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The Roman Foot in the Capitolium at Pompeii: a Contribution by the Pompeii Forum Project

John J. Dobbins and James G. Cooper

The present metrological study was conducted in the context of the ongoing research of the Pompeii Forum Project that was founded in 1995 to study the dynamic evolution of the forum and the zones immediately adjacent to it. This tightly focused article on the Roman foot in the Capitolium is a contribution to that effort in anticipation of a full treatment of the building in our final book publication.

The metrology of the temple constitutes an important class of evidence in its own right and must be considered when discussing the temple as a whole and its architectural history. The utility of such a study is that metric dimensions can be converted easily to Oscan or Roman feet. The first goal of the article is to provide raw data that allow us, and other researchers, to address the question of whether the temple was designed in Oscan or Roman feet. This is important as the pre-Roman Samnites employed the Oscan foot while the Romans employed the Roman. Our data thus allow us to address the related question of whether the temple was Samnite or a product of Roman control of the city after 89 BCE. The second goal is to assess the evidence that reveals the ubiquitous use of the Roman foot that, in turn, argues for a post-89 BCE Roman date for the temple.

In the process of our documentation, we discovered that the columns in the pronaos of the temple appear to be no longer in their ancient locations, and that a regularized placement reveals that the Capitolium conforms to the Vitruvian pycnostyle *type of Roman temple (Tables 13-15). While that observation requires a few comments on temple design, the latter is not the intent of this study. A future publication will treat the temple's design, phasing, and chronology in detail, as indicated above*[1]*. The twofold importance of the present article lies in the fact that it is the only study to date that provides full documentation of the metric dimensions within the temple and that it contributes to the Samnite vs. Roman debate in substantial ways*[2]*.*

Introduction

The Capitolium is situated at the north end of the forum. By means of scale, elevation, and axiality it dominates the colonnaded piazza in front of it (figs. 1 and 2 – plans of forum and temple). The temple platform

[1] On January 3, 2020 in Washington D.C. at the 121st Annual Meeting of the Archaeological Institute of America the authors presented a paper titled "The Temple of Jupiter at Pompeii Reveals its Secrets." In that paper we identify a design change after the temple's vaults had been constructed that lengthened the temple beyond its original design. That identification eliminated the need to posit two distinct phases in the temple's building history.

[2] We thank the Parco Archeologico di Pompei and its Director, Gabriel Zuchtriegel, and the previous Directors of the Soprintendenza Archeologica di Pompei, Massimo Osanna and Piero Giovanni Guzzo. We are grateful to Dottssa. Grete Stefani for her kindness in so many ways. The on-site Ufficio degli Scavi and its staff have helped us in our daily research, and we are most grateful for their assistance. We thank Anne Laidlaw and Larry F. Ball for reading an early draft, and Michael Anderson for reading a later one. Their insights were invaluable. Shwetanc Bothra assisted with the plans and layout. The authors are grateful to the editor and anonymous reviewer of *Fasti Online* for their insights and patience. Errors, of course, are our own.

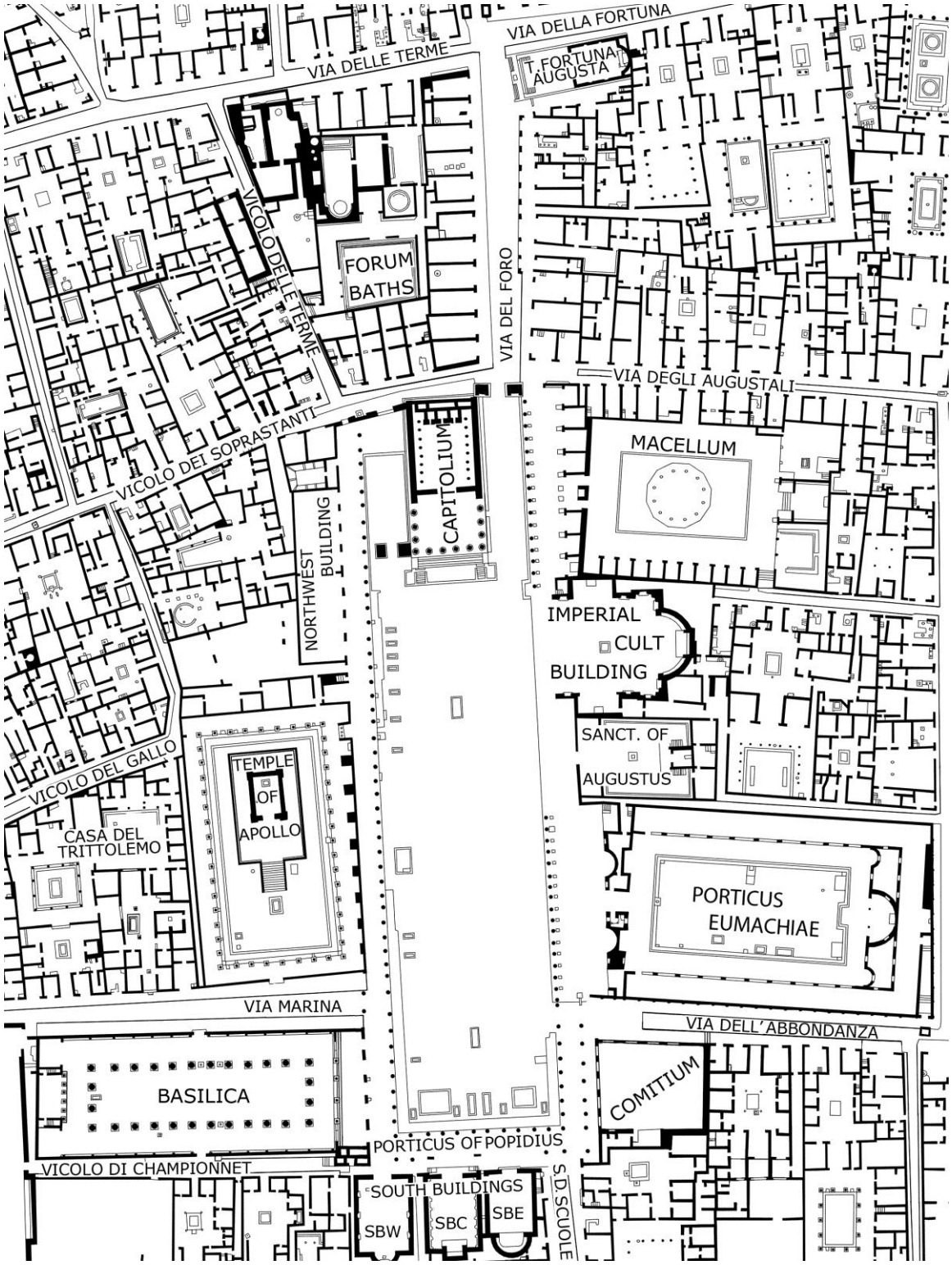

Fig. 1. Plan of the Forum at Pompeii (adapted from Eschebach and Eschebach 1995; Dobbins and Foss 2007).

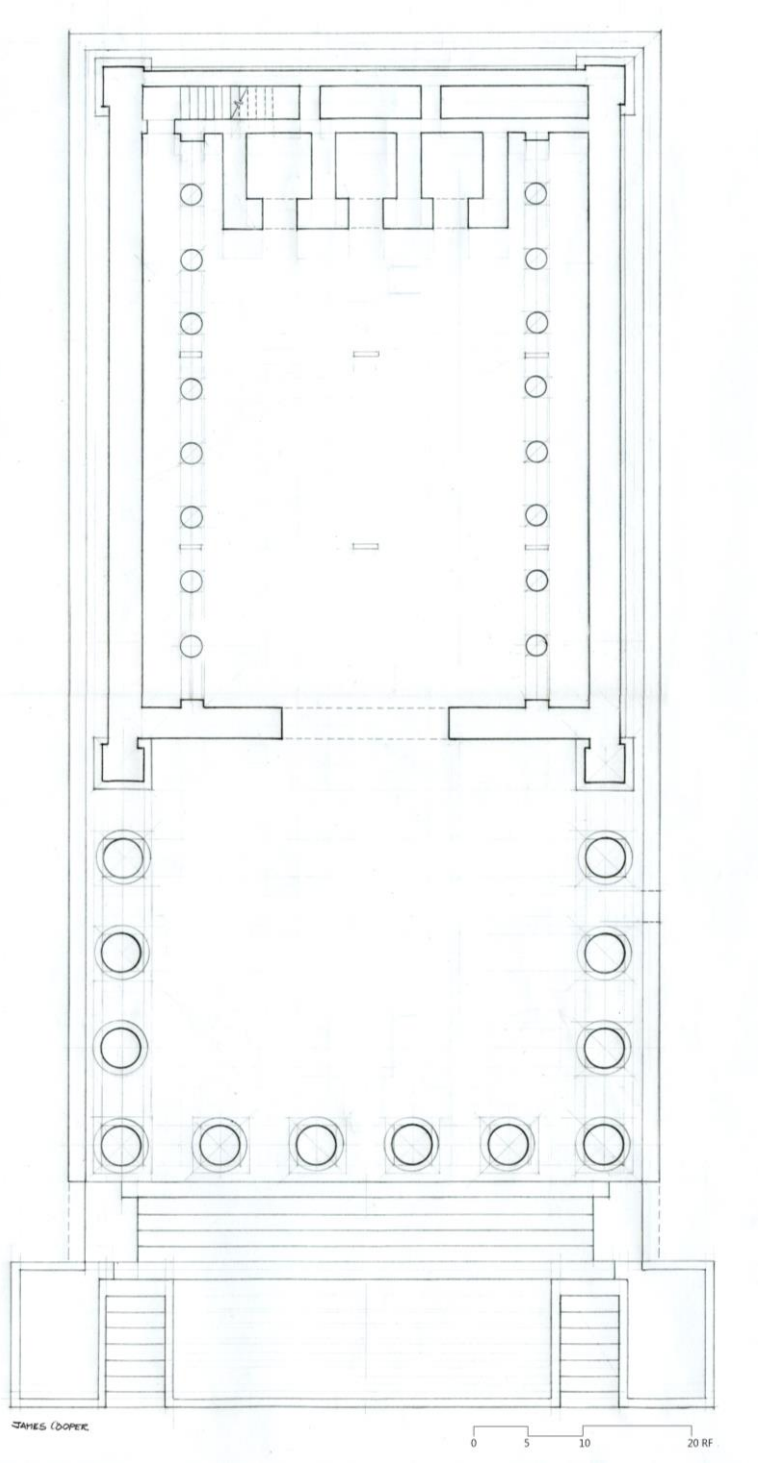

Fig. 2. Plan of the Capitolium at Pompeii.

measures 30.55m (103.5 RF) north to south and 14.9m (50.5 RF) east to west, and the overall length of the temple is 37m (125.42 RF).

At the temple's south end large podium arms accommodated equestrian statues; two relatively narrow staircases frame a large *rostra* where the altar was located (fig. 3). It is generally agreed that the rostral front flanked by podium arms is a modification of the original staircase to allow the temple front to accommodate the altar, as at the Temple of Mars Ultor in Rome. This arrangement is seen on the well-known Caecilius Jucundus earthquake relief.

Fig. 3. View of Capitolium *from southeast.*

Above the level of the rostra, a broad staircase leads to the pronaos. The pronaos is a hexastyle by four Corinthian porch whose scale and depth are noteworthy as it anticipates a long and equally wide cella (fig. 4) whose interior colonnades are set close to the walls to create a broad nave leading to a base with three small vaulted chambers. The base appears to have supported cult images and the small chambers within it could have held cult objects. The colonnades of the cella are Ionic and the pulvinars of the capitals are rendered as *fulmina*, or lightning bolts, an allusion to Jupiter (fig. 5). Behind the main chamber a narrow staircase leads upwards and currently stops at the remains of two large cisterns.

Over a century ago August Mau commented on the Roman foot measure in the Capitolium: “The temple stands on a podium 10 Roman feet high, and including the steps, 125 Roman feet long. Very nearly half of the whole length is given to the cella; of the other half, a little more than two thirds is occupied by the portico, leaving about a third (20 Roman feet) for the steps”[3].

The tables below list metric measurements and Roman foot and Oscan foot conversions for dimensions within the vaults and superstructure of the temple[4]. These data were generated by on-site measurements during several campaigns of investigation. It must be recognized that many walls at Pompeii, especially those of *opus incertum*, are so irregular that absolutely precise dimensions are impossible to achieve. The points from and to which one measures may differ within a few centimeters from person to person, or for the same person measuring at different times. This applies to standard tapes, total stations, and hand-held laser measuring devices. Nonetheless, while dimensions may differ within a small range, they are generally precise enough to dis-

[3] MAU1899: 63. Pages 63-69 treat the Temple of Jupiter. MAIURI 1973: 102, provides the length of 37m without the conversion to 125 Roman feet.

[4] We use .275m for the Oscan foot and .295m for the Roman. The metric measurement divided by these figures provides dimensions in Oscan and Roman feet. Throughout the 1990s and early 2000s, scholars within the University of Leiden project (RUSPA), directed by Herman Geertman, worked with the Oscan foot extensively in their survey of the Samnite city. Consequently, they gave considerable thought to its metric equivalent. In, or around, 1996, Geertman informed members of the PFP that he employed .27534m as the metric equivalent of the Oscan foot. See SCHOONHOVEN 2006: 36-37 who records this information.

Fig. 4. Cella of the Capitolium *from south.*

Fig. 5. Detail of Ionic capital.

inguish between Oscan feet and Roman feet. Longer measurements are usually not problematical. This situation can be illustrated at the temple itself by examining the history of the scholarship pertaining to the temple's dimensions as reported in Jos De Waele's 1984 article[5]. De Waele presents several dimensions by H. Nissen and A. Mau and compares them to his own measurements[6]. In Table 1 we present these three scholars, and include our own measurements (PFP = Pompeii Forum Project). De Waele presents more measurements than are recorded in Table 1, but they are still few in number.

De Waele's short article was less a comprehensive study of the temple, and more a summary of the investigations of Nissen, Mau, and Sogliano, and the difficulties that all, including De Waele himself, experienced in arriving at consistent measurements. De Waele did not survey the vaults or the details of the pronaos and cella, as the current study does. We hope, therefore, that our study will provide the documentation that is still lacking to confront the conundrum of whether the Capitolium at Pompeii was constructed using the Oscan or the Roman foot.

Table 1. Measurements from 1877 to 2019.

	Nissen 1877	Mau 1872	De Waele 1984	PFP 2019
Width of pronaos	14.85	14.88	14.88	14.90
Depth of pronaos (west; left)	12.10	12.165	12.165	12.08
Depth of pronaos (east; right)	_____	12.02	12.02	12.06
Thickness of cella wall	.825	.84	.825	.84
Length of cella	15.67	15.65	15.65	15.65
Width of cella	12.10	12.165	------	12.09

The platform on which the temple rests is not a perfect rectangle. Table 5 records the full dimensions. Consequently, the pronaos is not a perfect rectangle; the west (left) side is slightly longer than the east (right) side as revealed above in Table 1. The differences are so small that this condition is not evident on site.

The width of the pronaos should be an easy dimension to determine, as the blocks are well-preserved Caserta limestone. Nissen is an outlier at 14.85m; Mau and De Waele record 14.88m; and the PFP 14.90m. Similarly, the measurements of the depth of the west (left) side of the pronaos between Nissen/PFP (relatively close) and Mau/De Waele (precise between the two, but 6.5cm and 8.5cm from Nissen and the PFP) are difficult to explain without evoking an error in measuring. One actual error/typo must be pointed out. De Waele notes on p. 2 that Mau records the west doorjamb of the cella as .84m, but in his Abb. 2 on p. 3 and on the plan on p. 7 ("nach Mau") the dimension is incorrectly recorded as 0.825m (the same as Nissen). The west doorjamb is very easy to measure and it is .84m; the east doorjamb is .83m. The point to be underscored is that De Waele reports evidence and documents the difficulty of achieving consistent measurements for the Capitolium.

On-site measurements of buildings in Pompeii do not always convert to precise Roman or Oscan feet and their fractions. The reasons are obvious. An architect designed a building with precise dimensions. The on-site crew chief, masons, and workers strove to adhere to those specifications as closely as possible, but in many cases, the construction material and tolerances did not admit the same precision as an architect's straight edge and compass. The use of Roman concrete, *opus caementicium* (specifically *opus incertum*), in the vaults of the podium, for example, along with the carpenter's formwork and centering, allowed a certain deviation from the ideal. Consequently, when a vault width is measured at 3.51m (=11.9 RF) we can legitimately recognize that as 12 RF (see Table 2, Vault 4). When ashlar masonry was employed, all individual blocks were cut by hand to the tightest tolerance possible, which results in excellent precision when Caserta limestone was used, as in the platform of the Temple of Jupiter. Finally, it is axiomatic in the modern building trades that "prob-

[5] DE WAELE 1984: 1-8.
[6] NISSEN 1877; MAU 1879.

lems happen," meaning that no matter how precisely a team (from architect to laborer) works, unforeseen design problems, design changes, or errors occur[7].

The vaults

The podium consists of three long north-south vaults that support the superstructure of the temple and that created ample and cool storage space within the podium. Crosswalls divide the vaults into six chambers that are numbered 1-6 in figure 6. The interior width of the three vaults is 12.18m (41.29 RF; 44.29 OF). The door into chamber 6 that provides access to the vaulted chambers allows the east wall thickness to be measured as 1.52m (5.15 RF; 5.53 OF); the west wall is probably the same. Thus, the total width of the podium (excluding exterior moldings) is 15.25m (51.69 RF; 55.45 OF). One straight measurement (using a hand-held laser) from the north wall of the room to the north of chamber 2 to the south end of chamber 5 yields 22.74 m (77 RF; 82 OF). The presence of a narrow space that extends through and beyond the south wall of chamber 5 exposes the thickness of the south wall itself, .44m (1.49 RF; 1.6 OF)[8].

Table 2 records the thickness of walls and the widths of vaults in meters, Roman feet, and Oscan feet. The Roman foot dimensions alone are provided in fig. 7

Table 2. Wall and Vault Widths[9]

							Total	Total	Total
West Wall	Vault 4	Wall	Vault 5	Wall	Vault 6	East Wall	Metric	RF	OF
Metric (1.52)	3.51	.82	3.5	.81	3.5	1.52	15.25		
RF 5.15	11.9	2.77	12.1	2.74	11.86	5.15		51.69	
OF 5.52	12.7	2.98	12.98	2.94	12.72	5.52			55.45

Vault Height

The height of vaults from the undulating dirt floor level is not a useful dimension. Dimensions range from 2.1m to 2.33m. More informative is the height of the three long segmental vaults from their springing because the masons appear to have been striving for a dimension of 5 Roman feet. An aspect of Maiuri's legacy is that his designation of the vaults as barrel vaults has persisted for eighty years[10]. However, the vaults are not barrel vaults; they are segmental.

We emphasize that the six chambers in figure 6 and Tables 3 and 4 represent *three* vaults: western (1/4); central (2/5); eastern (3/6). In terms of measuring *opus incertum* masonry, it is instructive to observe the variations within a single vault and among the three vaults. These six measurements demonstrate the difficulty

[7] Maiuri, himself, cites the N-S wall foundation within the temple vaults as an example of a design change that took place during construction (our chamber 2). MAIURI 1973: 104-105 writes, "Quando al basso muro che attraversa nella sua lunghezza l'asse dell'ambiente central delle favisse (v. pianta, fig. 67, *n*) … esso verosimilmente non è altro che un pentimento durante il corso dei lavori …". Elsewhere we will present an urbanistically more significant design change that took place during construction.

[8] In Maiuri's fig. 67 (=Gasparini, fig. 14) the southern vault wall is depicted as more that twice as thick as it actually is. In Maiuri's north-south section detail, fig. 58 (=Gasparini, fig. 15b) the configuration of elements at the south of the central vault can be recovered. An arched opening in the wall is 1.66m wide and .44m thick; the south face of that vault is marked by a slight offset in Maiuri's fig. 58. To the right, south, of the offset in Maiuri's fig. 58 is an independent construction extending 1.73m farther south, although Maiuri's hatching suggests that the two components constitute one wall. Beyond that to the south lie what appear to be steps cut into rubble. They will be treated in our longer study.

[9] This table is presented horizontally because in this format it corresponds well visually to fig. 6. All other tables are presented vertically. Fig. 7 presents Roman feet while Table 2 presents metric dimensions and Roman and Oscan conversions.

[10] MAIURI 1973: 104. This is a reprint of "Saggi negli edifice del foro," *Notizie degli Scavi di Antichità* (1942): 253-320.

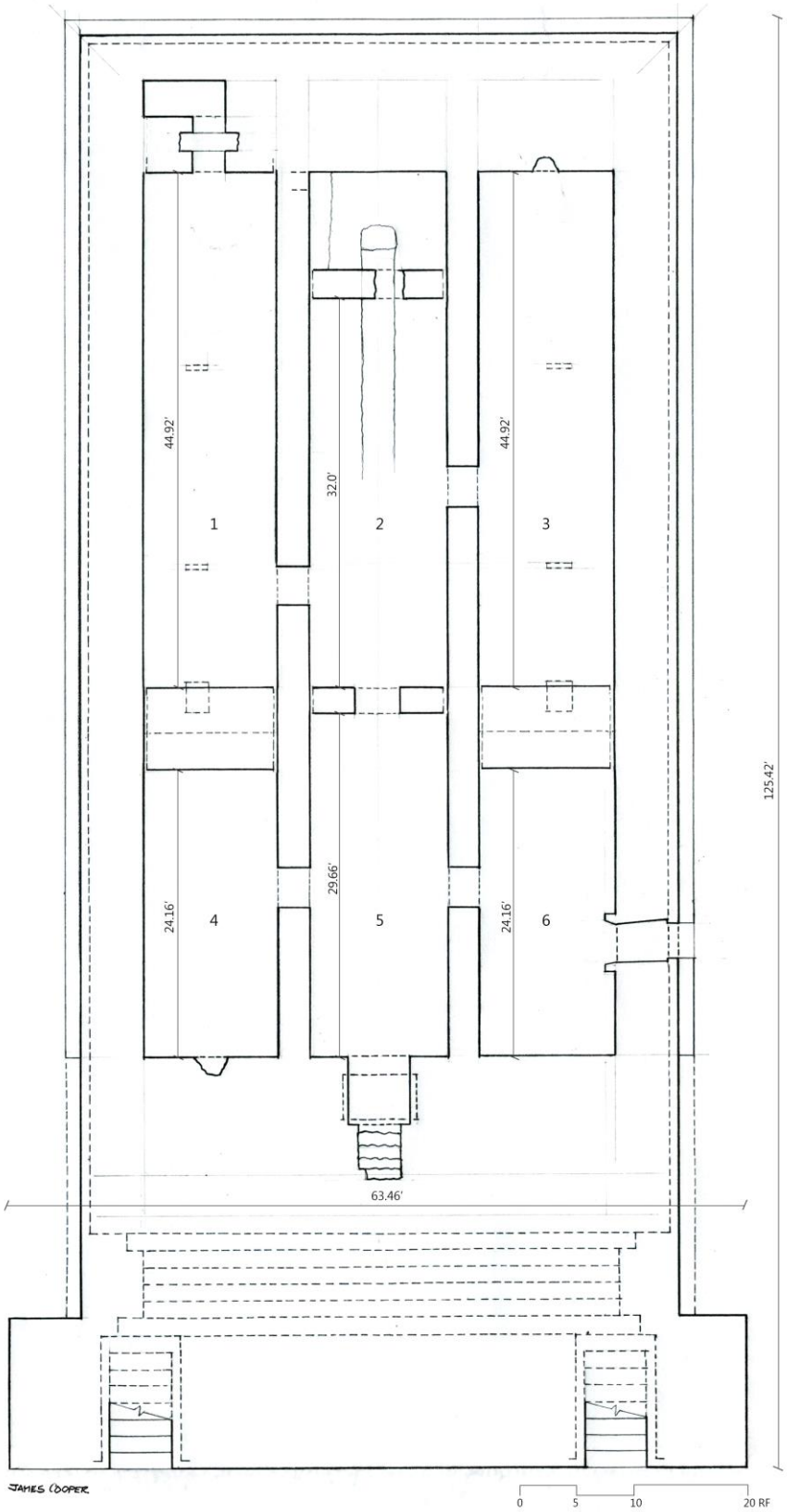

Fig. 6. Plan of the vaults.

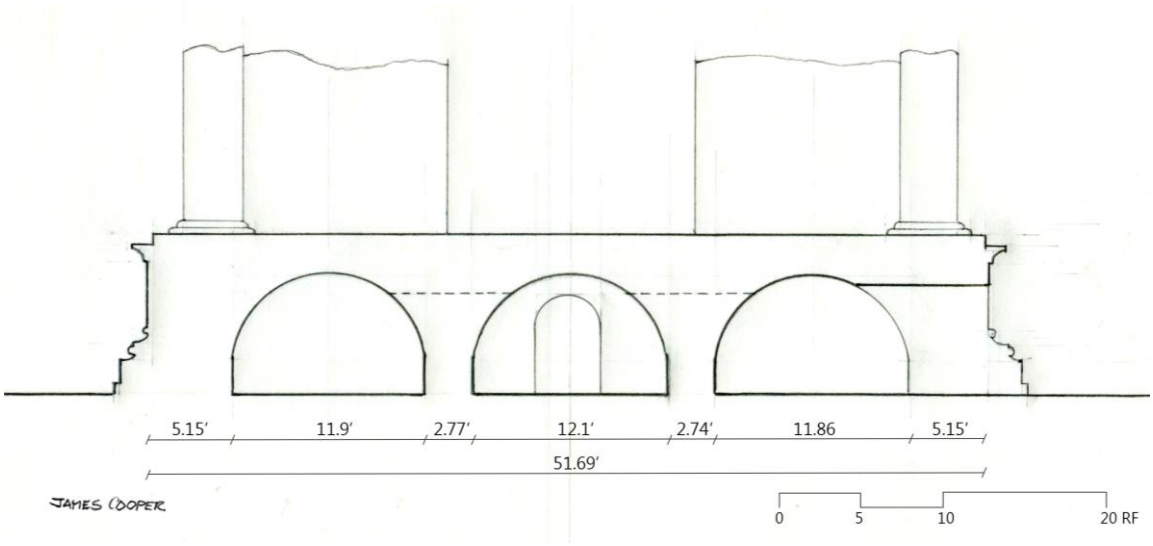

Fig. 7. Transverse section through vaults.

of assigning ideal figures to certain measurements. Only the 1.475m height in chamber 2 conforms precisely to 5 RF. The measurement of 1.339 in chamber 1 is 13.6cm off a Roman 5-foot ideal. It is closer to the Oscan 5-foot ideal of 1.375 (only 3.6cm off). Many more datum points would probably have provided greater clarity, but these are the six we have. Returning to the measurement in chamber 1, we must note that farther south in the same vault the measurement in chamber 4 is 1.51 (3.5cm above the ideal).

Where does this leave us? In a very literal sense, the vaults were fundamental to the success of the building project and they obviously succeeded in supporting the superstructure. These measurements are therefore interesting in their own right as they shed light on building practices at a time when architects had mastered the properties of *opus caementicium*. Builders tended to work with a standard measure, but it is clear from these measurements that the success of the project at foundation level (versus in the cella, for example) did not require absolute precision. Apropos of this we must underscore that our measurements were taken from the springing points to the intrados. The platform of the temple rested on a level surface associated with the extrados of the vaults, not on the intrados. A deviation from the standard measure of some centimeters was clearly not a problem because the vaults still stand and their essential function was to provide a level *upper surface* to support the superstructure. This leads us to the next obvious question.

Was the unit of measure in the vaults the Roman or the Oscan foot[11]? Table 3 presents the raw data and a conversion to Roman and Oscan feet. The numbers are ambiguous. It appears to us that they point toward a unit of measure of 5 Roman feet for the height of the vaults from their springing, but Oscan foot equivalents are relatively close. This is an example of the problem presented by short measurements as the Roman and Oscan foot differ by only two cm. This is a situation in which false positives for an Oscan foot could be identified. However, Table 3 records that the metric dimension in Chamber 2 is exactly five Roman feet while four other measurements are very close to the 1.475m reading in Chamber 2. The only real outlier is Chamber 1 whose continuation in Chamber 4 is close to 1.475m, illustrating the variability of dimensions in the vaults. Conversions to Oscan feet do not give one confidence as it cannot be determined whether a 5 foot or a 5.5-foot unit of measure might have been sought.

Although there are only six measurements, we can push them further. Table 4 quantifies the deviation of each measurement from the Roman and the Oscan 5-foot unit of measure, and it quantifies the total of those deviations. The total deviation of the six measurements from the Roman 5-foot unit of measure is 29.6cm and

[11] Those familiar with the Pompeii Forum Project, especially its vociferous critics, know that we see this temple as a product of the Roman colony. We are not arguing that case here as the primary focus of this article. We are presenting, as impartially as possible, evidence that should be useful to anyone interested in the Capitolium at Pompeii.

from the Oscan 5-foot unit of measure 49.6cm. This reading is hardly definitive, but it points toward the Roman foot being the unit of measure and offers nothing to support an Oscan foot[12].

Table 3. Height of Vaults from their Springing Points.

Height of Vaults from Springing Points			
	Metric	*Roman Foot*	*Oscan Foot*
Chamber 1	1.339	4.54	4.87
Chamber 2	1.475	5	5.36
Chamber 3	1.5	5.08	5.45
Chamber 4	1.51	5.11	5.49
Chamber 5	1.41	4.78	5.12
Chamber 6	1.44	4.88	5.23

Table 4. Deviations from the Roman Foot and the Oscan Foot in Spaces 1-6.

	Deviations from the Roman Foot and the Oscan Foot in Chambers 1-6	
	From Ideal 5-Roman Foot	*From Ideal 5-Oscan Foot*
Chamber 1	-13.6cm	-3.6cm
Chamber 2	0.00cm	+10cm
Chamber 3	+2.5cm	+12.5cm
Chamber 4	+3.5cm	+13.5cm
Chamber 5	-6.5cm	+3.5cm
Chamber 6	-3.5cm	+6.5cm
TOTAL DEVIATION	29.6cm	49.6cm

The Platform on the Podium

The platform measures slightly over 50 Roman feet in width (see Table 5). This might suggest that the architect strove for 1:2 proportions of 50 X 100 RF, but the lengths are 103 and 104 RF (eastern and western faces of the platform respectively). In the construction phase the overall podium was lengthened beyond the proportions of 1:2 in order to create the current proportions. We treat this elsewhere.

Table 5. The Platform.

PLATFORM			
Feature	*Metric Measure*	*Roman Foot*	*Oscan Foot*
North Face	14.95	50.69	54.36
South Face	14.90	50.5	54.1
West Face	30.76	104	111.8
East Face	30.55	103	111

[12] We hope that those who aspire to an Oscan foot module will enter the vaults and take numerous measurements, documenting exactly how and where those measurements were taken and reporting the results quickly. We caution that bright lights are necessary because the northern ends of chambers 1 and 2 are dangerous.

The Pronaos

The current spacing of columns in the pronaos is so irregular, especially among the flanking columns, that no architectural sense can be made of them as revealed in the Tables 6-8 below under "*Pronaos: current scheme*." We cannot explain this anomaly. The eruption of 79 CE may have toppled the columns, and the surviving bases may have been moved during Bourbon era reconstructions. The main point is that the columns and their bases appear not to be in their original positions.

If the current spacings were original, the implications for the entablature would be considerable, because instead of employing architrave blocks of consistent lengths, the builders would have needed blocks of inconsistent lengths to span the different distances. On the south colonnade, two of the spaces are consistent, but the other three are not, requiring four different architrave lengths. On the flanking colonnades, only the first intercolumniations on each side balance at 1.58m; the second on the west at 1.83m would be paired with a 1.61m intercolumniation on the east; the third on the west at 1.65m would be paired with a 1.72m intercolumniation on the east; and the fourth (the column to pilaster space) on the west at 1.53m would be paired with a 1.51m intercolumniation on the east. A total of seven architrave lengths would be required for the flanking colonnades in order to span eight spaces. Such a scheme is inconsistent with Vitruvian architectural principles and with built temples in the Roman world, for example the Temple of Portunus in Rome, or the Maison Carrée in Nîmes thus suggesting that the columns are not in their original ancient locations.

The Pronaos: current scheme

Intercolumniations

Table 6. Intercolumniations, South Colonnade.

PRONAOS			
Intercolumniations (IC): S. Colonnade, West to East			
IC	*Metric*	*Roman Foot*	*Oscan Foot*
IC I	1.64	5.55	5.96
IC II	1.68	5.69	6.1
IC III	1.65	5.59	6
IC IV	1.65	5.59	6
IC V	1.62	5.49	5.89

The West and East Colonnades of the pronaos

The northernmost bay in the east and west colonnades of the podium is not a proper intercolumniation. It is the space between the northern edge of the column and the pilaster. In the tables below this dimension is designated Col > Pil (Column to Pilaster).

Table 7. Intercolumniations, West Colonnade.

PRONAOS			
Intercolumniations (IC): W. Colonnade, South to North			
IC	*Metric*	*Roman Foot*	*Oscan Foot*
IC I	1.58	5.35	5.74
IC II	1.83	6.2	6.6
IC III	1.65	5.59	6
Col > Pil	1.53	5.18	5.56

Table 8. Intercolumniations, East Colonnade.

PRONAOS			
Intercolumniations (IC): E. Colonnade, South to North			
IC	*Metric*	*Roman Foot*	*Oscan Foot*
IC I	1.58	5.35	5.74
IC II	1.61	5.457	5.85
IC III	1.72	5.83	6.25
Col > Pil	1.51	5.11	5.49

The Pronaos: a regularized scheme

Alternatively, compared to the current scheme, the overall pronaos dimensions with regularized column placements produce a clear and simple pronaos that conforms to classical canons, Tables 9-11 and figure 8.[13] The columns themselves are 1.04m or 3.53 RF in diameter. While the extant columns appear not to be in their original positions, the pilasters, at the southeast and southwest corners of the cella have not moved since antiquity: their width of 3.53 RF confirms the diameter of the columns, and their positions dictate the alignment of the east and west colonnades in the pronaos.[14] This also means that the east-west positions of the first and sixth column in the south colonnade are definitively anchored by the pilasters whose width, outer face to outer face, is 14m or 47.5 RF.

The tasks that remain are to calculate the distance between the southern columns and the edge of the platform, and to place the columns (second through fifth) in a regular spacing between the already established first and sixth columns. As the distance between the east and west colonnades and the edge of the platform has already been established by the pilasters, we employ that dimension for the southern colonnade. If we place the four central columns evenly between the fixed first and sixth columns, the following spacings result: the intercolumniations are 5.28 RF; the interaxial distance is 8.75 RF; the base diameter of each column is 5 RF; and the inter-base dimension is 4 RF. The same dimensions obtain on the east and west colonnades of the pronaos (fig. 8).

Intercolumniations

Table 9. Intercolumniations, South Colonnade (regularized scheme).

IC	*Metric*	*Roman Foot*	*Oscan Foot*
IC I	1.56	5.28	5.67
IC II	1.56	5.28	5.67
IC III	1.56	5.28	5.67
IC IV	1.56	5.28	5.67
IC V	1.56	5.28	5.67

[13] We will elaborate upon this in our larger study.
[14] This is a critical point as it confirms that there is no guesswork in the placement of the east and west colonnades.

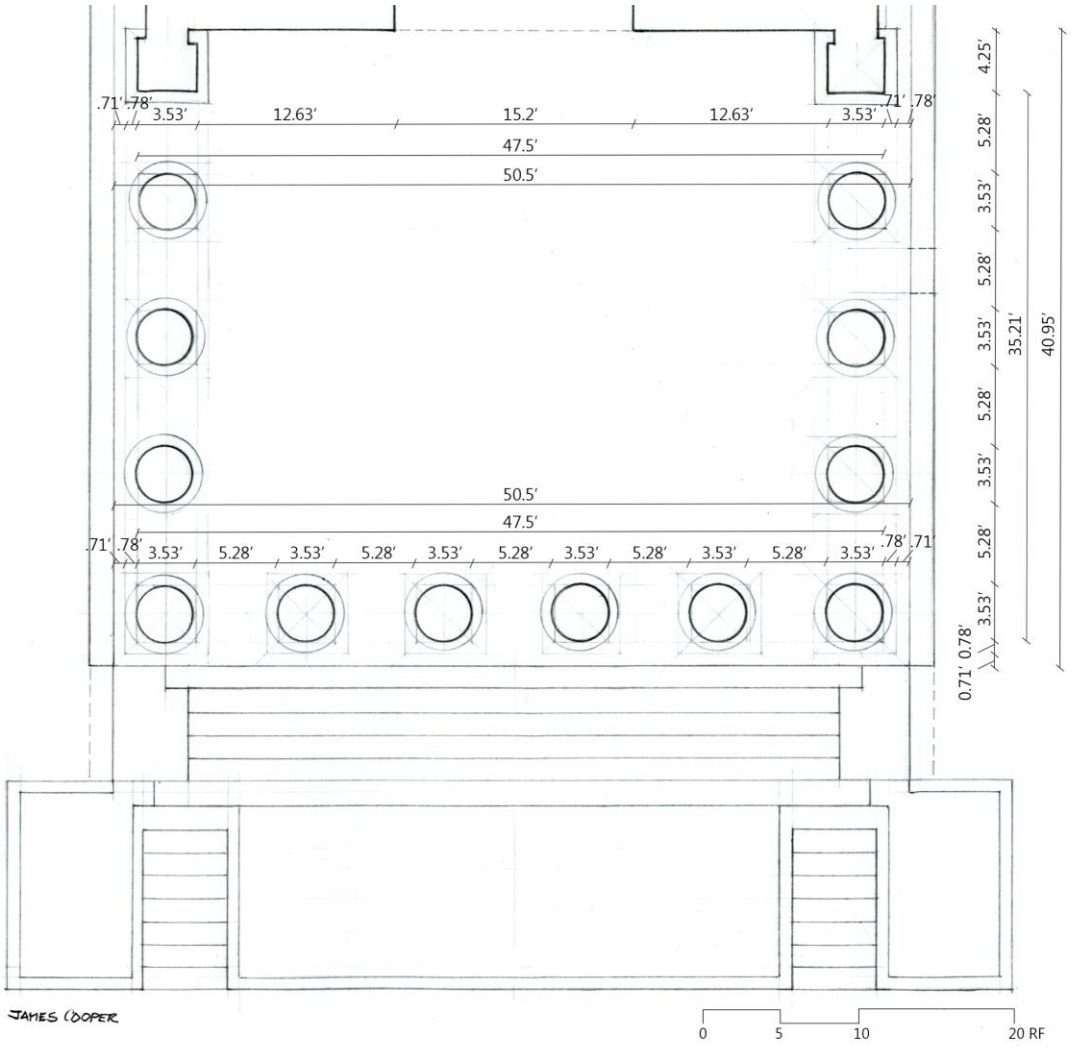

Fig. 8. Plan of pronaos (regularized scheme).

Table 10. Intercolumniations, West Colonnade (regularized scheme); Col>Pil below = Column to Pilaster.

PRONAOS			
Intercolumniations (IC): W. Colonnade, South to North			
IC	*Metric*	*Roman Foot*	*Oscan Foot*
IC I	1.56	5.28	5.67
IC II	1.56	5.28	5.67
IC III	1.56	5.28	5.67
Col > Pil	1.56	5.28	5.67

Table 11. Intercolumniations, East Colonnade (regularized scheme).

PRONAOS			
Intercolumniations (IC): E. Colonnade, South to North			
IC	*Metric*	*Roman Foot*	*Oscan Foot*
IC I	1.56	5.28	5.67
IC II	1.56	5.28	5.67
IC III	1.56	5.28	5.67
Col > Pil	1.56	5.28	5.67

The Cella

In scale and monumentality, the pronaos prepared those who entered the cella for its own majesty (fig. 4). All dimensions for the cella are in Roman feet. The overall width is close to 41 RF. The central nave was exceptionally broad at nearly 30 RF allowing viewers to confront the base and its statues. The flanking Ionic columns of 2 RF diameter were set close to the side walls, 4 RF, which is the same dimension as the intercolumniations. Interaxials are almost 6 RF. Unlike in the vaults, where the builders enjoyed considerable flexibility, the cella, the most important part of the temple, demanded a high level of precision and most metric measurements convert consistently to Roman feet (fig. 9 and Table 12). In cases where the dimension is not precise it is evident that a Roman foot was sought.

Table 12. Dimensions within the Cella (fig. 9)

Cella			
Feature	*Metric Measure*	*Roman Foot*	*Oscan Foot*
Column Diameter	.59	2	2.15
Pilaster Widths at North End of Cella	.59	2	2.14
Intercolumniation	1.18	4	4.29
Interaxial	1.75	5.93	6.36
Column Axis to Wall	1.48	5	5.38
Column Edge to Wall	1.18	4	4.3
Span between Colonnades (arris to arris)	8.67	29.39	31.5
Span between Colonnades (flute to flute)	8.75	29.66	31.8
Pilaster center to Pilaster Center (E-W)	9.23	31.28	33.5
Door Width	4.47m	15.1	16.25
Wall Segment to West of Door	3.85	13.05	14
Wall Segment of East of Door	3.82	12.95	14
Internal Length (not including stairway)	15.65	53	57
Internal Width	12.09	40.98	43.96/44

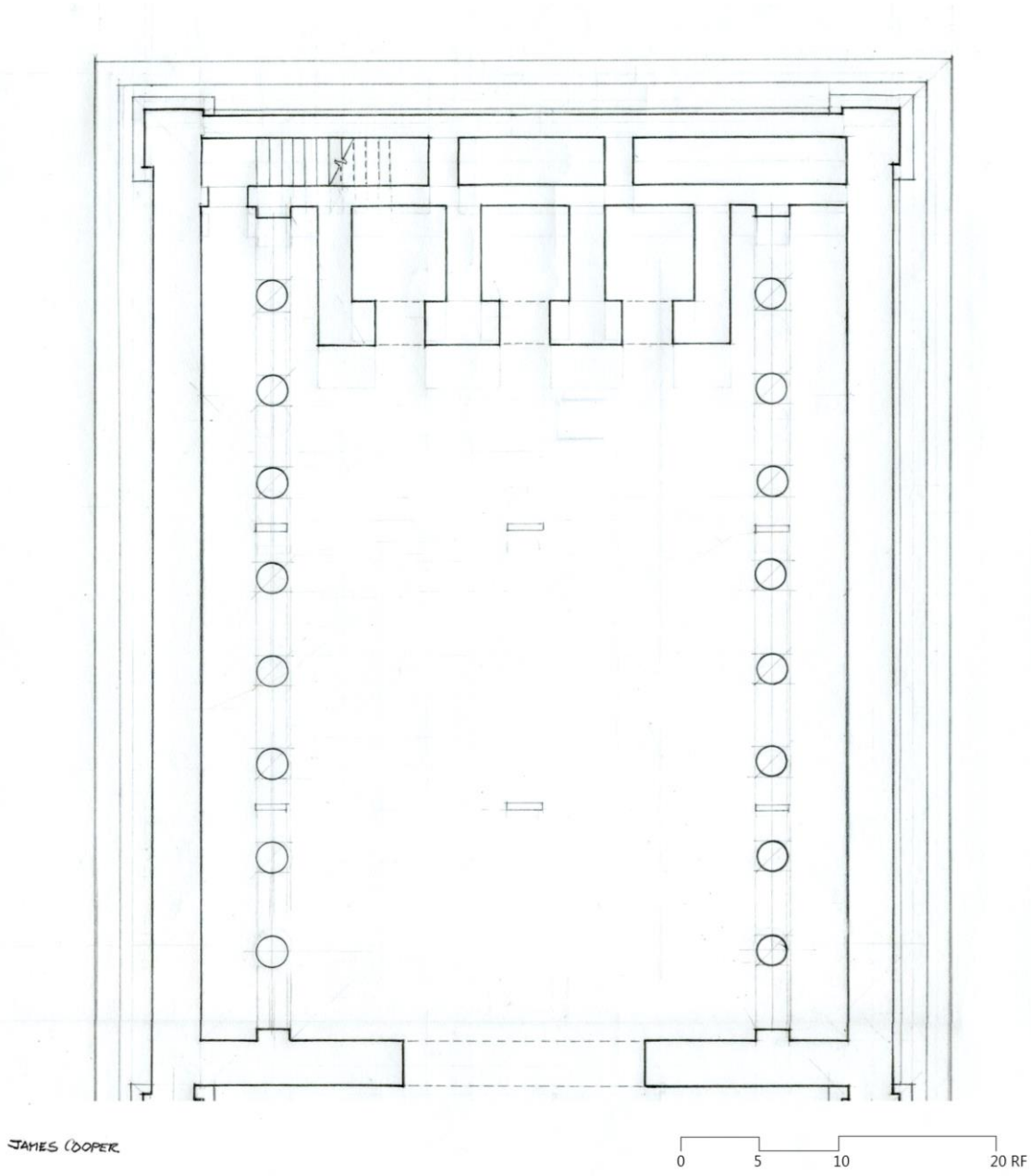

Fig. 9. Plan of the Cella (dimensions in Roman Feet).

Roman Metrology on the Forum at Pompeii

In addition to the Capitolium, other buildings on the forum employ the Roman foot. We present four of them: Basilica, Sanctuary of Apollo, Comitium, and *Porticus Eumachiae*. The first three are contested buildings concerning their dates and metrology. We treat them first. As an early imperial Roman building, the *Porticus Eumachiae* presents no problem concerning the Roman foot because all commentators expect it to have been designed and constructed using Roman metrology. Why then, cannot the first three in this list be considered for many reasons, including the use of the Roman foot, to be Roman? That is one of the critical questions in current Pompeian scholarship.

Basilica

The Pompeii Forum Project has already indicated that the measurements by Karlfriedrich Ohr convert to Roman feet although Ohr, himself, sought to call it something else, i.e., an Attic foot. We regard Ohr's detailed metrological study and publication as a major contribution to the understanding of the evolution of the forum. Moreover, we understand why he was unable to recognize and, indeed, announce his research as a revolutionary discovery, but we are puzzled as to why scholars well into the twenty-first century cannot accept it for what it is: the discovery of the Roman foot in the Basilica[15]! Ohr's methodology is one that the current authors emulated in the Capitolium, namely that accurate metric measurements be taken, and published in full so that we and others can determine whether the architect and builders used Oscan or Roman feet. For the Basilica, the answer has been available since 1991: the unit of measure was the Roman foot.

Sanctuary of Apollo

Careful metrological and stratigraphic study in the Sanctuary of Apollo over a period of more than twenty years has revealed much about the sanctuary's history, absolute chronology, use of the Roman foot, relationship to and role in modifying the urban fabric around it, and structural and chronological relationship to the forum's western colonnade[16]. In the current context we are interested in the Roman foot as a unit of measure[17]. The pilasters at the four corners of the temple's cella proper measure .59m, or 2 RF, in width. That two-Roman-foot unit of measure, is a module within the temple's design, and multiples of it inform the layout of the peripteral colonnade of the temple, the sanctuary colonnade, and the pier wall separating the sanctuary from the forum. The two-foot module of the pilasters provides the lower diameter of the columns of the temple colonnade[18]. As the pilasters wrap around the four corners of the cella, they establish the placement of eight columns. The task was then to fill in the empty space with appropriately spaced columns whose diameters were one module (2 RF). A scheme of ten columns with two-module intercolumniations (4 RF) and interaxial distances of three modules (6 RF) emerged. The 4 RF intercolumniation guided us in setting the columns 4 RF from the pilasters, hence we had the proper spacing between the temple cella and the colonnade[19].

The sanctuary colonnade and the pier wall employ the same modular scheme and function as an ensemble. Intercolumniations are three modules (6 RF); interaxials are four (8 RF). The outer edges of each pair of columns align with the inter-pier space, or 5 modules (10 RF); the length of each pier is three modules (6 RF). The sanctuary colonnade forms a double-square whose east-west central line responds to the south edge of the temple's south colonnade. The integrated design scheme argues that all components belong to one building project and our 1997 excavations date that project to the Augustan period[20].

Comitium

Pompeii Forum Project has been studying the Comitium for decades, and we are now preparing our final publication. We have depended heavily on the work and the 1957 publication of Günther Fuchs[21]. Nonetheless, we have conducted our own on-site autopsy and do not agree with Fuchs on every issue[22]. New excavations

[15] BALL, DOBBINS 2013: 482, esp. n. 119; BALL, DOBBINS 2017: 478-487 for the full presentation and interpretation of the Pompeii Forum Project's stratigraphic excavation against the south flank of the Basilica; see BALL, DOBBINS 2017: 486, n. 53 for a discussion of Ohr's metrology.
[16] DOBBINS *et al.* 1998; BALL, DOBBINS 2013: 487-490; BALL, DOBBINS 2017: 470-479; COOPER, DOBBINS 2015.
[17] COOPER, DOBBINS 2015.
[18] The current columns on the platform measure .72m (2.4 RF) and cannot be associated with the surviving pilasters. We therefore sought a colonnade that was compatible with the pilasters.
[19] Pompeii Forum Project Architect, James Cooper, was able to work out this scheme quickly.
[20] DOBBINS *et al.* 1998; COOPER, DOBBINS 2015; BALL, DOBBINS 2017: 470-478.
[21] FUCHS 1957.
[22] John J. Dobbins and Larry F. Ball have worked together to document the building as fully as possible. We have measured in detail, taken black-and-white and color images, studied the masonry chronology, converted the metric data into Oscan and Roman feet, and conducted a sub-surface prospection with a gradiometer. We feel that we understand the building well. At this writing, Ball is actively writing the chapter on the Comitium for our final book publication. John J. Dobbins.

and subsurface prospection, and a new publication by Flecker and Lipps seems especially appropriate as these are German scholars, and they bring approaches that Fuchs could not have imagined in 1957[23].

A full accounting of our metrological data will appear in our book chapter on the Comitium. Here we offer a sample to confirm the Roman-foot unit in the building.

North Façade:

Except for some complications in the first pier on the west, the original design was simple. The piers were rectangular in plan, 1.17-1.20 by 0.69m (4 by 2 1/3 RF). The second through fourth pier from the west remain in this original configuration. Each pier had an integral brick-faced pilaster strip on the north side. These projected 0.09m, for a total pier thickness of ca. 0.78m (2 2/3 RF). The pilaster strips are 0.59-0.60m (2 RF) wide.

The center doorway of the north façade is wider than the others, 3.54m (12 RF), while the doors flanking it are narrower, 2.79-2.80m (9 RF).

West Façade:

The west façade for the main room is symmetrically arranged, including both the sizes of the six piers and the spans of the apertures between them. Piers on the ends are longer: north pier is 1.162m in length and the south pier is 1.173m; width of north pier is 0.593m and the south pier is 0.85m; these are 2 x 4 RF in plan while the four piers between them are 2 x 3 RF (lengths 0.885m for three and 0.89m. for a fourth; widths are 0.59m., 0.59m., 0.565m., and 0.595m). The central doorway is the widest, at 2.97m (10 RF), while the other four doorways span 2.44-2.48m (8 RF).

The stairs leading up to the tribunal from the main room are 1.2m (4 RF) wide.

Porticus Eumachiae

Valerio Dario, a native of Bari, earned a Master's Degree in Architecture at the Pennsylvania State University under the supervision of current co-author of this article, James G. Cooper. As a valued member of the Pompeii Forum Project, Valerio assisted Dobbins and Cooper in their investigations and participated in countless discussion on-site and off-site pertaining to the proper interpretation of our data. Valerio Dario also conducted his own on-site investigations of the *Porticus Eumachiae*, being the first to measure, draw, and come to terms with the architectural *membra disiecta* on site that had once belonged to the *Porticus Eumachiae*. In the course of his investigations for his May 2016 thesis, "The Porticus of Eumachia in the Forum of Pompeii," Valerio came to recognize that the building was laid out according to a 32 RF module that underpinned major and minor design features, as illustrated in his text and drawings: "The rigid modularity of the parts introduces a precise scheme that is applied to the whole structure. A module corresponding to 32 roman feet (about 9.60 meters) can be measured in every portion of the building. The longitudinal wings of the inner porticus are five modules long, whereas the length of the short wings corresponds to three modules; the long corridors of the crypta have a length of six modules, and the rear branch is four modules long"[24].

Conclusion

This article is the product of systematic campaigns of measuring at the Capitolium at Pompeii conducted by the Pompeii Forum Project. The overall dimensions and proportions of the temple were recognized long ago by August Mau as Roman feet. Our data gathering builds on his work and on that of Jos De Waele, and provides much more data. The tables provide raw data documenting key dimensions within the temple. Dimensions within the vaults point to the Roman foot, and also reveal the latitude afforded to the builders of the *opus incertum* foundations compared to the precision demanded in the superstructure.

[23] FLECKER, LIPPS, 2021. Johannes Lipps contacted Dobbins and Ball to ask if he and Flecker could use one of our images in their publication. We appreciated this collegial outreach and quickly granted our permission, wishing them good luck with their publication, and at the same time recognizing that we will probably have different scholarly opinions. Lipps most graciously sent us (Ball and Dobbins) a pdf of the newly published Flecker-Lipps article. We are most grateful for the collegial interaction between German and American scholars as we purse the same goal: an understanding of the evolution of the Pompeii forum. John J. Dobbins.
[24] DARIO 2016: 155.

We wish to underscore that the 52 RF-wide podium appears to be associated with the temple built on top of it. The podium prepares for the reception of a platform that is 50.5 RF in width (14.9m), and the platform supported a temple that was 47.5 RF wide (column face to column face), or 49.06 RF if measured from base edge to base edge. That left a small strip of .71 RF between the bases and the platform edge. A temple of 50 OF in width (13.75m) would be narrow for the platform of 14.9m. Such a temple would leave a gap of .57m (2.09 OF) on each side. A temple of 55 OF (15.125m) would not fit on the platform of 14.9m. In short, the podium appears to have been built for the present temple, rather than for a Samnite one.

The current placement of columns in the pronaos does not appear to reflect an ancient columnar arrangement. However, when the column positions are regularized they are seen to employ the Roman foot and to conform to classical canons. Dimensions within the cella are definitive. They are Roman. This will not settle the debate, however. For those who see a multiphase temple, the cella can be assigned to the Roman period, and our dimensions will fit into that interpretation. This article does not engage in a discussion of the temple's phasing, nor is it an analysis of the temple's design; both of those issues will be treated in a subsequent publication. Its purpose is to present and analyze numerous measurements that reveal a critical aspect of the temple's building history, namely the unit of measure used in its design and construction.

The conversion of metric dimensions to both Oscan and Roman feet allows us to conclude that the architect employed the Roman foot. This would appear to settle the controversy as to whether the Oscan or the Roman foot was employed in the temple. Moreover, as it was the Romans who employed the Roman foot, this study also leads to the conclusion that the temple dates to the period after the arrival of the Romans in 89 BCE[25]. Nonetheless, we acknowledge that this article will not convince the traditionalists and that the debate will continue[26].

[25] In the late 1990s we asked Herman Geertman (in private conversation at Pompeii) if the Roman foot was ever used in Pompeii before 89 BCE. His answer was, "No, but the Oscan foot continued after the arrival of the Romans."

[26] Gasparini (2014: 9-92) illustrates the controversy. He believes that the Capitolium was constructed in Oscan feet and he uses Oscan feet throughout his study to present the temple.

In the final paragraph on p. 49, Gasparini announces that in 2009 he had conducted a total-station survey of the Capitolium. He presents no data and refers to no other presentation, either published or planned. Without such data, the scientific community is unable to evaluate his methodology, results, and conclusions. Nevertheless, he pronounces that his measurements have solved the debate about the Oscan vs. Roman foot, have validated the work of Nissen and Sogliano, have undermined that of Mau and De Waele, and establish that the Oscan foot, not the Roman, was used as the unit of measure for the Capitolium. Gasparini then summarily dismisses Mau and De Waele with no refutation or comment on their work. Thus, the question of whether the temple was built by the Samnites (using the Oscan foot) or by the Romans (using the Roman foot) remains a matter of debate.

Gasparini concludes the final paragraph on p. 49 with his footnote 7, a long diatribe against the Pompeii Forum Project for its views on the Basilica at Pompeii, issues not relevant to our current focused study of the Capitolium or to his own article. Moreover, Gasparini distorts our position, a familiar tactic of the traditionalists who oppose our methods, evidence, and conclusions (John Dobbins is the Director of the Pompeii Forum Project; Larry Ball is the Assistant Director; and James Cooper is the Architect). The position of the Pompeii Forum Project in the passages cited by Gasparini is that "the Basilica belongs to the early Roman period, immediately after the Sullan conquest" Dobbins (2007) 159. In Ball and Dobbins (2013) 482 we do not date the Basilica to the period after 80 BCE.

Rather than presenting all significant dimensions as we have done in our tables, Gasparini cites selected dimensions that ostensibly support his claim pertaining to the Oscan foot, and he makes errors. Three examples of errors come from p. 53 alone. Gasparini measures the tripartite base in the cella as 7.70m x 2.48m. (= 28 x 9 OF). Our length measurement is 7.68m, almost identical given the construction material. The depth measurement is 2.84m, however, not 2.48m, so the conversion to 9 Oscan feet is not valid. Perhaps Gasparini transposed his numbers. Our figures of 7.68m x 2.84m convert to 26 x 9.6 RF; or 27.9 x 10.3 OF. Neither of these conversions is especially telling. Gasparini records the interior width of the three small chambers as 1.65m = 6 OF. The widths are actually 1.70-1.72m (5.7/5.8 RF; 6.18/6.25 OF). A final example is the widths of the doors to the small chambers. The widths are .88-.90m, as measured on site, but Gasparini provides .82m. That is the width that can be scaled from Maiuri's fig. 63 (i.e., MAUIRI 1973) in the publication Gasparini cites several times on p. 53 (this is his own fig. 24). Maiuri's plan is incorrect in the door widths. This note offers an important *caveat lector* admonition to those who might be inclined to accept Gasparini's data at face value. For example, FLECKER, LIPPS 2021: 256, cite his article as a recent publication on the Temple of Jupiter without offering any discussion.

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