FASTIONLINEDOCUMENTS&RESEARCH

The Journal of Fasti Online (ISSN 1828-3179) ● Published by the Associazione Internazionale di Archeologia Classica ● Piazza San Marco, 49 – I-00186 Roma ● Tel. / Fax: ++39.06.67.98.798 ● http://www.aiac.org; http://www.fastionline.org

The 2013 Season of the Pompeii *Quadriporticus* Project: Final Fieldwork and Preliminary Results

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The present article outlines some of the research outcomes for the final season of fieldwork (2013) for the Pompeii Quadriporticus Project (Universities of Massachusetts Amherst and Cincinnati). The focus of our fourth season was on in-field documentation of archival resources, the exploration of various spectrometric methodologies for identifying mortar types, and the use of metrology for identifying construction 'signatures' in the various development stages of the Quadriporticus. The season thus aimed to nuance and further build upon the results of our earlier work, from which it is now possible to reconstruct the original form of the Quadriporticus and to chart its development over time – in relative and absolute terms – as well as to know something of its place in the infrastructural history of Pompeii. Even so, and although the following outlines the results of the last of four seasons of fieldwork for the project, this article remains as 'preliminary' as the preceding reports, and ultimately anticipates the more complete preparation and publication of the data and of our analysis of it in a final volume.

In the summer of 2013 the Pompeii *Quadriporticus* Project (PQP) completed its fourth season of archaeological investigations of one of Pompeii's long-neglected monumental structures. In this final field season of the PQP, we accomplished our primary goals of archaeological investigation and continued some experimentation with digital field-work methodologies. The following report begins by restating these overarching archaeological and technological goals and briefly discussing how they were accomplished. In this we hope to offer the shortest of summaries (and connections to other works) of our four seasons of work[1]. The second section deals specifically with the results of the 2013 season. Given the growth of scholarly interest not just in digital field methodologies, but in broader questions of 'best practice' and how new – and not just digital – methods can improve the range in scale and quality of field data, some of what follows explores some of our own attempts to document the successes and failures of these processes. The aim here is to contribute both quantitative and qualitative detail to the on-going discussions of measuring the output of various field-work methodologies. To that end we detail the methods and results of three approaches: the use of the online resource *DM*[2], a web-based markup and annotation environment, for in-field archival documentation; spectrometry for mortar analysis; and metrology to define some of the 'metrical signatures' used in the construction of different parts of the *Quadriporticus* over time.

Goals of the Pompeii Quadriporticus Project, 2010-2014

The principal goals of the PQP have been to produce a detailed account of the construction history of the *Quadriporticus*, to chart its (re)development over time, and to identify the various usages of its space during these phases[3]. As one of the earliest known examples of its type, if not the earliest, our interest in the building's construction history ranges from its original design, and the influences behind it, to its life and destruction in antiquity, as well as to its reconstructions in the modern period. Given the building's outwardly simple architectural form – a squat, rectangular building containing a four-sided colonnade – the *Quadriporticus* has been long associated with Hellenistic architecture and seen as an ambulatory and decorative pendant of the theater to which it attaches[4]. Because of the gladiatorial armaments and their depictions in frescos found during the initial excavations (figs. 1 and 2), the lat-

[1] See POEHLER, ELLIS 2011; POEHLER, ELLIS 2012; POEHLER, ELLIS 2013.
[2] http://dm.drew.edu/dmproject/.
[3] On the various functions of a *quadriporticus*, see Vitruvius V.9.1-8.
[4] For example, SEAR 2006: 93-94.

Fig. 1. Fresco with armaments from southern Exedra (MANN 9702; Photo by Bettina Bergmann).

Fig. 2. Fresco with armaments from southern Exedra (MANN 9694; Photo by Bettina Bergmann).

est phase/s of the *Quadriporticus* have been labeled as the Gladiator Barracks. We intended not merely to evaluate these traditional assignments of initial and final functions, but to enliven the two centuries of history between them. We have also aimed to understand the infrastructural components of this, the fifth largest building in Pompeii (it measures 45.5m by 56.3m internally, 69.3m by 66.4m at its widest external points), and how it operated within, and contributed toward, the larger urban infrastructure. A final historical goal has been to consider how the creation and modification of the *Quadriporticus* affected the local topography and how it impacted (especially ambulatory) movement in this part of the city.

A related set of goals have involved exploring non-invasive field research techniques, technological innovation in data capture and analysis, and the sharing of data between projects and across methodologies. One of these goals has been to refine and expand our primary archaeological method of masonry analysis. Masonry analysis is the process of identifying and distinguishing individual events of construction on the face of a wall – from the building's foundation to modern consolidation work – though the differences in materials, including types of stone and varieties of bonding agents, and in styles of construction. More importantly, it involves a process of interpreting the relative relationship between the construction of these events; these questions can be asked of those construction events with physical connections, as well as of those with only proxy evidence. Beyond the walls themselves**,** our masonry analysis campaign has included the 77 columns inside the *Quadriporticus*, work which has revealed a remarkable history of decoration, intervention, destruction, and reconstruction (fig. 3). Each of these events (i.e., stratigraphic units) that remain evident on the columns – as with those identified on the walls – were recorded into a database, located in a photograph and digital drawing, and organized stratigraphically in a Harris Matrix. Because excavations against the eastern limits of the *Quadriporticus* had already been conducted by PARP:PS, our sister project, crucial absolute chronologies were available to pin down our relative chronology[5]. In our parlance, we aimed to use masonry analysis to construct long, physically connected strands of relative stratigraphy in architecture, richly document that process in three dimensions, and then "bleed" the absolute dates from excavation into those architectural strands.

[5] For those specific trenches excavated by PARP:PS, see Trench 9000 in ELLIS, DEVORE 2006: 10-12; Trench 13000 in DEVORE, ELLIS 2008: 8-11; and Trench 28000 in ELLIS, DEVORE 2010: 12-15. For a broader history of this neighbourhood of Pompeii as based on those excavations, see ELLIS 2011.

Fig. 3. Column 57, Western Colonnade. View from west.

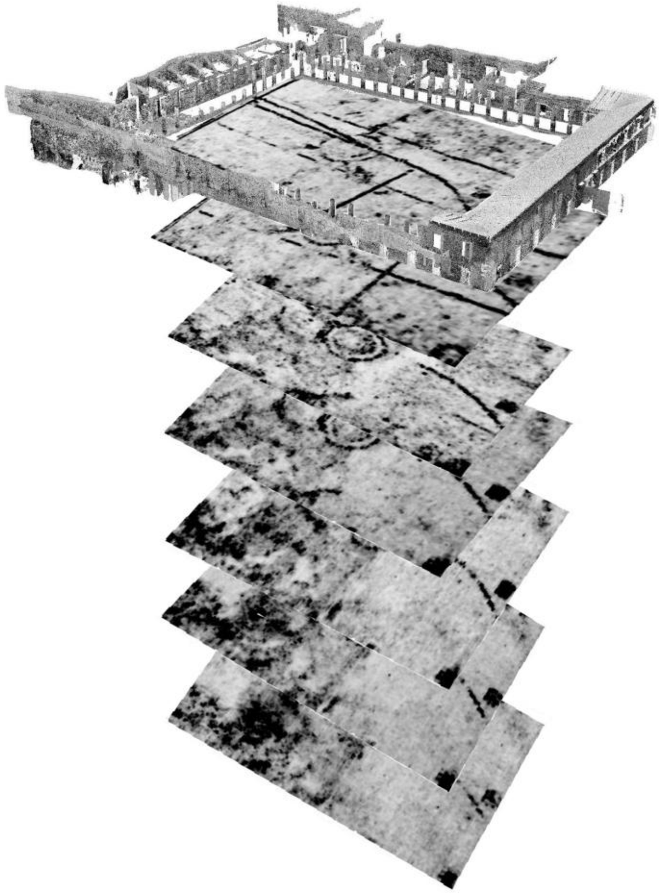

Fig. 4. Isometric image from southwest of Quadriporticus: laser scan model and ground penetrating radar slices.

The use of tablet computers has been pivotal to this field-work process: we have used Apple's iPad to collect our data, draw our plans, and graph our chronological interpretations. It is with the iPad that we take pictures, GPS readings, and control our airborne drone. Perhaps most importantly, the iPad puts the full panoply of the PQPs' information retrieval and capture tools in the hands of every member of the team. Additionally, over the last four years the App store has been an especially valuable asset. It is essentially a self-refreshing toolbox, continually improving the apps we use most, sometimes with features we directly requested, while also (and naturally) developing tools we had otherwise not yet imagined.

Other technical methods have included laser scanning and photogrammetry. In terms of documentation, the combination of these methods has brought not only efficiency, but also a density of data and the consequent analytical and experiential richness otherwise impossible with traditional methods. When combined with our ground penetrating RADAR results, our field-work activities have produced a complete three-dimensional palimpsest of the *Quadriporticus*, from bedrock to reconstructed roof (fig. 4).

2013 Field Season

Our 2013 field season allowed for the testing and development of two of our approaches to the archaeology of the *Quadriporticus*: in-field archival documentation and spectrometry. The first of these was facilitated by the fact that because this part of Pompeii was one of the first areas excavated, and given its monumental nature, the *Quadriporticus* has an exceptionally rich history of artistic representation[6]. The PQP's method of architectural analysis, however, while useful for studying the physical remains, atomizes the building into hundreds of individual observations and makes matching these many abstract, analytical units with changes evidenced in the hundreds of archival images a daunting task. To manage this effort we used *DM*[7], a web-based markup and annotation environment that allowed us to make spatial and temporal comparisons in three frames, two virtual and one in reality. That is, by loading both the archival images and research drawings into the *DM* system we were able to carry those images to the precise location from which they were created. We were thus able to stand in the *Quadriporticus*, ob-

[6] Special thanks go to Bettina Bergmann (Mount Holyoke College) who initiated our archival research in the SAP archives in 2012.
[7] http://dm.drew.edu/dmproject/.

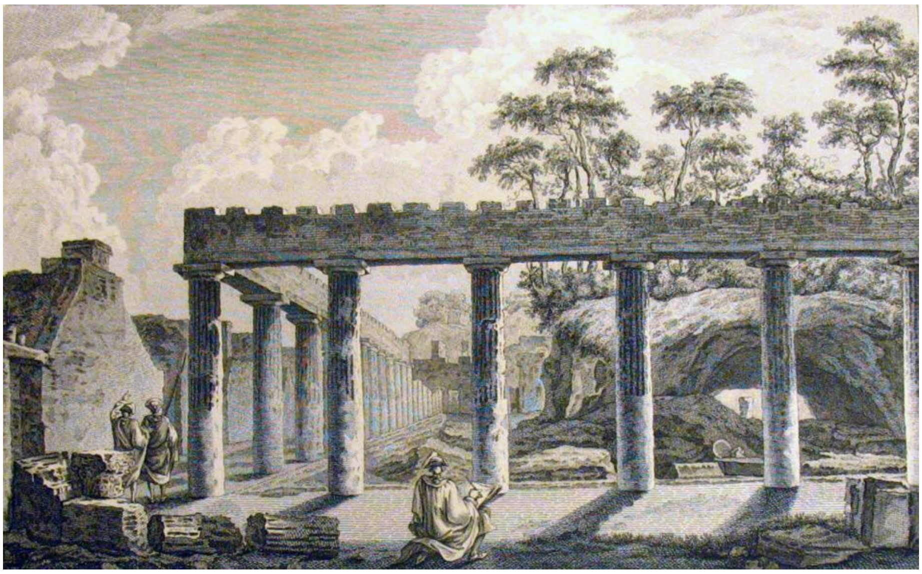

Fig. 5. View perspective de la Colonnade du Quartier des Soldats a Pompeii, 1781-1786. View from the East.

serve its current form, and compare that form to its appearance in 1774, or 1805, or 1899, or 1999 and then observe, mark, annotate, and link together those differences on both the archival image and on our wall drawings. This visual approach was especially useful given the inconsistent documentation and recording of the excavations in the Pompeian archives, and not least subsequent reconstruction and conservation efforts.

Some of these field observations and comparisons, even the simplest of them, shed much light on not just more recent issues of site conservation, but ultimately demonstrated rather significant developments of the structure's ancient form. For example, the interior of the *Quadriporticus*, is currently presented as an open, featureless space. Our use of *DM* brought a greater texture to this space, facilitating the identification of five major historical phases and ultimately leading to a reevaluation of its configuration in antiquity:

1. Disinterment (1767 – c. 1817): Initial excavations of the *Quadriporticus* in 1767 began in the Southwest corner of the structure and followed the colonnade counterclockwise, reaching the Northwest corner by 1774. The great central mound proved a greater (or less-appealing?) challenge, with the excavators attempting to tunnel through it prior to its eventual clearance.

2. Northern Trees (c. 1817 – c. 1860): By 1817, the interior is shown as cleared and accompanied by at least two large trees in the north. These trees seem to fluctuate in the artists' imaginations, moving closer to the northwest or northeast depending on the point of reference. There was also an interesting feature in this period: a large fountain at the northeast corner of the colonnade was depicted, including in plans of the *Quadriporticus*, but was last drawn in c. 1837.

3. Open interior (c. 1860 – c. 1924): by approximately 1860 the fountain and the trees had gone and the interior was bare. This would become something of the 'postcard' image of the *Quadriporticus*, given its widespread publication in August Mau's *Pompeji in Leben und Kunst*[8].

4. Plantings (c. 1924 – c. 1960): By the end of the 1920s, rows of small trees were planted, with four tall pines set at each corner. A gravel footpath traversed the interior from north to south. By the early 1950's the trees were cut back, and disappeared soon after.

5. Current Open Interior (c. 1960 – present): Once again the area was clear and featureless, as it remains today.

There is compelling evidence from the earliest images, however, that none of these representations have it entirely correct. First, Hackert's 1792 western view[9] shows column drums and a possible capital emerging from the unexcavated mound, while St Non's eastern view[10] into the tunnel of the same mound reveals a single column-like feature (fig. 5). Most importantly, one early 19th century image shows five column drums in a circular pattern surrounding a cylindrical altar or puteal (fig. 6)[11]. Plans from 1839 and 1858 show a cruciform garden design that pre-

[8] MAU 1900: 151-158.
[9] J.Ph. Hackert, 1792 "Veduta di una parte del portico di Pompei in dietro la Scena del teatro".
[10] Louis Jean Desprez, "View perspective de la Colonnade du Quartier des Soldats a Pompeii" in SAINT-NON 1781-1786: plate 86. (http://gallica.bnf.fr/ark:/12148/btv1b20000478/f104.zoom).
[11] Watercolor by W.J. Hüber of lithograph by L.Th. Müller, 1818-1819. Image reproduced, with permission of the publishers, from PAGANO, PRISCIANDARO (Vol. I) 2006: (unnumbered plate at) 176.

Fig. 6. Watercolor by W. J. Hüber of lithograph by L.Th. Müller, 1818-1819.

serve a circular center[12]. Most revealing of all are the results of our 2011 campaign of ground penetrating RADAR prospection[13] (fig. 7). A double-ringed feature appears from c. 22 cm to 1.8 meters of depth with a diameter of 8.8 m, which is approximately 32 Oscan feet, nearly twice that of the *tholos* surrounding the Doric temple's sacred well. These complementary images of the 19th and 21st centuries lead to the inevitable question: has Pompeii, for almost 180 years, been missing a circular cult structure? Examples of temples and shrines enclosed by a *quadriporticus* are known throughhout the Roman world, from the capital to the Tigris, but circular structures are found less frequently[14]. When they are found, however, such 'tholoi' tend to be an Imperial development, with several (now) found within *macella*. The *macellum* at the forum at Pompeii is a prominent local example, though many others abound (fig. 8)[15]. Another strikingly similar ex-

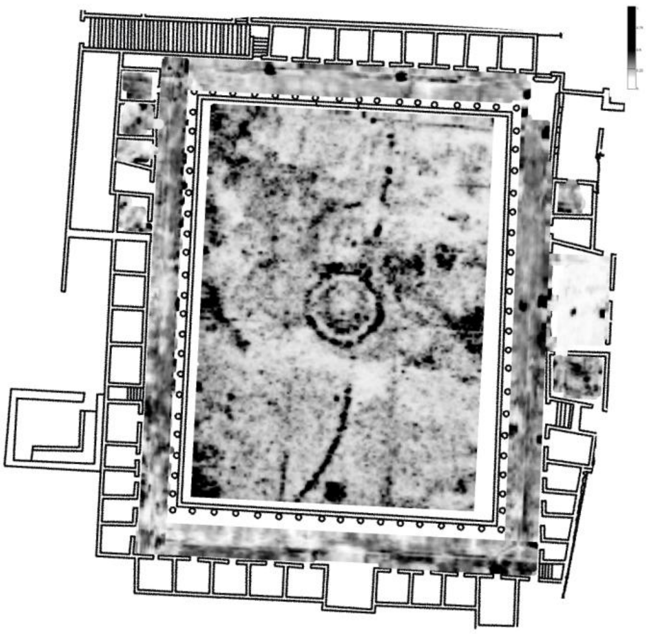

Fig. 7. Ground Penetrating Radar image of Quadriporticus*, slice 4 (c. 66cm-92cm).*

[12] For example the images by: de Jorio 1839 "Plan de Pompei" (http://arachne.uni-koeln.de/item/buch/345); BONUCCI 1845 (http://arachne.uni-koeln.de/item/buch/27); and Bonnet 1858 (in DE WAELE 2001: 27, fig. 11).

[13] This geophysical survey was conducted in collaboration with our colleagues at the British School of Rome and the Archaeological Prospection Services of Southampton University. Our thanks goes to Sophie Hay, Stephen Kay, Elizabeth Richley, and Alice James for undertaking the survey. See POEHLER, ELLIS 2013: 8. For a broader discussion of our efforts to conduct geophysical surveys at Pompeii (and Herculaneum), see OGDEN *et al.* 2012.

[14] For some examples of temples within *quadriporticus* enclosures elsewhere, see SEAR 2006: 94. Notable examples include the Domitianic Temple built inside the Augustan era 'Piazzale delle Corporazioni' at Ostia (see Van der Meer 2009), as well as those at Minturnae (the Augustan shrine to Concordia) and Rome, such as those within the Porticus Philippi (to Hercules Musarum, and notably round; on which see RICHARDSON 1977) and the Porticus Octaviae (to Concordia).

[15] Notably the *macellum* (or so-called Serapeum) at Puteoli and the *macellum* at Leptis Magna. For more on such structures see, especially, DE RUYT 1983 and PALMIERI 2010.

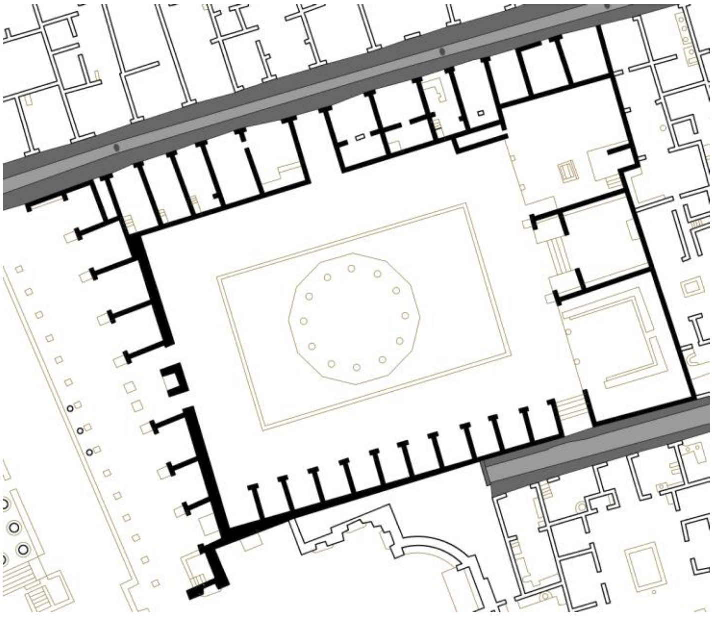

Fig. 8. Plan of the Macellum *at Pompeii (courtesy of Pompeii Bibliography and Mapping Project).*

Fig. 9. Mortar Detail, Wall Face 172, SU 172.003.

Fig. 10. Public Lab spectrometer, as assembled by PQP.

ample of a circular structure, but in this case a fountain, exists in the 'Tetrastoon' attached to the theatre at Aphrodisias.

The second effort of the 2013 season to advance our digital recording methodologies was an attempt to aid the conventional visual distinctions of differing mortars used in construction (fig. 9). Mortar analysis is a particularly valuable tool when building materials or construction styles are inconclusive, but in structures as large as the *Quadriporticus* such comparisons across the building are difficult to achieve. For this reason the PQP applied professional color spectrometry equipment and techniques[16] to the mortars as well as experimented with an inexpensive (c. $40) "Do It Yourself" spectrometer from Public Labs[17], which we assembled and modified to fit the PQP's archaeological needs[18] (fig. 10). The "DIY" spectrometer was introduced to test not only its applicability, but also the extent to which any positive results might compare to more high-tech options. Thus the professional spectrometer, the results of which are still forthcoming, served also as a control on our DIY experiments.

The "DIY" machine consists of an electrical housing and PVC pipe, a webcam as sensor, and Xenon bulb to provide reflectance from the sample. The results of our experiments were encouraging, but inconclusive. A typical mortar, for example from Phase Five of Wall Face 313, had a low intensity profile ranging from 400 to 750 nanometers[19]. While the sample matched relatively closely with that of another from the same phase, comparisons with other phases, however, did not offer a strong distinction (such as from Phase One of Wall Face 416; fig. 11). A Princi-

[16] These were undertaken during our 2012 field season by Katrin Wilhelm of the Oxford University Rock Breakdown Laboratory.
[17] http://publiclab.org/wiki/spectrometer.
[18] The authors wish to recognize the efforts of Ben Crowther, PQP Field Director and PhD student at the University of Texas at Austin, who built the spectrometer and ran most of the 98 samples.
[19] Our spectra are openly available and can be found on the Spectral Workbench website: http://spectralworkbench.org/search/PQP.

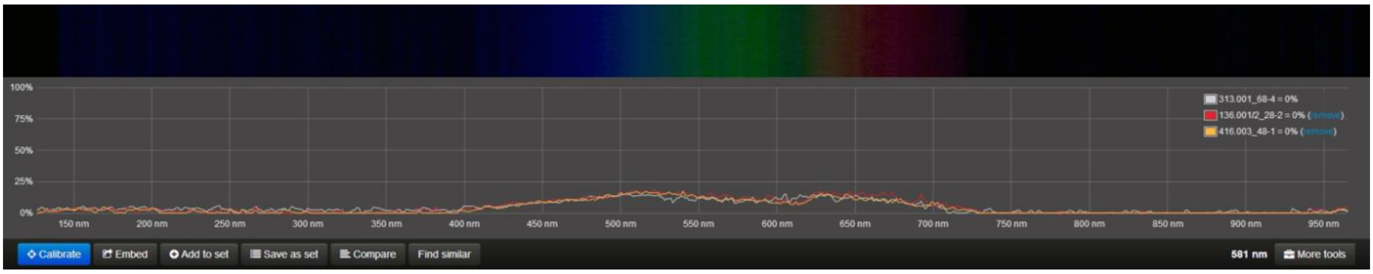

Fig. 11. Comparison of spectra *from Quadriporticus in Spectral Workbench.*

pal Components Analysis was run to determine if there was meaningful difference within the overall similar results[20]. The scatter plot of samples from all phases showed that there were not clear patterns between phases sufficient to link disparate samples based on the measured color of a phase's mortar. Even if the human eye and personal observation remain more effective than the spectrometer, and even if the tightest of recording procedures are employed, the practice of making visual observations of multiple mortar samples over vast distances, or from one day (or season!) to the next, demonstrates the value of further experimentation in this method. Although the results of the DIY analysis are ambiguous, we mention them here so as to encourage further methodological exploration[21].

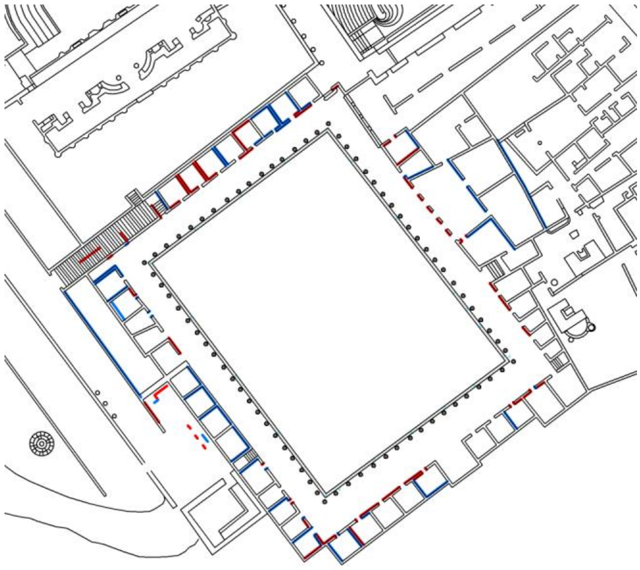

Fig. 12. Locations in Quadriporticus *of all walls measured in whole Oscan (blue) or Roman (red) feet.*

Metrology

In 2013 the PQP conducted an expansive metrological campaign, taking up to five measurements of the width of 255 walls, recording the results in a database and calculating those results against whole Oscan and Roman feet. Metrology can be a slippery science when the details of precision are not made clear. For the PQP, the assignment of a measurement to an ancient foot measure – 27.5cm for an Oscan foot[22] and 29.44cm for a Roman foot[23] – means being less than one tenth of one foot in difference to be considered a match. For example, wall face 288 (room 40[24], northwest suite of rooms[25]) measures 3.03 m, which when divided by the Oscan foot measures to 11.02 Oscan feet. The PQP's 1/10th foot tolerance means the largest discrepancy will always be less than 3cm. While this is too large a difference for the exacting precision of carpentry, it is certainly less so with regard to masonry (and its measurement). To ensure greater certainty in assigning a foot measure, we further divide this 1/10th deviation standard into three parts: 0-1cm, 1-2cm, 2-3cm. This division allows us to refine our standards of accuracy, to privilege the most certain measurements, and in the rare cases in which Oscan and Roman foot measures overlap (e.g., 12 Roman feet v. 13 Oscan feet and 13 Roman feet v. 14 Oscan feet), to decide between them.

Simply mapping the measure of whole Oscan and Roman feet is revealing: the Oscan foot predominates on the exterior of the building, while the Roman foot featured throughout its interior (fig. 12). These results accord with the building's construction history, as substantial changes were made to the interior facade in the Roman period, while at the same time the exterior retained most of its original alignments. Careful measurement of the eastern side of the *Quadriporticus* supports our architectural phasing and reveals a predominant use of the Oscan foot (fig. 13). The inner face of the eastern exterior wall, for example, measures 60 Oscan feet, though the wall's nearly complete

[20] Our thanks go to Bradley Duncan (UMass PhD candidate in Chemistry) for undertaking these analyses.
[21] On mortar analysis by spectrometry at Pompeii, see WEHBY, SWANSON 2010, and see also RINGBOM *et al.* 2014 on the failure of other radiometric methods at Pompeii.
[22] For a discussion of the Oscan foot, see SCHOONHOVEN 2006: 37.
[23] For a discussion of the Roman foot, see SOREN, SOREN 1999: 187-190.
[24] Room 40 is digitally reconstructed here: http://youtu.be/oViPu8UOF7k.
[25] POEHLER, ELLIS 2011: 3-8.

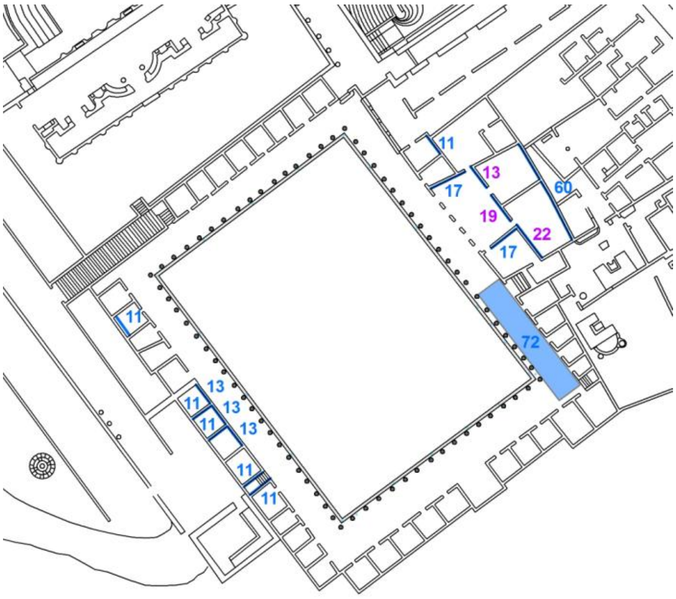

Fig. 13. Locations of wall measured in prime number of whole Oscan feet.

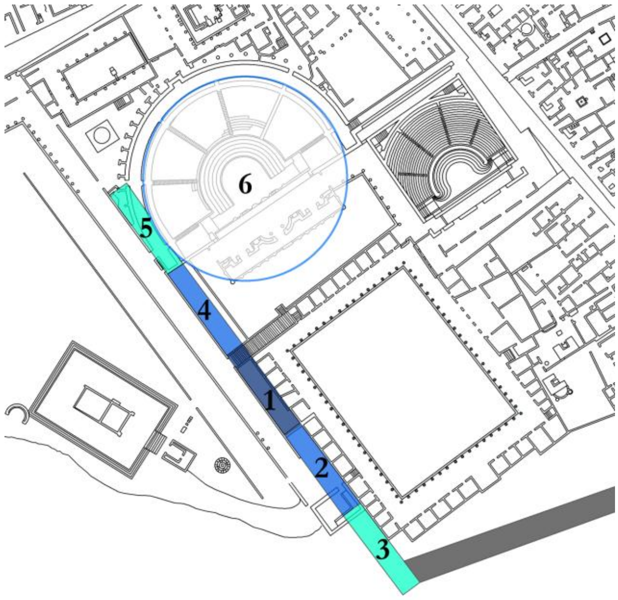

Fig. 14. Location of 90 Oscan feet units in Quadriporticus *and Theater. Circle of orchestra is 90 foot* radius*.*

reconstruction in Phase Five, a Roman period, make this measurement surprising. It is confirmed, however, by the precise dimensions of the internal walls. The dimensions of these walls are not only each in whole Oscan feet – 13, 19, 22 – but also combine with the width of the doorways to equal 63 Oscan feet, which creates the 60 Oscan feet interior space when the widths of the walls are subtracted. The same area is also defined on its northern edge by the Oscan foot. From the edge of the colonnade to the rear of the building is 72 Oscan feet and divides perfectly at the northern rooms' eastern wall. 72 Oscan feet is also the exact interior length of the great cistern below the eastern colonnade[26].

In the west, the examples of the Oscan foot measure continue to reveal the original architect's preferences for units of measure. For smaller dimensions, prime numbers continue to be favored, such as the repeated use of 11 and 13 Oscan feet for the widths of second story rooms. As in the east, these walls were entirely rebuilt in the latest phases. In the west, however, there is evidence of the complete removal of these walls for at least one phase (Three) of the building. For larger dimensions, the architect may have selected a base nine system, which is reflected in the 72, 63, and 36 unit measures in the east. The primary division of the west is into three units of 90 Oscan feet, two of which can be measured within the building: the first between the edge of the Monumental Stair and wall segment 132 (fig. 14, 1) and the second from the same wall segment to a massive set of quoined and plastered sarno blocks that define a corner in the original building's construction (fig. 14, 2). Another unit can be added in the south to intersect the extrapolated line of the fortification wall (fig. 14, 3), to suggest that this was the point from which the architect measured northward. These three units are also expressed vertically. Most interesting of all, this 90 foot unit is repeated to the north of the *Quadriporticus*, defining the space between the theater and the *Quadriporticus* (fig. 14, 4) and the location of the western entrance to the theater (fig. 14, 5). Finally, and to recall the Vitruvian (V.6.1) prescriptions of theatre design by first laying out a series of interrelating circles and triangles, if one takes 90 Oscan feet as the radius of a circle, that circle fits perfectly, and dramatically, within the *cavea* of the large theater (fig. 14, 6).

Conclusion

The history of the investigation of the *Quadriporticus* has been something of a paradox. Despite the 250 years since its initial disinterment, the *Quadriporticus* has only received the most superficial of epigraphic, art historical, and architecture historical attention. Moreover, what has been written has focused on its physical and chronological limits, that is, on its connection to other monumental spaces (specifically the large theater and Triangular Forum) and on its supposed original form or its reorganization into a barracks for gladiators. Over its four years of field-work (2010-2013) the Pompeii *Quadriporticus* Project has attempted to address this paradox, by exhaustively

[26] On the infrastructure of the *Quadriporticus* see: POEHLER, ELLIS 2013: 12-13.

documenting the building's architecture – both ancient and modern – from an inclusive, though non-invasive archaeological perspective. The PQP has produced the first phase plans of the building[27], which detail not only its final form and original design, but also the centuries of history between them. Through the metrological and archival research described in this report, we are now closer to understanding the elements that went into the *Quadriporticus*' original design as well as its modern reconceptualizations.

In its original research design, the PQP committed itself to testing the limits of non-invasive methods and technological approaches to archaeology. The first experiments explored the uses of the tablet computer and photogrammetrical techniques and softwares. These were matched in the middle years with professional laser scanning and geoprospection services to record the architecture in minute, three-dimensional detail and to peer below the surface without excavation. In the final year especially, experiments with online research platforms (DM), aerial imagery, metrological analysis, and spectrometry all shed new light on the history of the *Quadriporticus* and made several modest contributions to archaeological methods. Now that our field-work seasons has finished, we are preparing to publish a more complete account of the *Quadriporticus* at Pompeii, a monograph that will aim to build on this research to connect the structural and social history of the building – significantly one of the oldest of its type – to its broader cultural milieu.

Acknowledgements:
The authors remain grateful to the Soprintendenza Speciale per I Beni Archeologici di Napoli e Pompei and the Ministero per I Beni e le Attività Culturali for permission to undertake this research, and for all of their energetic support while in the field. Special thanks are due to Dott.ssa Teresa Elena Cinquantaquattro, Dott.ssa Grete Stefani, Sign. Vincenzo Sabini, and Sign. Giuseppe di Martino for facilitating our every need during the 2013 season. We are unusually fortunate in our institutional and financial support, from which we have received two Mellon funded grants from the Five Colleges, Inc. Digital Humanities program, as well as financial support from the Classics Department at the University of Massachusetts Amherst, the Louise Taft Semple Fund through the Department of Classics at the University of Cincinnati, and a gift from Cardinal Intellectual Properties, Inc. We take great satisfaction in extending our utmost appreciation to all of the members of our PQP team; their energy and commitment to the Project was of the highest order and we thank them for all of their contributions to the success of the field season.

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BIBLIOGRAPHY

DE JORIO A., 1839, *Plan de Pompei de le Chanoine D. André de Jorio*, Napoli.

DE RUYT C., 1983, Macellum*: marche alimentaire des Romains*, Louvain-la-Neuve.

DEVORE G., ELLIS S.J.R., 2008, 'The Third Season of Excavations at VIII.7.1-15 and the Porta Stabia at Pompeii: Preliminary Report', in *FOLD&R* 112:http://www.fastionline.org/docs/FOLDER-it-2008-112.pdf.

DE WAELE J., 2001, *Il tempio dorico del Foro triangolare di Pompei* (Vol. 2), Roma.

ELLIS S.J.R., DEVORE G., 2010, 'The Fifth season of Excavations at VIII.7.1-15 and the Porta Stabia at Pompeii: Preliminary report', in *FOLD&R* 202: http://www.fastionline.org/docs/FOLDER-it-2010-202.pdf.

ELLIS S.J.R. (ed), 2011, *The Making of Pompeii: Studies in the history and urban development of an ancient town*, Portsmouth, R.I.

ELLIS S.J.R., DEVORE G., 2006, 'Towards an understanding of the shape of space at VIII.7.1-15, Pompeii: preliminary results from the 2006 season', in *FOLD&R* 71: http://www.fastionline.org/docs/FOLDER-it-2006-71.pdf.

MAU A., 1900, *Pompeji in Leben und Kunst*, Leipzig.

OGDEN J., TUCKER G., HAY S., KAY S., STRUTT K., KEAY S., CAMARDO D., ELLIS S.J.R., 2012, 'Geophysical Prospection in the Vesuvian Cities', in F. VERMUELEN, G.J. BURGERS, S.J. KEAY and C. CORSI (Eds.), *Urban Landscape Survey in Italy and the Mediterranean*, Oxford: 114-125.

[27] POEHLER, ELLIS 2013: figs. 7, 9, 11, 14, 16.

PAGANO M., PRISCIANDARO R., 2006, *Studio sulle provenienze degli oggetti rinvenuti negli scavi borbonici del Regno di Napoli: una lettura integrata, coordinata e commentata della documentazione*, Napoli.

PALMIERI, L., 2010, 'Romanization and definition of commercial areas in Africa Proconsularis: the examples of Leptis Magna and Thugga', in Corsi, C. and Vermuelen, F. (Eds.), Changing Landscapes. The Impact of Roman Towns in the Western Mediterranean, Bologna: 385-392.

POEHLER E.E., ELLIS S.J.R., 2011,'The 2010 Season of the Pompeii *Quadriporticus* Project: The Western Side', in *FOLD&R* 218:www.fastionline.org/docs/FOLDER-it-2011-218.pdf.

POEHLER E.E., ELLIS S.J.R., 2012, 'The 2011 Season of the Pompeii *Quadriporticus* Project: The Southern and Northern Sides', in *FOLD&R* 249: www.fastionline.org/docs/FOLDER-it-2012-249.pdf.

POEHLER E.E., ELLIS S.J.R., 2013, 'The Pompeii *Quadriporticus* Project: The eastern side and colonnade', in *FOLD&R* 284:http://www.fastionline.org/docs/FOLDER-it-2013-284.pdf.

RICHARDSON L. JR., 1977, 'Hercules Musarum and the Porticus Philippi in Rome', in *American Journal of Archaeology* 81(3): 355-361.

RINGBOM A., LINDROS A., HEINEMEIER J., SONCK-KOOTA P., 2014, '19 Years of Mortar Dating: Learning from Experience', in *Radiocarbon* 56(2): 619-635.

SAINT-NON J-C.R.D., 1781-86, *Illustrations de Voyages pittoresques de Naples et de Sicile*, Paris.

SCHOONHOVEN A., 2006, *Metrology and Meaning in Pompeii. The Urban Arrangement of Regio VI*, Roma.

SCHOONHOVEN A.V., 1999, 'Residences for the rich? Some observations on the alleged residential and elitist character of *Regio VI* of Pompeii', *BaBesch* 74: 219-246.

SEAR F., 2006, *Roman theatres: an architectural study*, Oxford.

SOREN D., N. SOREN (Eds.), 1999. *A Roman Villa and a Late-Roman Infant Cemetery: Excavation at Poggio Gramignano, Lugnano in Teverina*, Rome.

WEHBY J., SWANSON S.E., 2010, ' Portable Analysis of Ancient Walls in Pompeii, Italy', in *Proceedings of ASD and IEEE GRS; Art, Science and Applications of Reflectance Spectroscopy Symposium* (2): 11-22.

VAN DER MEER L.B., 2009, 'The Temple on the Piazzale delle Corporazioni in Ostia Antica', in *Bulletin Antieke Beschaving* 84: 169-176.