these vaults were fairly considerable—up to 12 m—but had already been achieved in Nero's Domus Aurea.

No experimenting with vault forms is evident in the imperial palaces on the Palatine for the period of the late 1st century and early 2nd century. Architectural practice on the Palatine thus corresponds with the general tendency in Rome marked by de Fine Licht: "While it is evident that the sizes of the cupolas are increased quite considerably in the first decades of the second century, the period does not seem to have produced decisive artistic innovations in this field"<sup>41</sup>.

40 For the reconstruction of the Flavian phase, see Hoffmann – Wulf 2004, 157–62; Wulf-Rheidt – Sojc 2009, 268–72; Wulf-Rheidt 2011, 8–11; Wulf-Rheidt 2012, 108–10.

41 De Fine Licht 1968, 216.

Variation in cupola forms reaches new heights only in the reign of Hadrian. It is particularly pronounced, of course, in the Villa Hadriana in Tivoli. A comparable tendency cannot be seen in the Hadrianic palace rebuilding phases on the Palatine, however. This may be due to the absence, on the Palatine, of large-scale new edifices attributable to Emperor Hadrian. Instead, existing edifices were renovated, altered or rebuilt. In this building activity, however, it is possible to discern once again the tendency to create sequences of rooms which are impressive for their rich variety of forms rather than for their sheer scale. In view of this it would appear that it was not until Hadrian's reign that the 'sunken peristyle' acquired an upper storey, which was adjoined in the north-east by rooms displaying a wide variety of forms, including two nymphaea that were domed<sup>42</sup>.

Recent investigations into the reconstruction phases of the so-called Basilica of the Domus Flavia suggest that following apparently massive destruction in Hadrian's time, a groined vault was inserted here. This conjecture is based on the pillars, approximately 3 m in size, which are known to have been erected in all four corners of the space during this period<sup>43</sup> (Fig. 8). If it is true, then this groined vault—with its diagonal span of 23.8 m—will have been, to my knowledge, the widest groined vault that we know in 2nd century Rome.

From this period onwards, groined vaults are among the most common means of roofing the rooms of the imperial palace. This can be seen particularly clearly in the Domus Severiana. After wide-scale destruction, probably to be identified with the historically attested conflagration of A.D. 192, large parts of the substructure had to be rebuilt. In the process the damaged barrel vaults were replaced by groined vaults (Fig. 10b, 11). The wooden frameworks of *opus caementicium* vaults that were common in Flavian and Trajanic vaulting, were succeeded by a centering constructed of a layer of *bipedales* and a layer of *bessales*. This technique had been applied previously in other major building schemes in Rome, for example in Trajan's Markets<sup>44</sup>. Unfortunately we do not know what centering was used in the conjectured groined vault in the Basilica. According to the current state of knowledge it would seem that this form of centering came into widespread use in the imperial palaces only in the Severan period. As well as saving wood, this form of centering most likely had the added advantage of speeding up the building process. This could possibly have been a reason for the large-scale adoption of this technique at the end of the 2nd century—one was obviously eager to restore the badly damaged palace as quickly as possible.

The form of vaulting was changed, too, in the restoration of the upper-storey rooms of the Domus Severiana, although the overall plan of the rooms was retained. For instance, the coffered barrel vault of the central room, presumably destroyed, was replaced by a groined vault (Fig. 11). Still, as we have seen, groined vaults had been a widespread element of Roman architecture for at least 150 years and no longer represented an innovation of any kind. It also seems that designing the wooden centering for the erection of complicated groined vaults needed no longer considerable skill or masons, because it was also used for substructures.

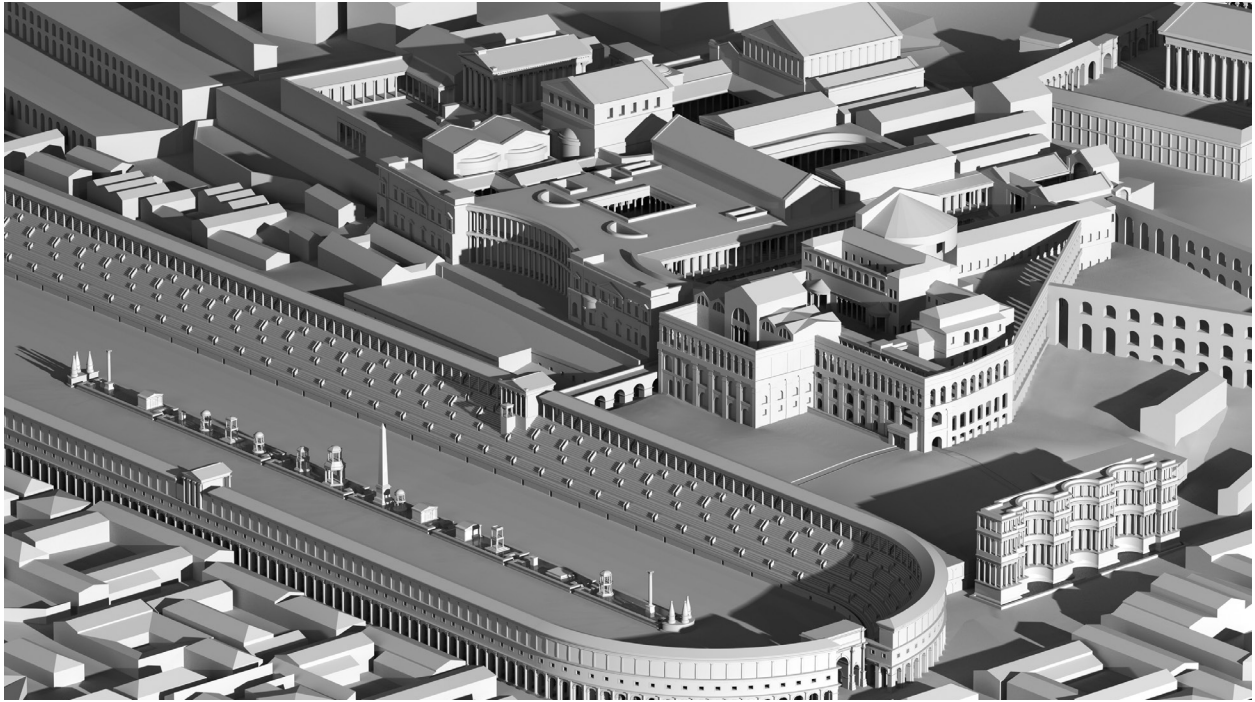
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42 Pflug 2013, 198–200.

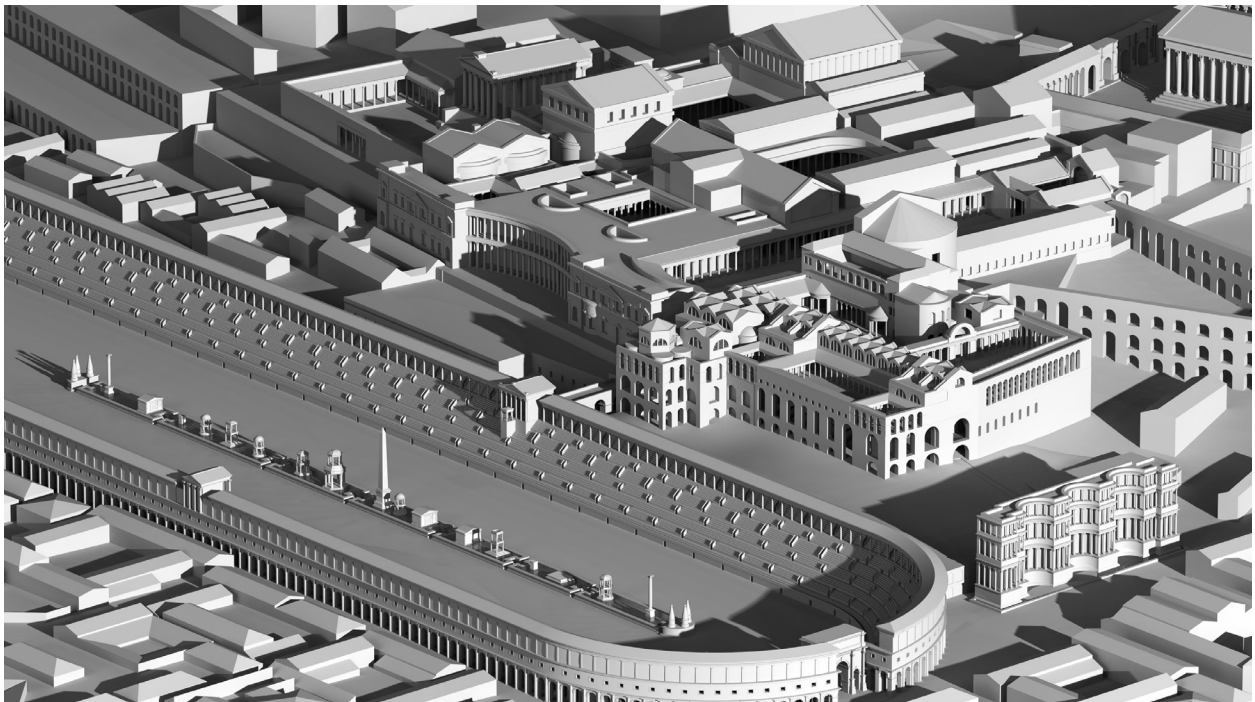
43 Blume 2012.

44 Lancaster 1995, 299–305. Fig. 20.





**Fig 12:** Hypothetical reconstruction of the Severan phase of the imperial palace.



**Fig. 13:** Hypothetical reconstruction of the Maxentian phase of the imperial palace.

However, Septimius Severus not only renovated this part of the palace but also extended it. Through the addition of a large substructure, the platform was extended by about 12 meters to the southeast in order to create space for a bathing complex, a few rooms of which



remain. It appears that the villa-like architecture apparently was refined once again during this period with this bathing complex overlooking the Circus Maximus (Fig. 12).

Interestingly experimentation with vault forms, such as is characteristic of palatial architecture of the late Neronian and early Flavian period, and as was developed to absolute perfection in imperial villa architecture in the Villa Hadriana in Hadrianic times<sup>45</sup>, is nowhere in evidence in the palace buildings on the Palatine until the reign of Maxentius. Also the monumental dimensions of the Flavian era were not surpassed until late antiquity.

An additional generous extension of the Severan bathing complex marks the end of the building activities on the Palatine (Fig. 13). Once again, the platform of the Domus Severiana was considerably extended nearly to the Circus Maximus. Less can be said about how the individual additional rooms looked, because today nearly all the superstructure has been lost. But it is certain that the relatively modest Severan bathing complex was considerably extended. This extensive bathing installation, which hovered above the 20-meter tall substructure, formed a glamorous finish to the imperial palaces. A replacement for the lost viewing rooms was created on top of the projection of the building. In the complex and diverse ground plan the viewing rooms formed a protruding belvedere, which must have given additional and unusual attractiveness to bathing in this extreme situation high above the Circus Maximus.

But despite the extensive and extravagant building, the octagonal hall of the Belvedere attached to the Severan baths in the Maxentian era (Fig. 2j) is of more modest dimensions than the 'Vestibule' in the new wing of the Domus Flavia. The Belvedere boasts an umbrella vault though at the beginning of the 4th century A.D. this constitutes the norm rather than an innovation<sup>46</sup>. The extension of the Severan baths under Maxentius included a central hall. The groined vault that has to be reconstructed here (Fig. 2j) accordingly has a smaller span than the Hadrianic groined vault in the 'Basilica' (Fig. 2f). Thus the central hall is clearly reminiscent of counterparts in the Baths of Caracalla or Diocletian (Fig. 2h, i), yet the vaulted spaces are of smaller scale than both and the dimension is less than the Flavian halls of the Domus Flavia. The contemporaneous Basilica of Maxentius alongside the Palatine also possesses groined vaults of much wider span (Fig. 2k).

It therefore seems to be the case that in the 3rd and early 4th century no new impulses in construction technique or spatial forms originated from palatial building projects on the Palatine. Nevertheless the Baths of Maxentius, built upon high substructures and seeming to soar above the city, must still have been an imposing sight (Fig. 13). The extraordinary achievement in structural engineering that the 'floating palace baths' represented must have dazzled those who saw it as much, no doubt, as the colossal dimensions of the Domus Flavia, even though that had been built more than 200 years earlier. Thanks to architects eager to experiment, innovations in construction technology and triumphs of structural engineering, palatial architecture and bathing complex architecture continued, into the 4th century, to stimulate and inspire each other to ever bolder creations and manipulations of space.

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45 For the development of cupolas, see Rasch 1985, 117–39.

46 Rasch 1985.

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Fig. 11: U. Wulf-Rheidt

Fig. 12–13: Lengyel Toulouse Architekten based on the 3D-model of A. Müller.