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From 2D and 3D documentation to 4D interpretation

Building archaeological conclusions and workflow strategies gained by remote study of *Insula* V 1, Pompeii

Abstract

The text describes new methods elaborated for and used in the building archaeological assessment of a city block, studied first on site, then remotely by members of the Swedish Pompeii Project. Use of a digital platform, with collected wall observations and analysis, systematic photographic documentation of all standing structures, and 3D models, allowed discussion to proceed after the fieldwork came to an end. The models provided new possibilities and new angles of approach, e.g. examining walls at any given point, studying boundary walls as wall-strings in their full extent, allowing all kinds of sectioning at will, introducing bird's-eye views as a new perspective in study, and measuring wherever needed. The joint results obtained are summed up in a four-phase development of the use of space: the earliest structures; the late Samnite building boom (2nd century BC); the colony (second half of 1st century BC); the imperial era (until AD 79). This narrative includes conclusions concerning building process and development of masonry techniques and on changes in way of life. Many results affect Pompeian archaeology in general. Results of particular importance concern the character of the early plot division and the understanding of the building process creating the double-*atrium* house of Caecilius Iucundus, including an anchorage in time for this creation in the Claudian period. The relatively small impact in terms of damage that may be ascribed the literary recorded earthquake of AD 62/63 is also worth noting. The text ends with a suggestion of a new workflow for *insula* studies.*

Keywords: Pompeii, *insula* V 1, 3DHOP, boundary, wall-string, bird's-eye view, sectioning, building sequence, building techniques, water supply

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Introduction

The Swedish Pompeii Project began in 2000. Its aim is the documentation and the study of a whole city block, *Insula* V 1 (*Fig. 1a*), unearthed mainly in the 19th century. The standing walls are the main objects of study; the approach, building archaeological. The study intends to reconstruct the development of the architecture over time, and thereby to recover as many aspects as possible of social interaction inside these walls—for the terms commonly used to designate kinds of rooms, relating to size and function, see *Fig 1b* using the South House of Caecilius Iucundus as example. The aim of the present paper is to give an account of how our method has changed in line with the necessities of the study and with the introduction of new technologies of documentation, and how the new methodologies have considerably contributed to our understanding of the building archaeological development of *Insula* V 1. The methods used and the interpretation gained will be outlined below, as well as a suggestion on how to organize future work of similar kind in a more time- and finance-efficient way than was ours. *Insula* V 1 represents but one of approximately 50 city blocks unearthed in Pompeii.

* We present our gratitude for the support and guidance offered to us by the staff of the Pompeian heritage body, the Soprintendenza archeologica di Pompei, and the personnel of its Direzione. We address special thanks to Prof. Pier Giovanni Guzzo and his successors, Dr Teresa Cinquantaquattro and Prof. Massimo Osanna, heads of the heritage body during the long run of our project, and also to Dr Antonio d'Ambrosio, Dr Antonio Varone, and Dr Grete Stefani, directors of the site. Their support has been decisive for the outcome of our work. We also want to express our warm gratitude to all colleagues and participants in the fieldwork, and especially to our photographer, Hans Thorwid. Danilo Marco Campanaro and Henrik Boman gave much patient help in processing images and making explanatory additions to them. Special thanks to Charlotte Malmgren, Arja Karivieri, and Nicolò Dell'Unto for reading and commenting on the text. We are indebted to many Swedish research foundations for their generous contributions, see www.pompejiprojektet.se/insula/finance. The creation of the digital platform was promoted by the Bank of Sweden Tercentenary Foundation and further supported by the Marcus and Amalia Wallenberg Foundation and the Swedish Research Council, the 2D documentation by the Knut and Alice Wallenberg Foundation, and the 3D documentation by the Fondazione Famiglia Rausing. Lastly, we would like to addresse special gratitude to Rebecca Montague who made it her effort not only to correct but also to understand our English.

Fig. 1a. Insula *V 1. Use of space in AD 79. The houses are known by names (referring to special finds or to the presumed imperial-age owner: Caecilius Iucundus, Tofelanus Valens) and by entrance numbers attributed to them in research. Letter or number sequences from entrance towards rear designate ground-plan rooms (when referred to in text, the number of the main entrance precedes the room designation). All main entrances open onto the two thoroughfares, Via di Nola to the south and Via del Vesuvio to the west. Illustration: Henrik Boman & Ezequiel Pinto Guillaume.*

Organization of fieldwork and study

Our fieldwork in Pompeii was organized according to the method earlier implemented by the German Pompeii project, *Häuser in Pompeji*. The essential strategy of approach consisted of objective (meening systematically performed, non-hierarchic) close study of preserved structures,[1] wall by wall, room by room. The property lines of AD 79 (when the ancient city was destroyed by the volcanic eruption of Mount Vesuvius) were used to establish areas of responsibility for the team. One or two archaeologists were appointed to lead work in, study, and redact close study ("autopsy") reports of each of these areas. That is to say, the study was conducted house by house, although the overall results were designed to be historical and to involve the whole city block. A house-by-house, wall-by-wall principle was also adopted for the comprehensive photographic documentation undertaken mainly during the period 2005–2014. The same principle decided

[1] Including walls, wall revetments, decorations, and floors.

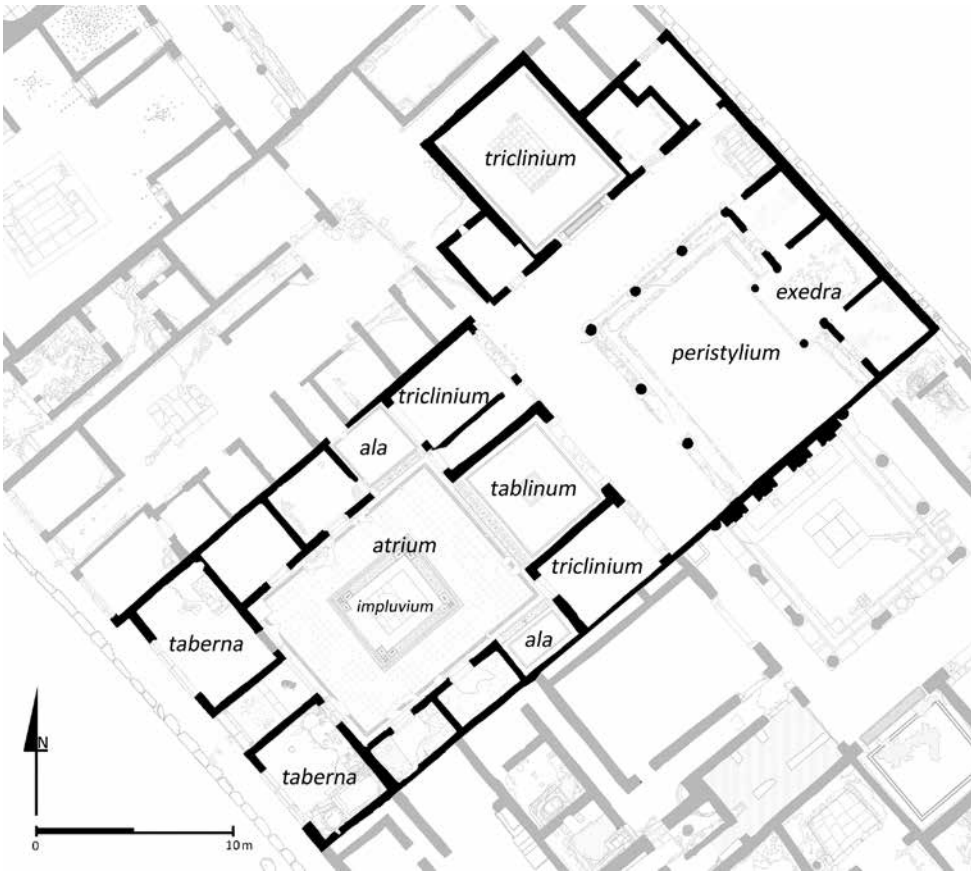

Fig. 1b. The South House of Caecilius Iucundus (V 1,26) in AD 79, demonstrating the typical division of ground-plan space in a traditional atrium *house. Small rooms (*cubicula*) flank two large partly or mostly non-roofed spaces, the* atrium *and peristyle areas. The latter included a garden and surrounding colonnaded porticoes, onto which dining/banqueting halls (*triclinia*) opened. In this case, the east side of the originally three-sided portico was rearranged as two rooms with windows and a central exedra extending the roofed space into the garden. The* atrium *was the traditional working and reception space, often equipped with a subterranean cistern with, on top of it, a collecting pool,* impluvium*. Two rooms without separation walls towards the* atrium *was situated at its rear. Between* atrium *and peristyle, the stately* tablinum *was reserved for the householder's business and display, and a corridor gave access between* atrium *and peristyle. The entrance (*fauces*), situated between two frontshops (*tabernae*), also had a corridor layout. Illustration: Henrik Boman & Ezequiel Pinto Guillaume.*

the structure of the database, introduced in open access on the web in 2008.[2] This digital platform was initially seen as a means to communicate results to study colleagues who lived in geographically distanced places. Other potentials of this approach soon became apparent. As a research platform, it allows comparing and combining of local results (data from the different research areas) for overall (*insula*-wide) contextualization and interpretation. Offering open access to anyone interested in our documentation and its accompanying texts, descriptive and interpretative, the website also became the main publication of our work.

The digital home of our combined research platform and publication facilitated the next step, the transition from 2D to 3D documentation. The transition began as a wish to test the outcome of data acquisition by laser scanning as compared to photography, combining the efforts of the Swedish Pompeii Project with the staff of the Hum Lab, Lund and the ISTI, CNR Pisa.[3] The result was that scanning is far more efficient than photography as far as the time aspect is concerned. With two scanners working, acquisition of the whole *insula* and the surrounding streets demanded no more than a full week of work (divided into two short campaigns in 2011–2012).[4] The photographer, on the other hand, needed nine seasons, each of six to twelve weeks' duration on site. His task consisted of producing non-distorted representations of all walls, and a selection of floors, achieved under similar light conditions, with no shadows. The archaeologists' progression in cleaning the floor levels of AD 79, which were obscured by much debris at the time of arrival of the Swedish staff, was another decisive factor affecting the photography schedule, already achieved when the scanning started. Both photography and scanning demanded considerable post-processing efforts to achieve a finished result. A good amount of the photographs had to be assembled into computerized photomosaics. The density of the 3D model's

[2] www.pompejiprojektet.se/insula.php

[3] The laser scanning was carried out by staff and material from the Humanities Laboratory, Lund University (Hum LAB LU), and from the Istituto di Scienza e Tecnologie dell'Informazione "Alessandro Faedo" (ISTI), Consiglio Nazionale delle Ricerche (CNR) Pisa.

[4] For a description of the acquisition, including instrument methodologies and post-processing: Dell'Unto *et al.* 2013.

point-cloud needed to be decreased, irrelevant acquisitions alien to the study object removed and the point-cloud itself changed into polygones, meshed.[5] For interpretation, however, the two methods of documentation were complementary. Because of the reduced density, necessary for handling in a normal-sized web reader, the 3D model did not have the detail accuracy of the photograph. Rather than allowing detailed scrutiny of walls, its contribution was in the series of new perspectives of the study object that it unlocked.

New workflow, hierarchy of study, and approaches

ON-SITE DOCUMENTATION AND REMOTE STUDY

As time quite sadly is money, a new hierarchy of documentation should be considered in the future. Study would be accelerated by letting 3D acquisition take the lead and having photography follow for areas of particular interest identified by archaeological autopsy. This hierarchy would diminish the time needed on site and thereby cut costs. The 3D model allows remote study and helps target areas needing special effort and return to site. Moreover, remote study has an important intrinsic virtue. It promotes teamwork in interpretation. Most of the conclusions on building history presented in this paper spring from collegial discussion in front of the screen, alternating 3D models and 2D photographs. According to our experience, the optimal workflow to implement in the future should include 3D modelling at an early stage of the work, based on an acquisition by scanning, drone photogrammetry, and ground-level photogrammetry in interplay. In our case, comprehensively conducted laser scanning was the first acquisition of 3D technology used, back in the 2010s. Two laser scanners working simultaneously secured the acquisition of *Insula* V 1 in one week. Drone photogrammetry gave a photographic finish to the polygon mesh and completed the model by the addition of the higher parts of the standing structures, out of the ground-bound scanner's reach.[6] Technology has developed since. Today, photogrammetry is the best-adapted technology, because it now offers largely automatized post-processing. If we were to repeat documentation in another city block, laser scanning would be restricted to confined or covered areas.

The introduction of 3D modelling in the documentation confirmed the suspicion, already raised in the early days of investigation on site during autopsy of the rear (east) perimeter of the *insula*, that an unbiased room-by-room wall scrutiny was not the optimal way to analyse the development of a complete lived-in context such as a city block. This rear perimeter is the still-standing witness of the building boom that created the first layout of this city block's larger houses (properties) in the late Samnite, pre-Roman, 2nd century BC. The differing stone materials used for the concrete masonry (*opus incertum*) of this perimeter is a testimony, easy to read (*Fig. 2*). The differences reveal the presence of property boundaries, from this early period and on, similar to those of the four large houses that we can still individualize in the situation of AD 79 (*Fig. 1*a). Designated by names and addresses (entrance numbers) given to them in research, they are from south to north as follows: the House of the Bronze Bull (V 1,7.9), the South House of Caecilius Iucundus (V 1,26), the North House of Caecilius Iucundus (V 1,23.10), and, finally, the House of the Greek Epigrams (V 1,18.11.12). In the early imperial period, when the north and south houses of Caecilius Iucundus merged into one big double-*atrium* house, the number of large properties decreased from four to three. It is therefore obvious that the study of the perimeters merits priority over that of the inner separations.

FOCUS ON PERIMETERS, BOUNDARIES, AND BUILDING PROCESS

Continued scrutiny of the city block's rear façade yielded further important observations. At each property, the corner masonry joining the perimeter and the boundary between two neighbours demonstrates that the boundary (all are shared single walls)[7] was initially, when laid out for construction, conceived as a perimeter belonging to the first-existing of the two properties.[8] This observation resulted in understanding the path of construction over the *insula*, starting by the main street to the south (Via di Nola) and proceeding uphill in northwards

[5] The mesh, point-cloud transformed to polygons, and points alignments were carried out at Hum LAB LU using software: meshlab (open source).

[6] The ISTI staff performed both the photogrammetry by drone on site and the integration of the drone acquisitions with the previously existing meshed 3D model.

[7] When we have a section where the boundary is double, this is explained by the need for an added wall to carry the weight of a roof. A good example is the wall duplicating the north boundary of the House of the Bronze Bull (V 1,7.9) to furnish support for the roof of its later added, very large banqueting room (V 1,7g): Staub 2013, 84. The overall study of features in *Insula* V 1 highlights the general practice of avoiding putting weight on perimeters and boundaries. Support for the weight of upper floors was by preference provided by the inner divisions, the walls which sometimes together with non-bearing partitions defined the inner space, the room.

[8] One exception to this rule is worth noting. A pier in the east perimeter/façade (*Fig. 2*) marks the departure of the boundary between the South and North Houses of Caecilius Iucundus beyond. It consists of both vertically positioned large blocks and stretchers, the latter bonding the perimeter masonry in both its southwards and northwards course.

House of the Bronze Bull (V 1,7.9)

South House of Caecilius Iucundus (V 1,26)

North House of Caecilius Iucundus (V 1,23.10)

House of the Greek Epigrams (V 1,18.11.12)

Fig. 2. East perimeter of Insula *V 1, façade towards Vicolo di Cecilio Iocondo. Changes in stone material (indicated by arrows) mark the boundaries of four properties. Photograph & orthomosaic: Hans Thorwid. Feature highlights: Henrik Boman. The arrow between V 1,7.9 and V 1,26 is shown twice.*

succession, property by property (*Fig. 2*).[9] Obviously, fragmentation is the risk run using a method involving the study of boundaries and inner divison walls alike, small section by small section, as one of four walls defining a room, and continued room by room from house entrance to rear. However necessary to achieving understanding, systematic wall scrutiny is time-consuming and, if conducted in the above manner, a slow way of reaching (if not conceiling) overall conclusions. Since it leaves aside questions concerning construction priorities (among which is the initial interest in delimiting borders),[10] it even risks ignoring elements of importance for understanding the history of both house and *insula*. However, it took some time and the use of the 3D models before serious discussion was prompted on the methodological consequences of such non-hierarchic wall scrutiny.

In the meantime, the 3D documentation that had begun as an experiment in data acquisition had developed into an experiment in post-processing and in tool-making to facilitate remote close study. In 2014, this work made it possible to share the model over the web. Today, the model is equipped with a series of tools that allows the user to zoom in and out, change light conditions, shift from colour to mesh representation, take measurements, pass walls at any chosen point of the masonry, and peel away walls or elevations to produce both vertical and horizontal sections.[11] Many of the new approaches to the architecture thus offered cannot be achieved through autopsy on site.

WALL-STRING SCRUTINY, BIRD'S-EYE VIEW, AND AUTOMATIC SECTIONING

Our first attempt to use the model for interpretation consisted in cutting away interior divisions and concentrating study on perimeters and boundaries between properties only.[12] Thus handled, the digitally denuded boundaries and perimetres (the long walls of the *insula*) appear in full extent on the screen, why we described this strategy of approach as the wall-string method. The general rule that emerged from this investigation is that walls built perpendicular to a perimeter/boundary mostly abut, without bonding. Therefore, all bonded walls perpendicular to perimeters/boundaries should be regarded as returns of these and, consequently, by definition as property borders.

However, whereas the masonry analysis of perimeters by wall-strings can be successfully undertaken, boundaries present more intriguing cases. Alterations have affected boundaries more thoroughly, not least by the fact that they back rooms on both sides of the wall. Covering by ancient wall plaster and repeated changes, ancient rebuild and repairs superimposed with series of modern restorations, all diminish the potential results of systematic masonry analysis.[13] Wall-string analysis offers a change of perspective and is a fundamental means of study, and should always be used in a first approach to overall understanding.

In 2015, further elaboration of the model took place. The drone campaign, undertaken to acquire the higher levels of the ruins (ground-bound scanning did not reach much above four metres), also added photography ("colour") to the mesh. This step forward proved of immense help to the archaeologists: it brought the 3D model's surface presentation very close to the reality of the on-site experience. This more easily comprehensible 3D model facilitated remote study. When needed, bird's-eye views backed the masonry analysis. Having wall alignment and masonry technique in the same view brought important new evidence to the discussion on present and former property boundaries. The possibility of making automatically rendered sections by peeling off planes in sliding progression—vertical from one side to the other, or horizontal from top to bottom—was another important addition to the toolbox. With these improved means of approaching the ruins, new paths opened for understanding both the building archaeological development and use of space in this *insula* over time.

Investigating early land use—on site and remotely

PERIMETER/BOUNDARY IRREGULARITIES IN *INSULA* V 1

The late Samnite building boom of the 2nd century BC had a great impact in the southern part of *Insula* V 1. The two main properties of the *insula*, the House of the Bronze Bull (V 1,7.9) and the South House of Caecilius Iucundus

[9] Leander Touati 2008, 118–123, figs. 6–9; 2010, 109, fig. 4.
[10] See below, for the suggested workflow and study priorities established as a result of our experience of work in *Insula* V 1.
[11] This visualization uses software 3DHOP: http://vcg.isti.cnr.it/3dhop/; Marco Potenziani Potenziani *et al.* 2015. To position the model on the screen, use command ctrl-alt, pointer.
[12] A first comprehensive attempt was carried out by Toke Hansen (2016) in his unpublished Masters thesis.
[13] Parts of *Insula* V 1 have known 270 years of ruin life, from the first official Bourbon excavations of Pompeii started in the south-west corner of this city block in March/April 1748. These early works concerned the street-front premises along Via del Vesuvio, V 1, 29–32, and minor parts of the north-western areas of Houses V 1,7.9 and V 1,3: Fiorelli 1860, 1–2. A plan of the excavation, drawn by Andrea de Jorio in 1825, is accessible on https://pompeiiinpictures.org/Maps/maps pompeii.htm. The southern part towards Via di Nola was unearthed in the 1830s, the rest mostly in the 1870s. Areas beyond the Via del Vesuvio street front of Houses V 1,14, V 1,21, and V 1,23.10, were hit by bombing in 1943.

(V 1,26), received their AD 79 borders during this great effort of ordered urbanization. Via di Nola's status as one of the city's two leading arteries (the level terrain offered the east–west arteries explains their importance for all kinds of traffic compared to the heavily sloping north–soutwards oriented Via del Vesuvio) is reflected in *Insula* V 1 by the through-time unchallenged prominence of its southernmost property, the House of the Bronze Bull (V 1,7.9). Together with its dependent satellites, small houses, and workshops, the House of the Bronze Bull occupied all the space along the southern street front and covered an area in depth corresponding to that of the main house. The neighbouring South House of Caecilius Iucundus (V 1,26) was also prestigious from the start. With its two front-shops (V 1,25 and V 1,27), which flanked the main entrance on Via del Vesuvio, it occupied the full width of the *insula* and covered an area similar to that of the House of the Bronze Bull. The preparation of the ground for the new architecture was thorough: up to the boundary separating the North and South Houses of Caecilius Iucundus (*Fig. 1a*) there are few or no pre-building-boom remains left. The situation in the north part of the *insula* is different, no doubt due to a lesser interest taken in this area by the enriched late Samnite city-dwellers.[14]

With the wish to make *Insula* V 1 yield more information on the early use of space (preceding and the the late Samnite building-boom), we had recourse to the approaches offered by our comprehensive photographic documentation and the new perspectives offered by the 3D models. In line with the new hierarchy of study, a first effort concerned observed irregularities occurring in perimeters and boundaries. Since the evidence easiest to note belongs to the space later to become the North House of Caecilius Iucundus (V 1,23.10), the present description of our effort to detect and understand earlier plot divisions will start in this space and then proceed northwards.

CASE 1. FORMER PROPERTY BORDERS WITHIN PLOT V 1,23.10—THE EAST AND WEST PROPERTIES

Focus on a robbed boundary return—identifying the East Property

In *Insula* V 1, marks of robbed perimeter/boundary returns, characterized as vertical "wounds" in standing masonry, are rare. One feature of this kind pertaining to the boundary between the North House of Caecilius Iucundus and the House of the Greek Epigrams is of particular importance because it presents an easily apprehended example of the type. On the North House of Caecilius Iucundus side of the boundary, a strip of the boundary lacks proper face finish. It runs the whole height of the boundary and it is about 0.5 m wide, that is, of normal concrete walls width in Insula V 1 (*Fig. 3*). The rough wall texture and a number of vertically aligned voids, suggestive of cut-away quoin stones, indicate a dismantled bonded return. Its mark on the other, House of the Greek Epigrams side of the boundary, is a neatly drawn and vertically aligned change in the stone constituent of the masonry; in this case not the wound of a robbed wall but a line corresponding to its former exterior corner (*Fig. 4*).

A truncated section of the boundary saved as a reinforcing support in the concrete masonry of the rear wall of the large east *triclinium* (later V 1, 26o) of the North House of Caecilius Iucundus confirms the southwards course of the robbed boundary (*Fig. 5*). This truncated wall was discussed as evidencing a potential former property boundary by August Mau on its unearthing. His report of work in Pompeii in 1876 mentions the occurrence with curiosity, but dismisses its consequences because of the anomaly that it introduced in the assumed neat division of the central and northern parts of this *insula* into plots entered from west.[15] Today, the joint evidence of excavation and wall structure confirms his initial thoughts. Our excavation in room V 1,23q,[16] south of the wall wound, produced the continuation of the putative dismantled wall, still extant at foundation level (*Fig. 6*).[17]

Homogeneous lava *opus incertum* characterizes the masonry of the boundary from the wall wound eastwards (*Fig. 7a*) to its bond with the *insula* perimeter. From the corner, the wall continues southwards, forming the rear perimeter of the North House of Caecilius Iucundus (*Figs. 2, 7a–b*). Thus it can be seen that three walls, homogeneous in fabric and linked by bonded masonry,[18] once enclosed an area facing the rear street (Vicolo di Cecilio Iocondo). We designated this the East Property, or V 1,10 (*Fig. 8*), since it was accessed from the rear street in a similar location as the (thus designated) rear entrance of the North House of Caecilius Iucundus (V 1,23.10). As already hypothesized by Mau, the area may have functioned as shop since a section of the original opening towards the street is a secondary fill (*Fig. 7b*), meaning that a large (shop-)opening was narrowed down to become the *post-*

[14] Via del Vesuvio (which is called Via Stabiana further south) is the only north–south-aligned artery of Pompeii. Via del Vesuvio is situated in a natural depression, which is very steep in its northern and southern parts, and these same areas appear to have remained relatively unattractive to builders of prestigious domestic architecture up to a relatively late period: Leander Touati 2008, 123.

[15] Mau 1876, 247–248.

[16] Here, as on the web platform www.pompejiprojektet.se/insula, the room designations follow *PPM*.

[17] Karivieri & Forsell 2006–2007, 103–105.

[18] The bond between the excavated wall and the wound in the boundary towards the House of the Greek Epigrams is hidden by a much later feature—a bench belonging to the period when room V 1,23q functioned as stable to the North House of Caecilius Iucundus.

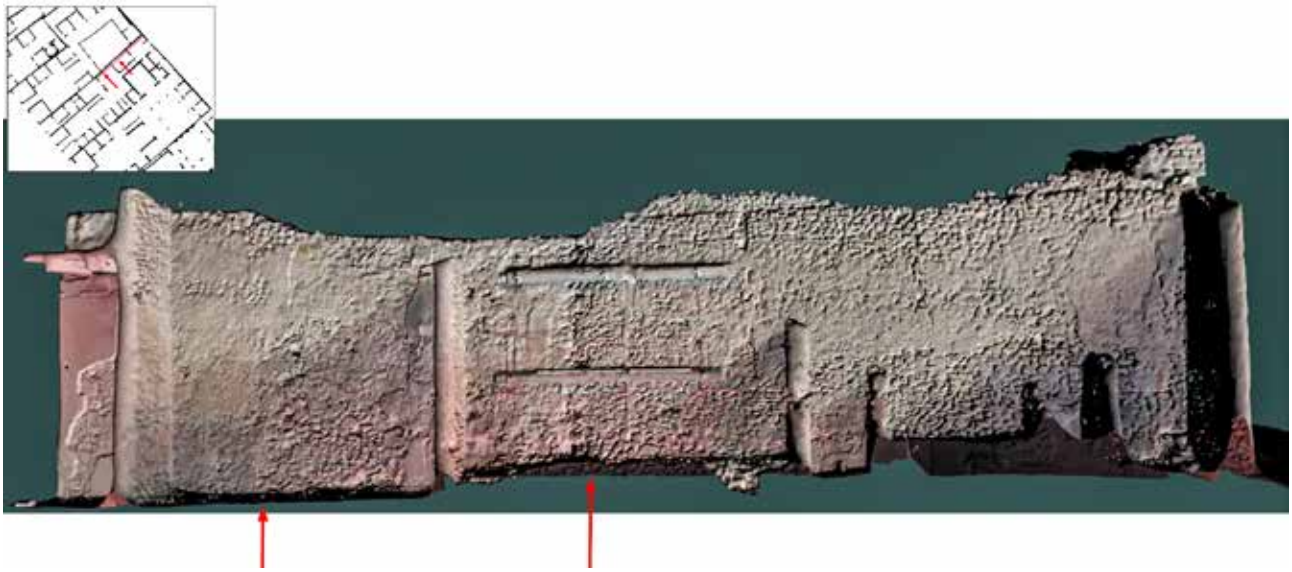

Fig. 3. East part of the boundary between the House of the Greek Epigrams (V 1,18.11.12) and the North House of Caecilius Iucundus (V 1,23.10) displayed as a wall-string. South elevation with inner divisions cropped away. The arrows indicate two abrupt changes in masonry texture. To the right, the wall "wound" indicating a robbed boundary return, to the left a change in masonry. Visualization: 3DHOP software. Feature highlights: Henrik Boman.

*Fig. 4. Rear wall of the peristyle (V 1,18i) of the House of the Greek Epigrams boundary towards the North House of Caecilius Iucundus. Note the abrupt change in masonry corresponding to the wall "wound" on the other side of the wall (*Fig. 3*). Photograph: Hans Thorwid.*

icum (rear opening) of plot V 1,23.10.[19] In consequence, we designated the space entered from the west, with entrance on Via del Vesuvio, the West Property, V 1,23 (*Fig. 8*).

This recognition that the later plot V 1,23.10 (North House of Caecilius Iucundus) covered the space earlier occupied by two earlier, separate plots, the East and West Properties, is a clear example that the building boom of the 2nd century BC not only fixed borders of large property plots, such as we know them from the AD 79 situation (*Fig. 1*), but also respected what we may understand as pre-existing property rights. The bonded boundary return evidences a former, more workaday use of space, probably dating back to an earlier period, but enclosed during the late Samnite building boom. Its persistence demonstrates that the north part of city block V 1 offered a less interesting prospect to the late Samnite developers, who apparently chose not to intervene here. The reasons for this probably relate to topography: the steep slope of the terrain north of the *insula* combined with the distance to the main east–west-aligned city artery, Via di Nola.

Contribution of 3D-generated visualization—identifying the West Property

The 3D model created new ways to study the boundary separating the peristyle of the House of the Greek Epigrams (V 1,18i) from the North House of Caecilius Iucundus. Wall-string scrutiny, a more useful technique for studying large

[19] Or that the location of the doorway was pushed northwards for some reason.

*Fig. 5 (below). Southwards course of a robbed boundary as shown by a bird's-eye view from the peristyle of the House of the Greek Epigrams (V 1,18i). The arrow in front highlights the change in masonry marking the quoin of a former, shorter boundary turning south (*cf. Figs. 3–4*). The arrow at the back highlights its truncated remains embedded in the south wall of corridor V 1,23m. In-between we may reconstruct the course of the robbed boundary delimiting the East Property, V 1,10 (see below,* Fig. 8*). Visualization: 3DHOP software. Feature highlights: Henrik Boman.*

Fig. 6 (right). Excavated remains of the robbed boundary. Wall remains at foundation level through room V 1,23q (stable in AD 79). View towards south. The excavation confirmed the presence of a connection between the wall wound in Fig. 3 *and the truncated wall in* Fig. 5. *Photograph: Arja Karivieri.*

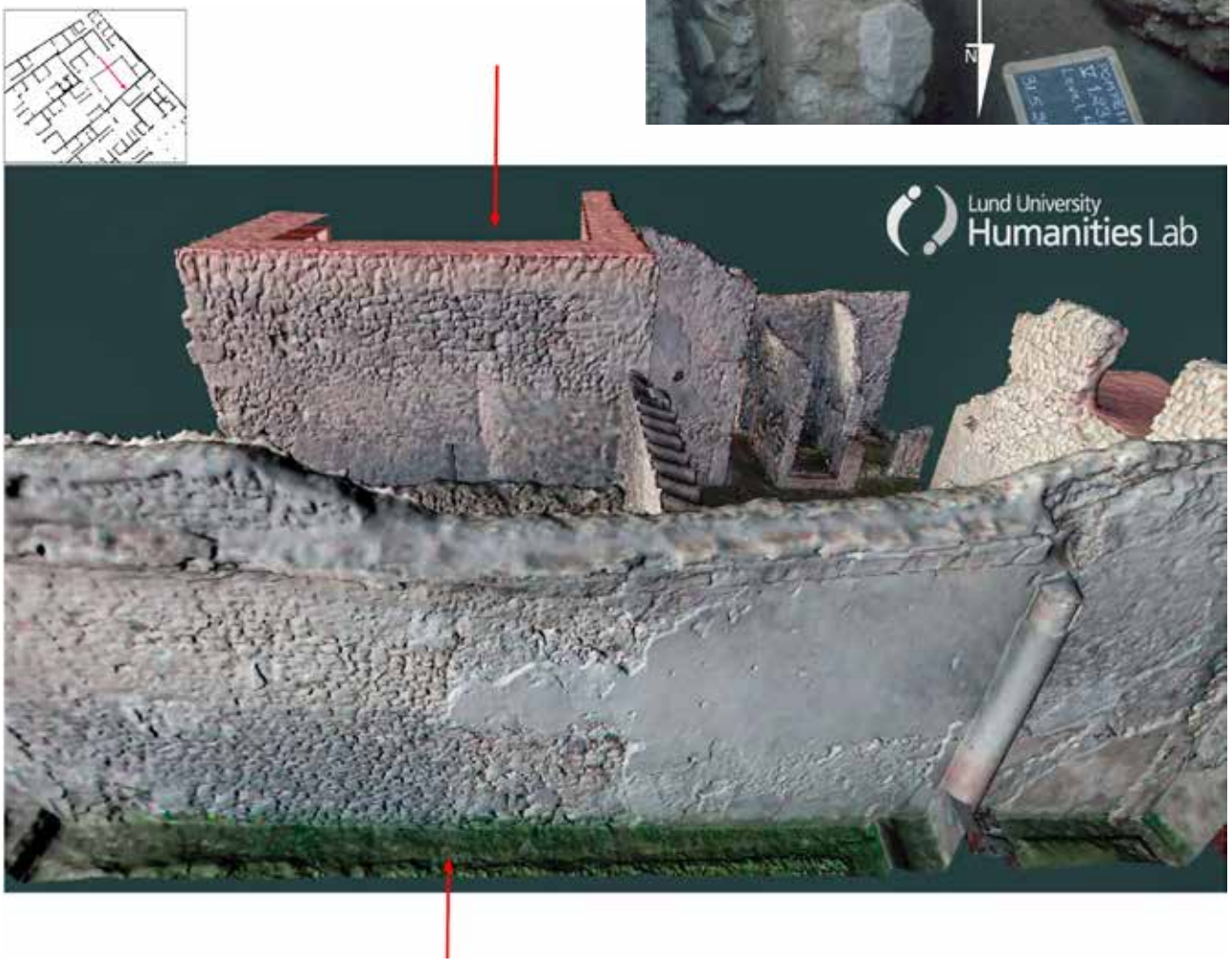

Fig. 7a. View towards the north-east corner of the North House of Caecilius Iucundus (kitchen and latrine, V 1,23n). Homogeneity of texture of the lava incertum *characterizes the north boundary and the east perimeter. Photograph: Hans Thorwid.*

Fig. 7b. Façade towards the east rear street (Vicolo di Cecilio Iocondo). The perimeter wall of the North House of Caecilius Iucundus turns 90° to continue as the north border of the East Property as demonstrated in Fig. 7a. *The façade of the House of the Greek Epigrams (to the right) uses stones of lighter colour. The arrow indicates the former extent of a putative shop-opening, later partially blocked (between the arrow and the left side of the doorway). Photograph: Hans Thorwid. Feature highlight: Henrik Boman.*

stretches of the boundary than the limited views between abutting room dividers permit, brought more material to the discussion on the East and West Properties. The newly observed situation, that walls with bonded returns served the initial purpose of framing property, either as perimeters towards the *insula* exterior or as boundaries between properties, whereas inner divisions abut, but never bond boundaries/perimeters, was elaborated on in the discussion.

Wall-string visualization of a more extensive section of the northern boundary of the North House of Caecilius Iucundus brought another change in masonry texture to attention (*Fig. 3*, arrow to the left). As with the wall wound investigated above (pages 187–188), it describes a vertical line in the preserved elevation. This time, however, it is more like a halt than a wound in the masonry. If there once was a wall return towards the south connected to the change in masonry build

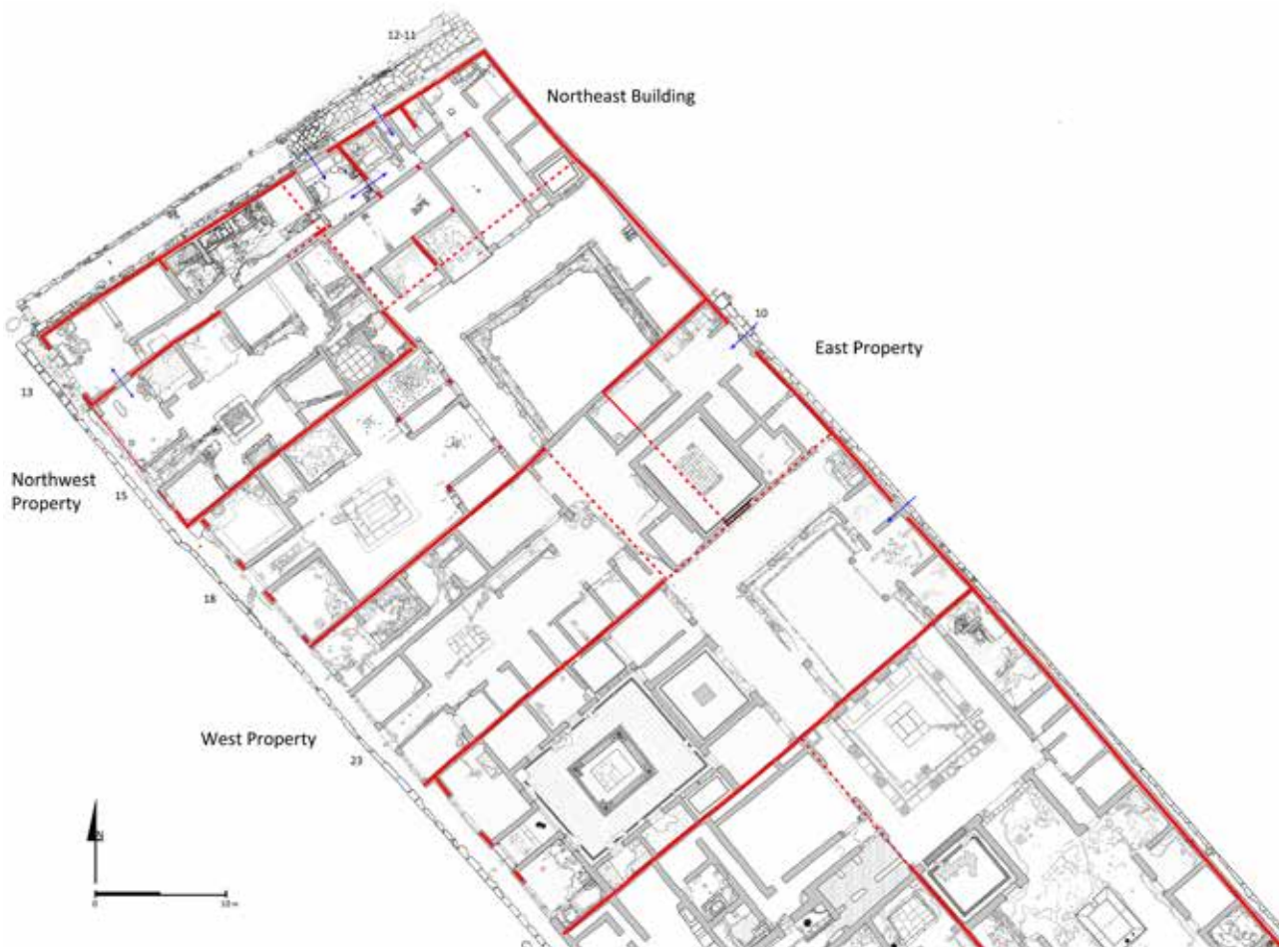

Fig. 8. Early property boundaries in the northern part of the insula *reconstructed. Dotted lines indicate hypothetical, or dismantled and later reconstructed walls. Fragmented and truncated walls as well as ashlar-built pillars preserved in inner divisions of the House of the Greek Epigrams are also indicated. Fine lines indicate dismantled boundaries evidenced beneath floor level and blue arrows, doorways. Illustration: Henrik Boman & Ezequiel Pinto Guillaume.*

and texture, no trace of the actual corner remains. Instead, we must imagine a boundary severed before the corner or leaning against some other dismantled (wooden?) structure. A hypothetical turn towards the north is unlikely.[20] Investigation at the foot of the boundary inside V 1,23l revealed that its western part stands on a deep foundation (indicated on the ground-plan, *Fig. 8*) and that the line observed in the wall elevation corresponds to the point where this foundation ends. This observation does not permit any conclusion on the issue of a perimeter return of the West Property, but brings attention to another interesting correlation: the well-founded masonry belongs to the boundary west of the observed change of masonry technique, whereas the masonry east of it lacks foundations, being raised directly on floor level.

Another way to investigate the same wall-string was to view it from above, either by studying the ground-plan, or more successfully by sliding horizontal sectioning within the 3D model. In our experience, computer-generated horizontal sectioning reveals wall misalignments much more clearly than does an architect-produced, drawn ground-plan.[21] Seen from

[20] Preserved plaster and a half column belonging to the west portico of the House of the Greek Epigrams (V 1,18i) cover the masonry corresponding to a putative boundary return towards the north (*Fig 3*), for which the feature seen on the south side would represent a quoin. However, lack of relation (alignment) to any of the preserved early architectural remains within the House of the Greek Epigrams accounts for the low probability of a turn towards the north.

[21] The 3DHOP software allows sectioning for study purpose, whereas 3D Studio Max (autodesk—commercial) also provides high-resolution 2D representations (*Figs. 9, 19b, 31*). The latter visualization highlights the walls as black lines (representing wall interiors to which the acquisition instrument had no reach). These lines are thus created automatically

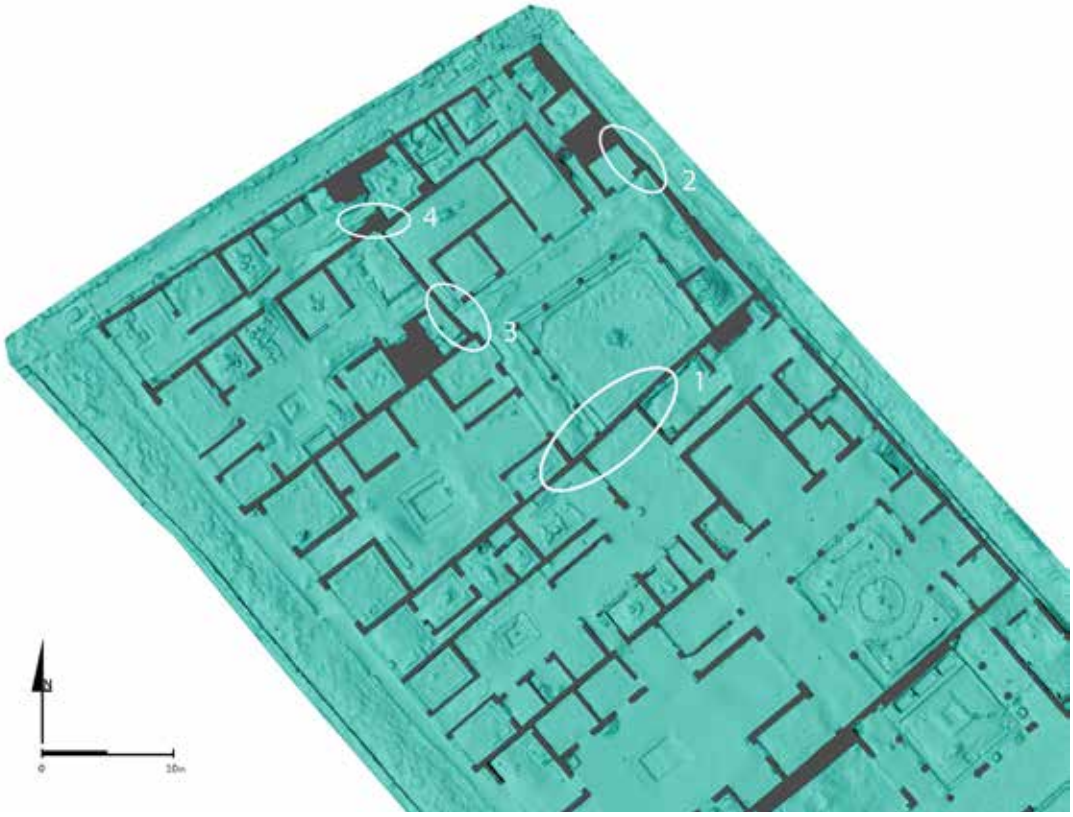

Fig. 9. North part of the insula *highlighting areas of perimeter/boundary misalignments (Cases 1–4). Ground-plan produced by means of horizontal sectioning using 3D Studio Max software. To obtain a homogeneous presentation of the walls this image combines two sectioning planes set at different levels (cf. note 21). Processing: Danilo Marco Campanaro. Feature highlights: Henrik Boman.*

above, the two wall-alignment irregularities described above in the east course of the boundary between the North House of Caecilius Iucundus and the House of the Greek Epigrams, show two wall misalignments related to an obliquely set wall adjustment (*Fig. 9*, Case 1), obviously rectifying the places where the walls constructed from opposite sides were to meet. In fact, the north boundary of the East Property is set further north than that of the West Property. The adjusting wall section closes an approximately five-metre gap between the two. Its east end abuts the robbed wall return, the north-west corner of the boundary pertaining to the East Property. Its west end seemingly springs from the north boundary of the West Property (*Fig. 10*). In stone material and facing technique (*Figs. 3, 10*), the adjusting wall section (the one lacking foundation) differs from the make of both the walls that it links. This all suggests that plot V 1,23.10 formerly was shared between two properties, here called the East Property and the West Property, probably with a not-fully enclosed space in-between (*Fig. 8*).

Building archaeological conclusions regarding the East and West Properties

The merge of the East and West Properties presumably coincided with the building of the wall adjustment which links their northern boundaries (*Fig. 8*). Since the stone material used for the adjustment (concrete partly framed or reinforced by yellowish Sarno limestone ashlars or fragments of this material) recurs in one more wall (*Fig. 11*) belonging to the inner separations of the West Property, this allows us to conclude that the two walls belong to a common building phase.

As judged from other alterations in the room disposition of the new property, the fusion of the West and East Properties occurred sometime by the middle of the 1st century BC.

by the 3D software. When the visalization shows a wall drawn in outline (not as a black line) this means that the chosen level of the horizontal sectioning plane was set higher than the wall in question (the *insula* stands on different levels). For differing results when presenting a same part of the *insula*, compare *Fig. 9* combining two different sectioning planes and *Fig. 19b* using only one. Processing by Danilo Marco Campanaro.

Fig. 10. Wall adjustment closing the boundary towards the House of the Greek Epigrams, viewed from courtyard V 1,23l in the North House of Caecilius Iucundus (south side of boundary). Note the frequent use of Sarno limestone ashlars and fragments within the adjustment. The arrows highlight some of the larger pieces. The full extent of this adjustment covers the space indicated between the arrows in Fig. 3. *Photograph: Göran Kindström. Feature highlights: Henrik Boman.*

Fig. 11. North atrium *wall of the North House of Caecilius Iucundus (V 1,23b). Note the Sarno limestone ashlars: to the right used as a door-jamb of a later walled-up doorway; to the left bridging a foundation fragility (latrine pit dug on the opposite side of the wall). Fragments are present as well. Photograph: Hans Thorwid.*

The creation of two *triclinia* (V 1,23k and V 1,26o[22]), each with a large window opening towards the formerly non-enclosed space (to remain an open courtyard, V 1,23l, up to the end of Pompeian city-life) marks the new private use of a space possibly held in common in earlier days (*Figs. 12a, b*). *Triclinium* V 1,23k still preserves traces both of a mortar floor (*opus signinum*) with tesselated inlays judged by specialists as typical of the latter half of the 1st century BC, and older wall decorations beneath the extant (late 3rd-style) ones.[23]

Courtyard V 1,23l remains unexcavated; however surface cleaning revealed significant amounts of deep disturbance in antiquity. This may be related to the construction of a new water channel running from the east to the large underground cistern (or the making of the cistern itself). Above ground, the cistern is capped by a well-head, *puteal*, still *in situ* (*Fig. 13*). This *puteal* is situated about half a metre inside the hypothetical southwards boundary of the West Property (*Figs. 8, 9*) —granted that the reach of the old north boundary represents the position of the interior corner of the robbed boundary.[24]

CASES 2 AND 3. THE NORTHEAST BUILDING

Focus on boundary/perimeter misalignment

Another case of wall misalignment belongs to the rear perimeter of the *insula*, along Vicolo di Cecilio Iocondo (*Fig. 9*, Case 2). It brings us back to a situation preceding the House of the Greek Epigrams (V 1,18.11.12) and may contribute to the understanding of the unorthodox layout of this, the northernmost of the large houses of *Insula* V 1, created as such in the 1st century BC.[25] Taken together with two more, less

[22] The development of east *triclinium* V 1,23 into V 1,26o in the imperial period (ground-plans with room numbers in *Figs. 26, 35*), will meet detailed discussion below.

[23] The floor decoration is described as "*crocette, tipico della fine del secondo secolo, - primo metà del primo secolo davanti Cristo*". *PPM* III 1991 (A. de Vos), 620, no. 94. In our investigation of the floor in 2001, the mortar floor was found preserved in patches close to the walls. It presented tessellated borders: a pattern consisting of one central, black and four white *tessera* runs all around the room. The older wall decorations, comprising a dark base displaying sparse white vertical lines on top, were visible in some parts close to the floor of the north wall.

[24] It is worth noting that the boundary section for which we expect a return is itself slightly misaligned when compared to the rest of the boundary running from Via del Vesuvio (*Fig. 9*). This misalignment starts at a point corresponding, on the south side of the boundary, to a mid-"vestibule" (facing doorway) position inside *triclinium* V 1,23k; on the north, House of the Greek Epigrams side, to the rear wall of the west portico of the garden area, V 1,18i.

[25] The L-shaped ground-plan of the House of the Greek Epigrams has provoked discussion in earlier scholarship, mainly concerning whether this house was created from a fusion of a main property extending

Fig. 12a. Window of triclinium *V 1,23k, opening towards and viewed from courtyard V 1,23l. Photograph: Hans Thorwid.*

Fig. 12b. Walled-up window of east triclinium *(later V 1,26o) opening towards and viewed from courtyard V 1,23l (see also* Fig. 13*). Photograph: Hans Thorwid.*

Fig. 13. Courtyard (V 1,23 l) with puteal *(well-head) above the cistern. Doorway of* triclinium *V 1,23k to the left. Façade of the east* triclinium *(V 1,26o) with walled-up window at the rear (see also* Fig. 12b*). Photograph: Hans Thorwid.*

prominent wall irregularities (*Fig. 9*, Cases 3 and 4), this perimeter misalignment will be used to advance new ideas about the use of space in this area, and plausibly also on a different societal organization in the city before the late Samnite building boom.

The wall adjustment presents itself as a kink in the long, well-aligned perimeter running from the south-east *insula* corner, formed by the junction of Via di Nola's eastern and Vicolod di Cecilio Iocondo's southern end, up to this point (*Figs. 8, 9* Case 2). Visible on the street side only, because it is obscured by added masonry facing the perimeter on the inside towards the peristyle area of the House of the Greek Epigrams, it corresponds to a position approximately half a metre south of the façade of room V 1,18y. In this case, the extent of the adjustment is barely two metres in length and its masonry gives no obvious lead to interpretation. Its detailed composition is difficult to read because it is largely obscured by a thin plaster coat, but the stone material used does not differ markedly from the rest of the surrounding perimeter. Still, one important aspect of the masonry demonstrates a difference. Oblique photographs, shot in light conditions favourable to creating shadows in surface depressions, and initially intended to document the change in alignment of the perimeter, yielded a supplementary result. On the perimeter south of the adjustment, the photographs document six horizontal, equally spaced, superimposed masonry lines, but none to the north (*Fig. 14*).

The lines in question belong in kind to a number of features noticed from the start of our wall-string scrutiny of the rear *insula* perimeter.[26] Occurring in several places as horizontal grooves one above the other, repeated at a regular vertical distance, it makes sense to recognize them as the borders of the formwork lining used when casting the *incertum* masonry. Such lines, first spotted in the masonry that belongs to the House of the Bronze Bull, were subsequently found in the rear perimeter of the properties further north as well. These lines differ in position and height spacing from one property to another, thus confirming the earlier mentioned property related use of different stone materials for reinforcing the concrete, that is, of different entrepreneurships at the origin of each property enclosure (*Fig. 2*). The discovery of these formwork lines was made while studying the mesh model, as this model (without colour) enhances depth differences in a surface more than does "normal" photography, or autopsy on site for that matter.

In the case of the rear perimeter of the House of the Greek Epigrams, the north section of the wall from the corner to the wall adjustment did not reveal any masonry lines—neither in 3D visualization nor in any of the photographs shot at the same angle at different heights of the sun. The conclusion seems safe. Obviously, well-mastered concrete technology characterizes the well-aligned, late Samnite rear perimeter of the *insula* from its south-east corner on Via di Nola, all the way up Vicolo di Cecilio Iocondo to the oblique adjustment in the rear wall of the House of the Greek Epigrams (*Fig. 9*, Case 2). The masonry used to the north of this adjustment indicates different, less standardized, and probably older practice.[27]

Without excavation, the hypothesis proposing a return of the part of the perimeter that lacks marks of formwork timber skins, at the north end of the oblique adjustment, cannot be proven. On the other side of the wall, it corresponds to a location in the middle of the Epigram Room (V 1,18y), which still preserves its famous 2nd-style paintings accompanied by epigrams in Greek *in situ*. On the wall that corresponds to the inner face of the perimeter, the paintings were set onto a new wall-revetment, a wedge-shaped wall-shell housing the beam-holes necessary for securing the vaulted ceiling of the room. The added masonry and covering painted plaster effectively hides the potential position of a wound representing a former perimeter return towards west.

In alignment towards the west, the suggested perimeter return fits remarkably well with a further boundary misalignment noted in the area (*Fig. 9*, Case 3), a sudden change of orientation described by the boundary between the House of the Greek Epigrams and House V 1,15. Together, the two misalignments (Cases 2 and 3) could represent the position of a robbed south boundary of the area, rich in early remains, designated the Northeast Building in *Fig. 8*.

Building archaeological interpretation

It merits attention that remnants of early construction—2nd century BC or older—are rare south of the hypothetical south boundary of the Northeast Building, in the area corresponding to the later peristyle of the House of the Greek Epigrams (V 1,18,i), whereas, north of it, truncated walls and sections of standing early walls abound. It is safe to state that we are dealing with a built area extending from the north perimeter of the city block as far south as to our hypothetical south boundary of the Northeast Building. In the logic of our argument, we should also recognize it as a property, were it not for the fact that it remains uncertain if it constituted a single enclosed

north–southwards or east–westwards, and when this fusion occurred: Mau 1877, 91–93; Staub Gierow 2005, 146; Staub Gierow 2006–2007, 105, 108–109 with further bibliography; Geertman 2007, 91–93.

[26] Facilitated here because the perimeter façade is mostly "naked" as covering plaster and paint have eroded.

[27] On the progressive rationalizing of the revetment of Roman concrete building technique during the 1st century BC (albeit without discussing formwork lines): Pfanner 1989.

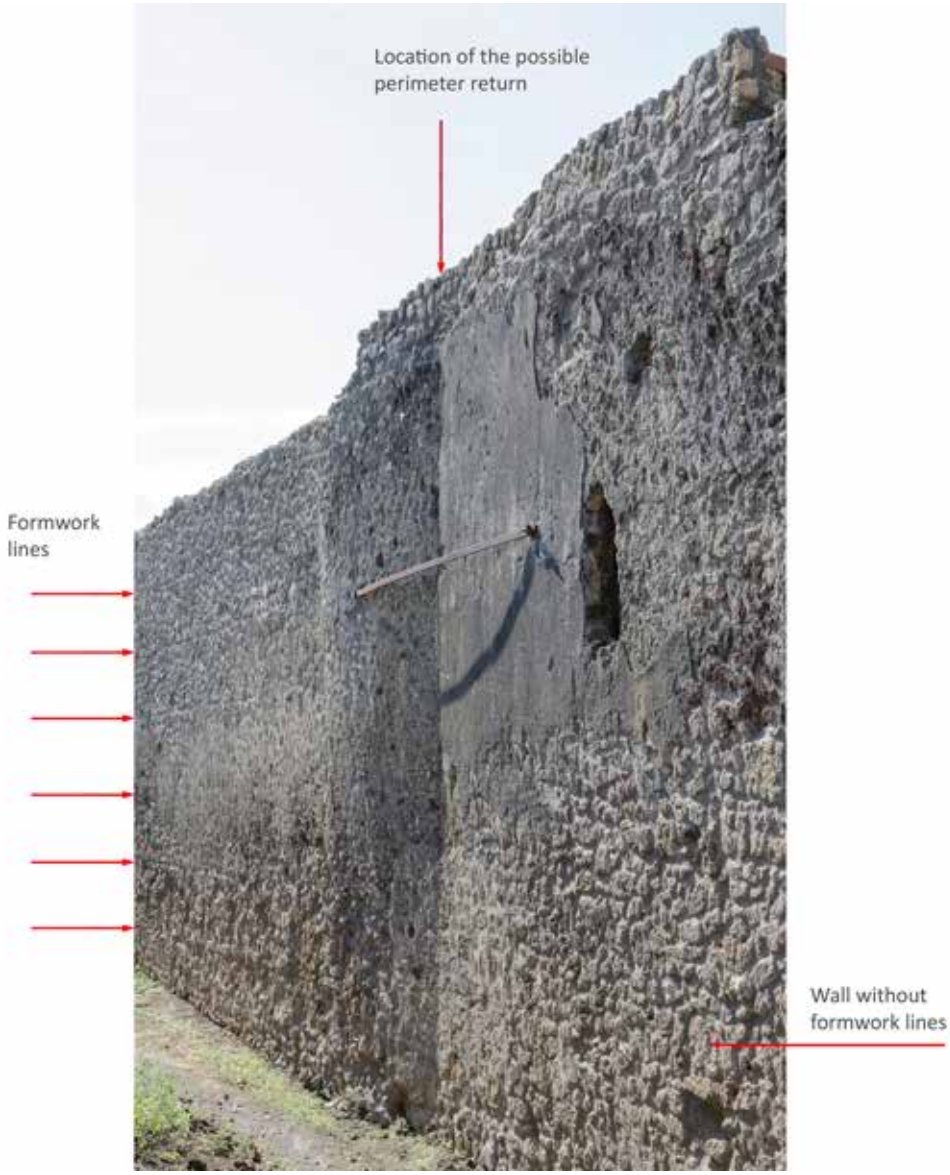

Fig. 14. Looking south on the east façade (perimeter) of the House of the Greek Epigrams, along Vicolo di Cecilio Iocondo, showing the oblique wall section adjusting the mismatch between the long straight line of the late Samnite insula *perimeter and the north part of the perimeter of the House of the Greek Epigrams. Arrows indicate formwork lines in the masonry south of the adjustment. Photograph: Hans Thorwid. Feature highlights: Henrik Boman.*

space. The presence of several doorways in the part of the northern perimeter corresponding to this space explains why we have chosen to designate it not the Northeast Property, but the Northeast Building (*Fig. 8*).

Four entrances observed in the north *insula* perimeter, all related to the space ascribed the Northeast Building, mirror the intensive and changing use of the north street front, along Vicolo delle Nozze d'Argento, over time. Two doorways were walled-up in antiquity (*Fig. 15*).[28] A third, functioning as *posticum* to the House of the Greek Epigrams, probably belongs to the period of the creation of this house in the 1st century BC. In the imperial period, it was enlarged and divided in two (V 1,18.11–12, *Figs. 1a, 15*). At our present state of knowledge, we choose to recognize the walled-up doorways as entrances to the Northeast Building that preceded the creation of the House of the Greek Epigrams, although the largest belonged to the innermost rear room (V 1,13f) of the neighbouring property in AD 79. In this late period, that property

[28] On the inside only the east jamb of the narrower doorway is exposed to view, the west one is hidden by a later division. The wider doorway knew two phases, see field drawing by Henrik Boman: www.pompejiprojektet.se/insula.php, V 1,13, Caupona, North wall.

Fig. 15. North façade of the House of the Greek Epigrams (V 1,18.11.12). The arrows indicate two walled-up entrances attributed to the Northeast Building (the larger primarily diminished in width, then walled-up). See also Fig. 8. *Photograph & orthomosaic: Hans Thorwid. Feature highlights: Henrik Boman.*

functioned as an inn, *caupona*, and room V 1,13f was its kitchen. Its kitchen bench reclines on the masonry used to wall up the former doorway (*Fig. 16*).

Understanding the wider walled-up doorway as leading into a room that was initially planned for the Northeast Building explains the strange intrusion of room V 1,13f into the neat rectangular shape of the north part of the House of the Greek Epigrams (*Fig. 1a*). However, there are also arguments that the AD 79 property boundary between the two houses resulted from an alteration of the original situation. An important argument is based on the fact that the 19th-century cork model-maker who copied the ruin soon after its unearthing, clearly indicated a walled-up interior doorway between room V 1,13f and the neighbouring room V 1,18x of the House of the Greek Epigrams.[29] Following this line of thought, an pillar or pier of slim ashlars lodged within the *insula* perimeter is of particular interest since it could represent the original quoin of property V 1,13 in an initial, "primitive" phase (*Fig. 17*), designated the Northwest Property in *Fig. 8*.[30]

Fig. 16. Kitchen bench in front of a walled-up former entrance in the north façade of the insula *(room V 1,13f). Note the well mouth to the right of the bench—this water supply may explain the interest in the room, apparently divested from one property and annexed by another. Photograph: Hans Thorwid.*

[29] The very precise model is now in the National Archaeological Museum of Naples (MANN). It is more difficult to recognize the walled-up doorway on site due to modern restorations.

[30] The evidence for understanding the AD 79 boundary as the original east boundary of V 1,13 (Boman 2008, 90), based mainly on analysis of small patches of plaster sampled on a—possible stretcher—if so marking a boundary return towards the south, is weak and would probably not stand scrutiny if revisited. The exact measuring offered by the 3D model has shown that this façade block is just a small quadrangular ashlar. The suggestion drawn from the plaster study by Boman and Nilsson was made before the study of the 19th-century cork model in the MANN. It may be noted that the sidewalk along the north perimeter, Vicolo delle Nozze d'Argento, mirrors the extent of the *caupona* and the House of the Greek Epigrams as we know them from their AD 79 state. Thus, we can conclude that there were no sidewalks in the period of the oldest property boundary when the street was still unpaved. Boman and Nilsson (2006–2007, 87) point out that the level of the walled-up perimeter doorway of Room V 1,13f corresponds to the actual level of the street, not to the curbstones of the sidewalk (cf. also Boman 2008, 87–90. This suggested lack of sidewalk is worth comparing to the situation of the street section beside the east perimeter of the House of the Greek Epigrams, which remained unpaved and without sidewalk up to AD 79. On sidewalks indicating property in general: Saliou 1999; in *Insula* V 1: Leander Touati 2010, 139.

Fig. 17. North façade of V 1,13 along Vicolo delle Nozze d'Argento (a caupona *in AD 79). The well-fitted, heavy ashlars of the lower part of the wall represent the oldest building technique (*opus quadratum*) evidenced in this* insula*. The arrow indicates the position of the pillar suggested as the return of the original north border of the Northwest Property. Photograph & orthomosaic: Hans Thorwid. Feature highlight: Henrik Boman.*

CASE 4. AN EARLY NORTH–SOUTH *INSULA* DIVIDE?

Focus on two stanchions and a boundary misalignment —boundary between the Northwest Property and the Northeast Building

The portion of the north *insula* perimeter that includes the (above hypothesized) initial north-east corner pier of the Northwest Property clearly constitutes a homogenous ashlar (*opus quadratum*) masonry (*Fig. 17*), which presumably represents the oldest standing architecture in this *insula*. The pier stands on the ashlar that represents the last of the well-fitted series that forms the west part of the *insula* perimeter. Of similar build and size, a pier on the opposite side of room V 1,13d matches the one of the perimeter. The bird's-eye view offered by the 3D model furthers a spatial correspondence between the two. It suggests a possible relation (*Fig. 18*), not observed on site. Accepting the high ashlar-built pier in the perimeter as marking a wall return, it makes sense to interpret the two piers as stanchions, main vertical supports framing a concrete and/or rubble fill, of a robbed framework wall (of *opus africanum* type), plausibly the original north–south boundary separating the Northwest Property from the Northeast Building. Unfortunately, the space between the two, here recognized as possible candidates for an original boundary, could not be cleared and investigated during our fieldwork in *Insula* V 1 since the north-east corner of room V 1,13d was covered by a high heap of debris, presumably resulting from the 1980 Avellino earthquake.[31]

The southern of the two stanchions is located within a short section of double walling, a masonry "knot" marking the place where several boundaries meet, old and more recent (*Fig. 9*, Case 4). In this knot, the pier under consideration (with presumed stanchion function) is without question the oldest structure. It contains two narrow stretchers that bond westwards, into an original wall section belonging to the area designated as the Northwest Property in *Fig. 8*.[32] The solid pier built of large stones served as support for the surrounding concrete walls either abutting or leaning onto it (*Figs. 18–19a*),[33] or onto the robbed boundary (separating the Northeast Building and Northwest Property) that we hypothesize sprang from it (*Figs. 8, 19b*).

[31] In this space Mau reports a robbed room with partly covered decorations, which he suggests belong to the 2nd style: Mau 1877, 138.

[32] That the Northwest Property is suggested to have encompassed the two AD 79 properties V 1,13 and V 1,15 (*Fig. 8*), seemingly contradicts the norm according to the rule put forward in this paper, by which there are no wall returns in perimeters/boundaries other than walls marking property borders. The exception to the rule observed here may meet an explanation in the steep drop in level operating between the two neighbouring rooms V 1,13d and V 1,14h, situated on either side of the wall. Retention needs called for a well-anchored wall serving both terassing and elevation here. Today, only a narrow section towards the south-east corner of room V 1,13d remains of the original masonry; most of the south wall of V 1,13 is of very recent (modern) reconstruction. The narrow wall section west of the pier is only a continuation of the old wall in appearance. Closer study reveals it as a fill belonging to the phase when room V 1,13f had become part of property V 1,13.

[33] In Pompeian concrete masonry, old walls were used as supports while raising younger replacements. In the northern part of the House of the Greek Epigrams such supports are common. Sections of the inner divisions of the Northeast Building have survived as truncated walls in more recent masonry. They mostly occur as inside corners of rooms (dots on *Fig. 8*) meaning that the old wall was used as a mould frame for a new one, raised along the old one. The old wall was subsequently demolished, only surviving as a trunc pillar, integrated into the fully new wall built at 90° to adjoin the other by the corner of the room. The truncated section is a point of departure or arrival, functioning as support during the moulding of this new wall. In the case of the wall knot studied here; the extant north and west boundaries of the House of the Greek Epigrams (*Fig. 1a*) apparently used the west and south sides of the ashlar-built pier (understood here as part of an old framework boundary of *opus africanum*-type) similarly (*Fig. 19a*). According to our interpretation, the original west boundary separating the House of the Greek Epigrams (V 1,18.11.12) from House V 1,15 (Bakery in AD 79) leaned on the original (subsequently robbed) boundary between the Northwest Property and the Northeast Building, which in turn had used the ashlar pier as its point of departure towards south (*Fig. 19a*). The north boundary of the House of the Greek Epigrams was instead built after the demolition of the old boundary. The short wall sections east of the original ashlar-built pier is a fill made to accommodate the new division between rooms V 1,13d and V 1,13f, most probably made when the latter space became part of House V 1,13 contemporary to the creation of the House of the Greek Epigrams.

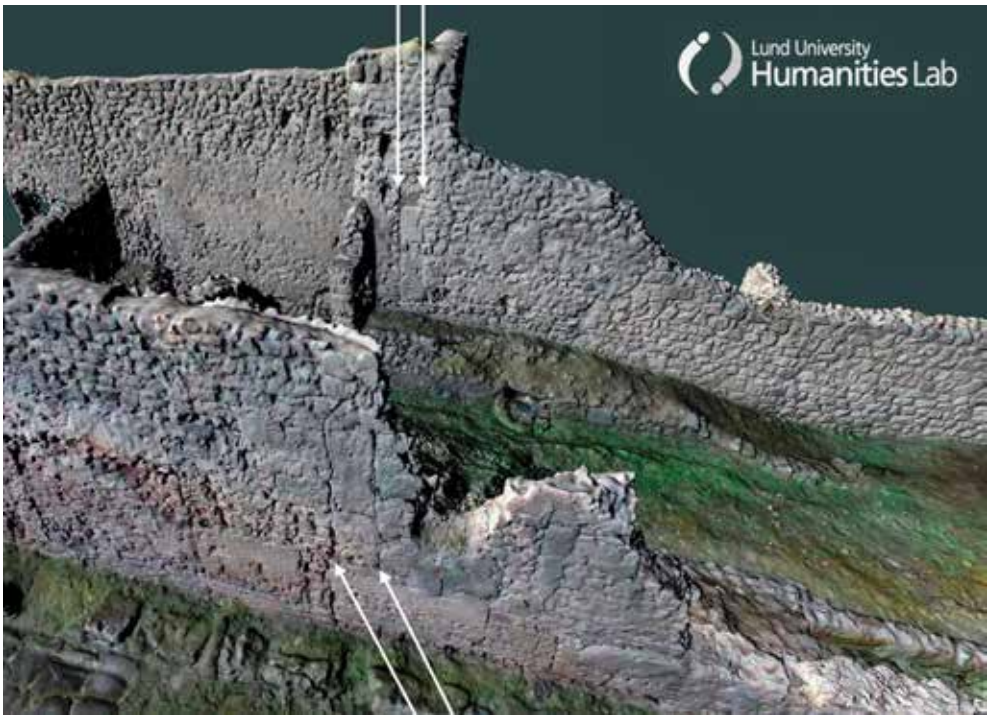

Fig. 18. Pair of stanchions, one on each side of room V 1,13d. Together they may be understood as the remains of the robbed north-east part of the boundary between the Northwest Property (to the right) and the Northeast Building (cf. Fig. 8*). Visualization: 3DHOP software. Feature highlights: Henrik Boman.*

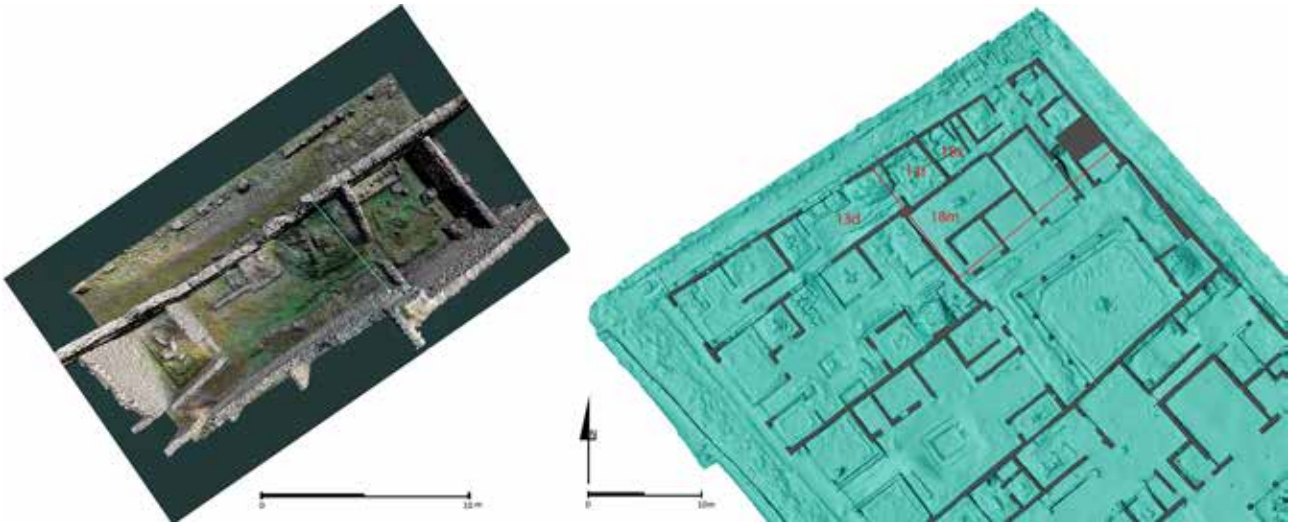

Fig. 19a–b. a: suggested course of the robbed east framework boundary of V 1,13. The green line was generated automatically, by means of the 3DHOP measuring tool. Visualization: 3DHOP software. Processing: Anne-Marie Leander Touati. b: suggested course of the robbed east framework boundary of V 1,13 and its possible continuation as shared boundary between the Northwest Property and the Northeast Building. To obtain a neat indication of the walls, the sectioning plane (cf. note 21) is set above the debris heap in the north-east corner of room V 1,13d. Visualization: 3D Studio Max software. Processing: Danilo Marco Campanaro. Feature highlights: Henrik Boman.

By a line drawn between the two stanchions, we obtain the alignment of the suggested early framework boundary. The toolbox of the 3DHOP software offers a precise means to reconstruct this alignment. After application of the measuring tool to the exterior side of the façade stanchion, the model was tilted to obtain a bird's-eye view, thereby permitting the application of the arrival point of the measuring line to the corresponding side of the south stanchion. Passing through the perimeter the obtained line indicates the orientation of the suggested robbed boundary (*Figs. 19a–b*). Note that this alignment better adapts to the layout of inner separations in both the Northeast Building and in V 1,13 than does the later wall separating rooms

V 1,13d and V 1,13f (*Fig. 19a*). If extended further south, this line continues beside and along the extant boundary up to the already discussed kink that marks the point (*Fig. 9,* Case 3) which we have suggested as the point of arrival of the robbed south boundary of the Northeast Building (*Figs. 8, 19b*).

Another two stanchions, a boundary bend, and a query about master plans

The alignment set by the two stanchions marked in *Fig. 18* and continued along the extant boundary between the House of the Greek Epigrams (V 1.18.11.12) and House V 1,15 (Bakery in AD 79) may bear witness to a north–south *insula* divide, a master plan differing slightly from that of the late Samnite building boom, which governs the layout of the two large southern houses. The southern longitudinal *insula* divide (*Fig. 1a*) runs along the west boundary of the House of the Bronze Bull (V 1.7.9) and along the line separating peristyle and *atrium* areas of the South House of Caecilius Iucundus (V 1.26). If the original function of a pair of ashlar-built piers integrated in the rear wall of the west portico of the later House of the Greek Epigrams (*Fig. 8*) is recognized as another pair of stanchions, supports of a framework wall, the northern *insula* divide can be pushed further south, beyond the boundary between the Northeast Building and the Northwest Property. A slight misalignment in the end section of the north boundary, ascribed the West Property (V 1,23), precursor to the North House of Caecilius Iucundus (V 1,23.10), also merits attention in this context. That bend occurs along the alignment set by the two piers/stanchions of the hypothetical border between the later peristyle and *atrium* areas of the House of the Greek Epigrams,[34] It adds a further argument that a former master plan once operated here. Interestingly the same alignment is repeated much further south, in the west boundary of workshop V 1,5 on Via di Nola. The position of this workshop is strange as it does not accommodate to the alignement set by the west boundary of the main mansion in the area, the House of the Bronze Bull (*Fig. 1a*), and thereby to the late Samnite *insula* divide that may be followed (*Fig. 8*) up to the putative boundary return of the West Property (V 1,23). To sum up, the above discussion hints the presence of a north–south divide of the *insula* situated somewhat (*c.* 2.7 m) further west than that of the late Samnite building master plan. For confirmation, this hypothesis requires excavation.

Up to here, the aim of the presentation has been to demonstrate how remote study of the joint 2D and 3D documentations permits us to follow the ancient building process: to look beyond the AD 79 situation, focus in on the late Samnite building boom, and suggest some characteristics of the still-earlier use of space in the north part of the city block. In the following, the presentation will proceed in line with how we understand the development of the properties in this *insula* over time.

Development over time: 4D interpretation

2ND CENTURY BC. THE LATE SAMNITE BUILDING BOOM AS URBANISTIC DIVIDE

Stately south and rough, old-fashioned north

The plan of *Insula* V 1 clearly reveals how its southern half bears witness to ordered arrangement—or re-arrangement, as we must conjecture exploitation earlier than the standing remains in this, the most propitious part for exploitation in this *insula* (*Fig. 1a*).[35] The straight lines of the boundaries that enclose the two largest houses of the city block, the House of the Bronze Bull (V 1,7.9) and the South House of Caecilius Iucundus (V 1,26), draw attention, as do the equal sizes of these two houses.[36] This configuration agrees with a handbook characterization of Pompeii's Samnite building boom as "a concerted programme in which existing houses were swept aside to make space for new ones".[37] In our case, "the new ones" were, of course, the two mentioned above. Homogeneously buildt and well-preserved plaster coating hide potential evidence about adjustments to the earlier use of space here. Not even close study of the seemingly less orderly architecture west of the House of the Bronze Bull has provided results that may be interpreted as old property lines.[38] In this area, many rooms and boundary walls stand as rebuilds. Early modern restoration further complicates our understanding. Since the south-west area can be

[34] Commented upon in note 24.

[35] The southern part of the *insula* has the most privileged position by (or close to) Via di Nola, one of the two main arteries of the city. As Via dell' Abbondanza further south, it runs east–west, on level ground contrary to the slope of the city hill. Instead, the city's only north–south-orientated artery, Via del Vesuvio-Via di Nola, flanking Insula V 1 on its west side, climbes the steep slope, which converts the street to a stream in rainy weather: Leander Touati 2010, 117–120.

[36] The measurement of the *insula* width, amounting to *c.* 40 m when mesured axialy trough (length of) the South House of Caecilius Iucundus, apparently served as reference, also deciding the size of the House the Bronze Bull. The axial length of the latter, measured from its threshold onto Via di Nola up to its north boundary amounts to somewhat less, *c.* 37.2 m, as compared to that of the northern neighbour's, but its somewhat greater width seemingly compensated for this loss of compared space. The width of the House of the Bronze Bull, measured by the rear of its *tablinum*, amounts to *c.* 16.2 m versus the *c.*15 m of the South House of Caecilius Iucundus at the same location.

[37] Ling 2005, 36.

[38] The only old boundary preserved is the one separating V 1,7.9 and V 1,3, as well as some short sections in V 1,28.

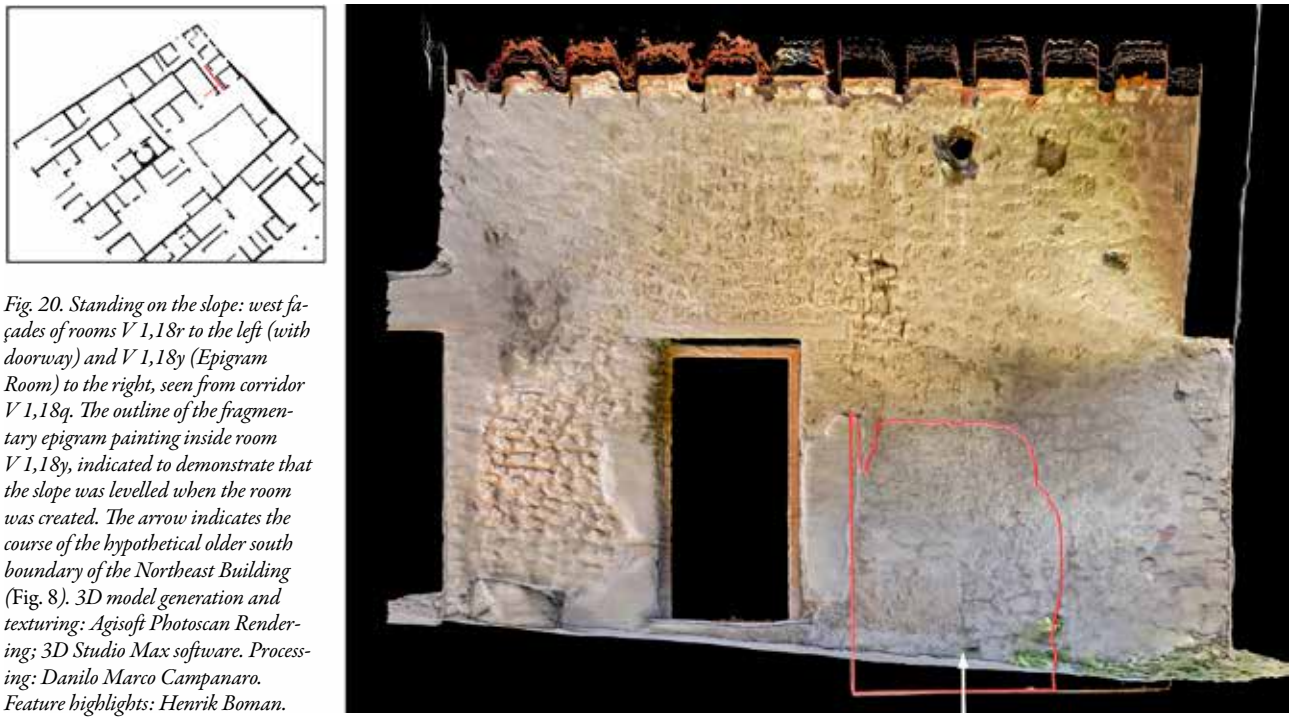

Fig. 20. Standing on the slope: west façades of rooms V 1,18r to the left (with doorway) and V 1,18y (Epigram Room) to the right, seen from corridor V 1,18q. The outline of the fragmentary epigram painting inside room V 1,18y, indicated to demonstrate that the slope was levelled when the room was created. The arrow indicates the course of the hypothetical older south boundary of the Northeast Building (Fig. 8)*. 3D model generation and texturing: Agisoft Photoscan Rendering; 3D Studio Max software. Processing: Danilo Marco Campanaro. Feature highlights: Henrik Boman.*

shown to have already furnished dependencies to the House of the Bronze Bull from the original layout of the area,[39] it is easy to suggest that it was arranged and reorganized at will by the owner of the large house, up to the end of life in Pompeii.

As already amply described, the well-ordered situation of the properties changes as we pass to the North House of Caecilius Iucundus and continue northwards. The most irregular layout in the whole city block is that of the House of the Greek Epigrams. The main axis of the entrance from Via del Vesuvio is not maintained in the interior. In the *atrium* (V 1,18b), the *impluvium* is placed out of axis, as is the *tablinum* (V 1,18g). In the peristyle (V 1, 18i) there is no correspondence between a main axis and the alignments of the surrounding boundaries, none of which meet to form perpendicular corners. Nonetheless, some planning also operated further north. The dimensions and height of all the main entrances on Via del Vesuvio and the straight alignments of the boundaries separating the front part of these houses call for the interpreter's attention.

Size, sequence, and level of exploitation evidenced in the northern Via del Vesuvio street front

Effort to enhance the entrances along Via del Vesuvio, only north–south artery of Pompeii, characterizes most *domus*-openings towards this street, although the grandness of the façades tends to diminish as one proceeds northwards. The mere 6.9-metre-wide façade of the property in the north-west corner of *Insula* V 1, (V 1,13 functioning as a *caupona* in AD 79) is the least impressive, by far. In its case, a deliberate land-surveying plan is excluded as the origin of its narrow design. The plan of V 1,13 is not a "left-over", last in line in a presumed *insula*-embracing effort to establish plots. As already underlined, this property has the most old-fashioned building techniques in this city block: ashlar masonry (*opus quadratum*) for a large part of its north perimeter (*Fig. 17*), and recurrent use of ashlar-stanchion framework (*opus africanum*) in boundaries and inner divisions. It makes more sense to ascribe its design to its greater age, and to the different use of space in an earlier period, an important factor of which was, as we will see, the challenging relief of the terrain.

The boundaries of the AD 79 *caupona* (V 1,13) enclose an area situated on a higher level than its southern neighbour (V 1,15—a bakery in AD 79). The height difference between the two properties gradually increases in height towards the east. By the north-east corner of V 1,15 it amounts to about a metre or more. It should be noted that the whole north edge of the *insula* is situated on higher ground than the rest. East of V 1,13, enclosing the same natural ledge, the Northeast Building stood on sloping land. This situation may explain the choice of location for its (hypothetical) south boundary, towards the end of the slope—but not at its very end (*Figs. 8, 20*). This way, inflow of water from the south, where the natural depression easily could convert into a dell, could be

[39] Leander Touati 2010, 138–142.

Fig. 21a. Walled-up doorway in boundary separating V 1,13a from V 1.14i, viewed from the north side of the boundary (the caupona *side). The limestone pillar is understood as the west door-jamb. The east jamb is covered by modern restoration work (covering most of boundary left of the jamb in the image), but visible on the other side of the wall (*Fig. 21b*). Photograph: Hans Thorwid.*

averted. Even today, the area of the north peristyle portico of the House of the Greek Epigrams (V 1,18i) is easily flooded. The natural environment was obviously more important than ordered land-division in the early period. One more conclusion is that the prospectors of the building boom in the late Samnite era did not take an interest in modernizing the north part of the *insula*. This is why we find so much information about the early cityscape here.

Scrutiny of bonded and non-bonded returns of house boundaries into their Via del Vesuvio façades adds information concerning the relative age and extent of the properties in the northern half of the *insula*. That the first northern boundary, separating the rooms behind entrance V 1,13 (shop-opening of the *caupona* in AD 79) from those behind entrance V 1,15 (a bakery in AD 79), was built as the south wall of House V 1,13 is clear. The corner consists of alternately lying and standing limestone ashlars, which, neatly bonded, turn into the Via del Vesuvio façade. South of this, the original façade of House V 1,15 was almost totally robbed in antiquity to create the two wide shop-openings (V 1,14 and 16), and furthermore damaged by bombing in 1943. Only a few signs of its early form remain, such as a pair of cubic capitals, originally set to form the top of the entrance pylons of House V 1,15. Today one is mistakenly restored to crown the pier that constitutes the south corner of plot V 1,14–16.[40] A line of wall plaster preserved in the sidewalk in front of the two large workshop thresholds indicates that the façade was originally closed,[41] without shop-openings.

The ashlar-built façade of the House of the Greek Epigrams (or more precisely, of its north front-shop, V 1,17,1), is positioned set back in relation to that of its northern neighbour, V 1,15 (or more precisely, its southern front-shop V 1,16h). Using the 3DHOP tool that permits to pass scrutiny from one side to the other of a wall, yielded additional information on this issue, revealing that the ashlar-built façade of V 1,17 meets the shared (west–east-aligned) boundary with V 1,15 at a point where a large lying ashlar, visible on the other side of the wall, impedes bonding. As a consequence, we may conclude that the whole ashlar-built façade of the House of the Greek Epigrams abuts the north boundary, which originally was built to define the border of the northern neighbour (V 1,15).

The Northwest Property

One more observation of importance must be made before moving away from the north-west area of the *insula*. The boundary between V 1,13 and V 1,15 features a walled-up doorway, indicating that the two separate properties functioning respectively as a *caupona* and a bakery in AD 79 once

[40] Boman & Nilsson 2006–2007, 146 and fig. 10. The original position of the cubic capitals is documented in the 19th-century cork model at the MANN.

[41] Mau described a high-quality 2nd-style decoration on the south wall of room V 1,14i, and suggested that it had been a *triclinium* (thus closed to the street) before being transformed into a workshop: Mau 1877, 129–130; 1882, 206–207, pl. 8; Beyen 1938, 284–288. For the drawing produced of this decoration (Mau 1882, pl. 8) or www.pompejiprojeket.se/insula.php, V 1 14–16 Bakery (Boman & Nilsson), Room 14i, Previous decorations.

Fig. 21b. Walled-up doorway in boundary separating V 1,13a from V 1,14i, viewed from the south, bakery side of the boundary. Photograph: Hans Thorwid 2007. Feature highlights: Henrik Boman.

were linked by a means of direct communication. An ashlar-built pillar, well exposed on the *caupona* side reaches through the full width of the wall (*Fig. 21a–b*). A view from the other *caupona*-side of the wall (*Fig. 21b*) demonstrates that it once functioned as door-jamb. Its lower part, visible below a large patch of ancient plaster, finds a match further east: the second door-jamb. The width between the jamb blocks is about a metre. The presence of this doorway, (walled-up to create a room in which the 2nd style decorations caught the eye of August Mau) suggests that the original property of the north-west *insula* corner included the space behind two AD 79 entrances, both V 1,13 and V 1,15.[42] It has been suggested that the northern part, V 1,13, was a house, properly speaking, a freestanding roofed space, whereas the southern part, V 1,15, for a time remained an area largely open to the sky.[43] Several ancient alterations mark its interior. After the depradations of both the World War II bombing and the 1980 earthquake, and subsequent restorations, none of the standing walls show early inner divisions. The last indications of large stone masonry belonging to the west street-front rooms (mainly door-jambs), were destroyed in the 1980 earthquake. Notwithstanding, we have chosen to recognize the two as one property in the early period and named it the Northwest Property (*Fig. 8*).

Low exploited areas: V 1.18, V 1,15, and more

The irregular layout of the peristyle area (V 1,18i) of the later House of the Greek Epigrams (*Figs. 1a*, *9*) constitutes an exception in this city block, best explained by regarding it as an in "between-area", a later infilling development defined by boundaries initially conceived for the neighbouring properties. In fact, we may suggest that two different waves of construction involving the *insula* as a whole decided the irregular boundary alignments of the two parts. It would seem as though we have an older, more pragmatically established push (with the relief of the landscape as a contributing agent) pro-

[42] *Figs. 21a–b* demonstrate the necessity of comparing wall readings of both sides of a wall. On the *caupona* side of the wall the east door-jamb is hidden by masonry resulting from modern restoration—irregular yellow limestone and grey pourous tufa blocks used as concrete reinforcement and ultimately covered by modern grey cement. On the bakery side the two door-jambs are visible at floor level but covered by ancient plaster, both painted fine plaster and undercoating. Both kinds are secured with modern cement. The stretcher on top of the west door-jamb, appearing as part of the ancient masonry, may well be a modern addition. All the masonry on top of the east door-jamb block is modern, belonging to two different restoration efforts. The last in line dates to 2008 when room V 1,14i received a totally new modern east wall. Mau (1882, 206–207, pl. 8) saw the decorative scheme of the south wall of room V 1,14i as typical of the 2nd style.

[43] www.Pompejiprojektet.se/insula.php, V 1,14–16 (Boman & Nilsson), Room 14i, North wall. Boman & Nilsson 2006–2007, 91–92.

ceeding from the north, and a more recent, concerted, and ordered land-division from south—the latter following the master plan of the late Samnite building boom. Even though the appearances of all Via del Vesuvio façades seem to correspond well with the idea of one concerted plan at its origin, the already described scrutiny of the return of the east–west aligned boundary between plots V 1,15 and V 1,18 and their Via del Vesuvio façades (including main entrance and flanking front-shops) helps to establish a building sequence demonstrating the Northwest Property as older than its southern neighbour, in this case the later *atrium* area (V 1,18b) of the House of the Greek Epigrams. In a bonded return, the boundary between them turns 90° and continues north to form a façade on Via del Vesuvio, whereas the façade of the House of the Greek Epigrams, V 1,18 with flanking front-shops is set back and abuts the shared boundary.

Continuing southwards, no similar clues may be found to establish the sequence of this façade and that of the West Property (in AD 79 comprising all openings numbered 20–24). The east–west aligned boundary between the two houses (V 1,18 and V 1,23) appears in the Via del Vesuvio façade as an ashlar-built pier, only standing part of the original façade, elsewhere demolished to create two shop-openings (V 1,19 north of the boundary and V 1,20–21 south of it). However, the scrutiny of the full length of the boundary above has already shown that the series of irregularities occurring in its alignment should be ascribed to activity on the south side. Furthermore, on the north, House of the Greek Epigrams side of the shared boundary, architecture remained sparse all through Pompeian city-life, whereas the area south of the boundary is dense in walls and rooms dating back to different building phases and to many successive changes.

In the *atrium*-peristyle areas of the later House of the Greek Epigrams, early remains are restricted to a short number of ashlar-built pillars (red dots in *Fig. 8*). All belong to the rooms that flank the *tablinum* (V 1,18l and V 1,18f) and functioned as door-jambs in the AD 79 version of the House, with one exception. Standing in the prolongation of the alignement that we know from further north as that of the boundary between the Northwest Propery and the Northeast Building, the last mentioned of the pillars may, together with one of the ashlar-built door-jambs belonging to the same south–north-oriented alignement, indicate that this alignement formerly held a framework boundary in which the two may have functioned as stanchions. In the *atrium* area, all other architecture apart from the *impluvium*, is of late date. Excavation undertaken in the peristyle garden, yielded no architectural structures, other than water installations and a patch of mortar floor in the north-east garden area, approximately half a metre below the level of the ancient flower beds, and well below the porticoes.[44] With such sparse remains, not even the joint evidence of wall-string study and building archaeological scrutiny allows us to determine the original relation between the *atrium* and peristyle areas in terms of properties. If several, it takes excavation to decide if the expansion took place from the property entered from Via del Vesuvio or from the Northeast Building entered from Vicolo delle Nozze d'Argento.[45]

The presence of unbuilt areas is worth more discussion because it may well have constituted a recurrent situation in more parts of this city block in the early days. As already touched upon, the areas corresponding to the *atrium* (V 1,18b) and peristyle (V 1,18i) of the later House of the Greek Epigrams seem to have remained largely unexploited for construction a long time after that they received solid-built boundaries in the late Samnite period. Worth some attention, perhaps as additional indicators of the low exploitation of the *atrium* area, the two front-shops (V 1,17 and V 1,19), which in normal order flank the entrance of the house beyond, lack communication by doors leading from shop to the house. Two high-positioned, later walled-up windows, pierced the boundaries shared with (and for) the neighbours,[46] once borrowing light from the area later to be the peristyle and *atrium* spaces of the House of the Greek Epigrams, adds to the idea that both spaces were of low use for domestic architecture and life.

Unbuilt areas may well have been part of the urbanistic situation in other parts of *Insula* V 1 both before and after the late Samnite building boom, well after in some areas. Behind entrance V 1,15, in this period south part of the Northwest Property, as in the area later to become *atrium* (V 1,18b) of the House of the Greek Epigrams, the street-front rooms represent the best preserved early remains. Behind this street front (V 1,14–16 and V 1,17–19), it may be hypothesized that large parts remained open to the sky (perhaps with another set of rooms at the rear). Investigation in V 1,15b (*atrium* of the later bakery) has shown that the *tufa impluvium* in V 1,15b, dated typologically to the mid-2nd century BC was not originally made for this house, but a reused structure brought here from some other context in a construction phase

[44] Staub Gierow 2006–2007, 110. On the flower beds: Robinson 2006–2007.

[45] For this discussion in former scholarship, see, n. 25.

[46] For images visit www.pompejiprojektet.se/insula.php. The walled-up window situated in the short section of out-of-alignment prolongation of the east boundary of House V 1,15, south of the kink in the boundary, above designated as Case 3 (*Fig. 9*), once assured a light intake from the area of the later northwest portico of the House of the Greek Epigrams into the southwest corner of House V 1,15. The other, situated in the boundary between the West Property (V 1,23) and the area to become *atrium* of the House of the Greek Epigrams, (in front and above of the entrance to room V 1,18f). South of the boundary, the west division wall of *triclinium* V 1,23k, belonging to a successive building phase, abuts the walled-up window and hides it from view on this side of the boundary.

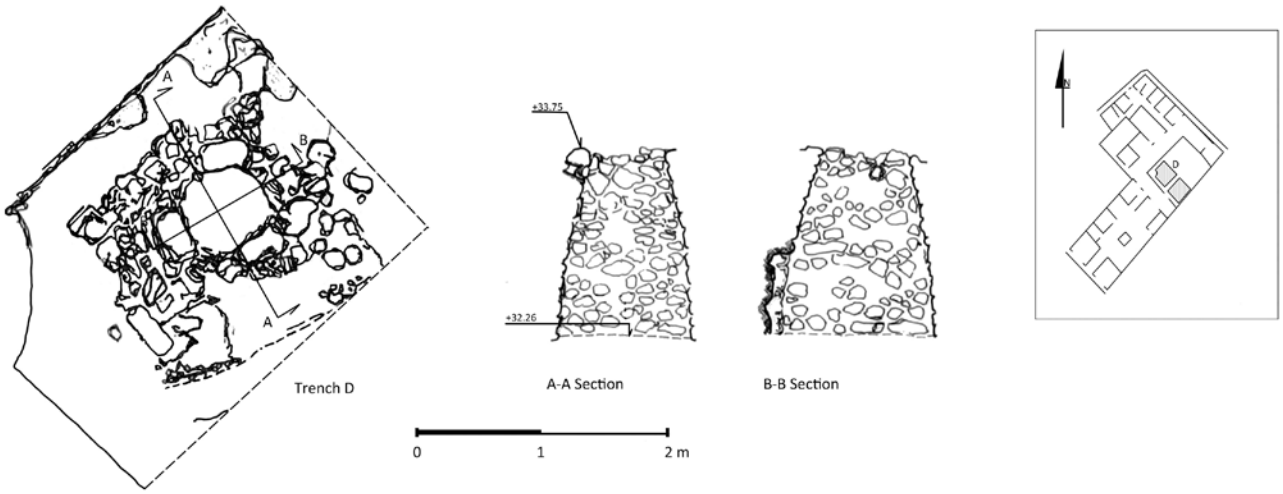

Fig. 22. Well mouth found during excavation in the peristyle garden (V 1,18i) of the House of the Greek Epigrams. The well found was in trench D, located in the south-east part of the garden as shown on the overall plan. Field drawing: Ezequiel Pinto Guillaume, processed by Henrik Boman.

postdating the extant floor. The new installation disturbed the floor, which is missing all around the *impluvium*. Also the conduit that runs from the small garden *viridarium* (V 1,15h) to the *impluvium* and further out to the street postdates the floor in the *atrium,* as well as that of the *fauces* (V 1,15a). The trench opened in 2005, adjacent to the *impluvium*, revealed that the extant *atrium* floor is the only floor ever constructed in the area and confirmed that the *impluvium* is a secondary installation in this house.[47]

Similar discussions have also concerned the situation in the southern part of the *insula*, since much effort to trace wall alignments pertaining to hypothetic original rear parts of the two small houses, V 1,3 and V 1,28, have failed (*Fig. 1a*). The progressive expansion of the House of the Bronze Bull into this area in following periods may well have been facilitated if this area remained of low exploitation and perhaps not even properly walled-in, as it was part of the dependencies of the large house.[48]

To return to the situation of the early land use in the area later to become House of the Greek Epigrams, a deep well, defined as such and not as a cistern shaft by the lack of confluents to a cistern in this area, was found during excavation in the garden (V 1, 18i, *Fig. 22*). Although the age of this well has not been established, it allows a hypothesis to be made about the function of the unbuilt area. Its nature, already described above as, at least at times, waterlogged,[49] may explain both the choice of location of a well and the architecturally unexploited nature of the area. The hypothetical presence of an early well takes us back to a discussion of the non-aligned wall adjustments to be found in the surrounding boundaries and the *insula* perimeter (*Fig. 9*, Cases 1–3). They could indicate places reserved for openings, where neighbourhood access-ways to the water supply were situated.

1ST CENTURY BC. *INSULA*-ENCOMPASSING GENTRIFICATION

Overview

The second half to late 1st century BC is when this *insula* became fully developed. The East and West Properties fused into one. A separation occurred in the Northwest Property, resulting in the narrow house we know from its AD 79 format (*Fig. 1a*), and south of it, a modest-sized house (V 1,15) decorated in the late 2nd style.[50] The House of the Bronze Bull was enlarged towards the north-west, beyond the supposed location of its original west boundary (*Fig. 8*), first with a series of small garden rooms (later demolished) and a larger *triclinium* (V 1,7f) opening towards the south-west part of the peristyle (V 1,7b).[51] Another garden *triclinium* was created when the entrance of the north-west *atrium* room (V 1,7,18) was

[47] www.pompejiprojektet/insula.php, V 1 14–16 Bakery (Boman & Nilsson), General description Boman & Nilsson 2006–2007, 91–92.

[48] On the progressive expansion of the House of the Bronze Bull: Staub 2013, 61–62.

[49] A substantial bed of large coarse pottery sherds found all over the garden (V 1,18i) may indicate an effort to drain the terrain before establishing more normal domestic architecture here, at a later period.

[50] Ehrhardt 1987, 95–100: *Kandelaberstil.* On this particular decoration (situated in the street-front room designated V 1,14i in this paper, but V 1 14j by Ehrhardt, and its 4th-style additions: Ehrhardt 2012, 98; *PPM* III, 534–535; Mau 1877, 130; 1882, 208, 254 pl. 8. The house, here V 1,15, is designated V 1,14 by Ehrhardt 2012.

[51] Staub 2013, 43–45, figs. 40–41.

Fig. 23. East insula *perimeter with added inner wedge-shaped wall-shell revetment in small tufa blocks. House of the Greek Epigrams, north wall of room V 1,18k. See also the ground-plan produced by means of horizontal sectioning,* Fig. 9. *Photograph: Hans Thorwid.*

walled-up and a new, wide doorway was opened towards the peristyle.[52] The *atrium* area was thoroughly redecorated in the 2nd style.[53] The most novel creation was, however, the House of the Greek Epigrams. The only house for which we lack clear evidence of refashioning in this period is the South House of Caecilius Iucundus, maybe in part due to its thorough modernization in the imperial period.[54]

The House of the Greek Epigrams.V 1,18.11.12

The newly created House of the Greek Epigrams was decorated according to the late 2nd style. The house gained its modern appellation because of the high-quality, figured motifs accompanied by Greek-languag epigrams, which decorate three of the walls in exedra V 1,18y.[55] The peristyle and atrium areas, as well as the former Northeast Building, were all engulfed into the fashionable dwelling. The wish to create an illusion of right-angled regularity and alignments explains a series of alterations made especially in the old well area,[56] now transformed into porticoed peristyle (V 1,18i). Horizontal sectioning (*Figs. 9, 19a*) best demonstrates the effort made to remedy the situation caused by the cramped position between the non-matching orientation of the borders that defined the area, where "hardly any straight lines can be observed in either walls or colonnades and perpendicular corners are rare."[57] In large, the layout of the peristyle porticoes follow the alignment set by the line separating peristyle and *atrium* areas, which indicates that the Via Vesuvio entrace was seen as the main entrance of the new dwelling. To obtain effect of parallelism between the east and west frames of the peristyle area, a new wedge-shaped wall-shell revetment was added to the inner face of the perimeter (*Fig. 23*), thus receiving the same orientation as the extant line to the west, separating the persityle and *atrium* areas. A similar addition of a wedge-shaped revetment provided a perpendicular interior layout also to the Epigram Room (V 1,18y). On the north side or the peristyle, a new alignment was created for the front of the garden rooms (*Fig. 24*). Now protected from flooding by the portico, this new alignment of the front of the garden rooms protruded onto level ground about a metre in front of the (hypothetical) course of the former southern boundary of the Northeast Building (*Fig. 8*). All rooms were levelled, leaving the slope only in the corridor (V 1,18q) leading towards the *posticum* opening on entrance hall V 1,18w and the further northern rooms.

Several of the new fronts of the north garden rooms were, as may be deduced by the building materials used, reworked in the imperial period.[58] In the east half of this garden front, however, much remains of the material that may be defined as typical of that used in the creation of the House of the Greek Epigrams. Small standardized blocks in limestone or tufa, here indiscriminately labelled *tufelli*, were used in regular courses for the carrying members of the new architecture, such as door-frames, assuring the masonry's strength to bridge openings, to support first-floor and roof constructions, or for quoins (*Figs. 23, 24*). Wedge-shaped limestone blocks alternating with similarly

[52] Staub 2013, fig. 23.
[53] Staub 2013, 66–69, fig. 63, with full quotation of Mau 1882, 252–253.
[54] We have a sequence of changes related to the peristyle V 1,26l (involving both its creation and the closing of the east portico), but lack clues to more precise dating. The sequence of development as outlined in our preliminary publication (Karivieri & Forsell 2006–2007, 132–138) awaits partial revision.
[55] On these paintings: Mau 1884, 465–467; Strocka 1995; Bergmann 2007.
[56] Observe the effort to create an impression of regularity in the peristyle area in spite of the fact that its borders lack perpendicular returns. The existing north portico is imperial; it had a slightly differently aligned predecessor: Staub Gierow 2006–2007, 109–110.
[57] www.pompejiprojektet.se/insula.php, V 1,18 Casa degli Epigrammi greci (Staub & Staub Gierow), Room i (peristyle).
[58] We may suggest a collapse in this part due to the AD 62/63 earthquake.

Fig. 24. North garden front rooms of the House of the Greek Epigrams. Note the upwards-sloping floor of corridor V 1,18,q cf. Fig. 20. *Photograph & ortho-mosaic: Hans Thorwid.*

shaped but differently coloured tufa blocks were used to form relieving arches. In much, the function of the *tufelli* masonry was similar to that of the limestone ashlars of the earlier architecture: it was structural, providing strength for walls made with inferior technique, *opus incertum*, or rubble. Occurrences of the same building material in both the *atrium* area and in the area formerly constituting the Northeast Building reveal the extent of the house, both to Via del Vesuvio and to the north rear street, Vicolo delle Nozze d'Argento, as we know it from its AD 79 situation. Access to and from Vicolo delle Nozze d'Argento was provided by a new doorway (somewhat wider precursor to V 1,11), functioning as *posticum*.[59]

Room V 1,18m is the northernmost of the new garden architecture of the House of the Greek Epigrams. Until recently, it presented well-preserved late 2nd-style decorations, stylistically matched by the still-extant mortar floor decorated with rich and varied patterns, made of white *tesserae* inserted into the red mortar revetment (*cocciopesto*).[60] Accessed only from the north portico by way of a narrow corridor (V 1,18m'), it was situated between the rooms of the garden front and those behind, facing the north street (Vicolo delle Nozze d'Argento). To create its oblong layout an earlier north–south-aligned wall, still witnessed as a truncated support in the east–west running walls, had to be taken down. It has been suggested that the room lacking windows functioned as a summer *triclinium*.[61] The unusual position and shape of the room indicate that the space north of it had been ceded to the house accessed by entrance V 1,13 (later a *caupona*). The presence of another deep well in the ceded room (V 1,13f) has already been noted (*Fig. 16*).[62] It undoubtedly represented an important asset, albeit one no longer needed in the new large dwelling which held other resources for its water supply—the garden well, and perhaps a compluviate *atrium* roof.[63]

West Property and East Property become one.V 1,23.10

To the south, the fusion of the West and East Property generated large changes. The entrance on Via del Vesuvio (V 1,23) was now the main entrance. As already mentioned above, the wall adjustment (*Fig. 3*)—representing the final closing of the north side of courtyard V 1,23l, between the two older properties (the East and the West Property)—used limestone ashlars together with smaller, irregular small stones in the fill (*Fig. 10)*. The same yellow-buff Sarno limestone in large blocks and smaller pieces characterizes the north wall of the *atrium* V 1,23b (*Fig. 11*), later to become the boundary between the North House of Caecilius Iucundus (V 1,23) and the large workshop V 1,20. Since a 1943 bomb destroyed most of the extent of this wall further west of the preserved limestone-strengthened *opus incertum* of the late 1st century,

[59] In contrast with the earlier, walled-up doorways on this street, the level of V 1,11 adjusts to that of the sidewalk. In the imperial period the opening was enlarged to acccomodate two doorways V 1,11 and V 1,12, the latter giving direct access from the street to a first-floor flat.

[60] Today totally eroded, the wall paintings were still in good condition when photographed for publication in *PPM* III, 1991. For images of the floor, see, www.pompejiprojektet.se/insula.php, V 1,18. Casa degli Epigrammi Greci, Room m (*triclinium*), Floor.

[61] Strocka 1995, 270.

[62] On the temporal belonging of this structure to an early phase of the room (preceding both paved street and sidewalk on the outside: Boman 2008, 87; www.pompejiprojektet.se/insula.php, V 1,13, Caupona (Nilsson), Room f, Well.

[63] A compluviate roof is defined by its slope towards a central non-roofed area corresponding in size to that of the *impluvium* pool in the *atrium* floor, beneath. Its purpose was rainwater collecting. The technical prerequisites for a compluviate roofing above this *atrium* is discussed in Campanaro forthcoming.

Fig. 25. Cistern mouth in the north-east corner of workshop rear room V 1,20d. Behind, the small and high room V 1,20f, functioned both as a downpipe for rainwater harvesting and as a light-shaft accomodating both room V 1,20d to the west and, by a window in the south wall, room V 1,20e. View towards east. Photograph: Henrik Boman.

nothing can be said concerning the appearance of the *atrium*'s north side in the preceding West Property period.

That the doorway leading from the *atrium* V 1,23b into V 1,20e allowed communication in the 1st century BC is demonstrated by the use of a set of two thin limestone ashlars as a door-jamb (*Fig. 11*). The cistern mouth situated inside the workshop to which this doorway led, in rear room V 1,20d (*Fig. 25*), is probably linked to the same cistern as the *puteal*-decorated mouth belonging to the enlarged open courtyard, V 1,23g,l (*Fig. 13*),[64] from now properly enclosed by the adjusted north perimeter. The age of the cistern cannot be confirmed with certainty. It could belong to this period or to that of the earlier West Property. In this period, however, it received new means to secure its rainwater provision. The high, shaft-like room (*Fig. 25*) situated in the north-east extreme of the workshop (V 1,20f) had walls and floor covered by hydraulic plaster and functioned as both large downpipe (*c.* 1.9 x 1.1 m) and light-shaft. Water was led here from the roof above the upper floor above the workshop and from that of the *triclinium* occupying the space east of the workshop area. This, the west *triclinium* (V 1,23k), was entered from forecourt V 1,23g and, as noted above, had a large window towards the open courtyard/garden (V 1,23l). Its west, rear wall abuts the, by now, blocked window, originally built as a light-intake from the neighbour (the earlier open space, but by now become *atrium* [V 1,18b] of the House of the Greek Epigrams). The original wall decorations of the *triclinium* are hidden behind the late 3rd-style decoration still extant. Remnants of a mortar floor with borders of tessellated inlays, lines of cross-patterns consisting of a black *tessera* surrounded by four white ones, agree stylistically with floors firmly identified as belonging to rooms decorated in the late 1st century BC in this *insula*.[65]

Further east, another large dining room (later to become V 1,26o) was created, using older walls belonging to rooms next to the original west boundary of the East Property (*Fig. 26*).[66] This boundary was taken down, apart from the truncated section in the north wall of the new dining room, spared as support for the new concrete masonry permitting the room to advance some 2.2 m into the space of courtyard V 1,23l. The thus considerably enlarged room, the east *triclinium* (precursor to the even larger *triclinium* V 1,26o in the imperial period) was most likely entered by a corridor-like antechamber using the boundary towards the South House of Caecilius Iucundus (V 1,26) as its south wall. This antechamber may have admitted access from both sides, east and west. This is at least what is suggested by the two niches, cupboards in the imperial period but most likely doorways in the phase under discussion here. A large window, equivalent in size to that of *triclinium* V 1,23k, on the other side of the courtyard/garden, allowed light intake and view (*Figs. 12a–b, 13, 26, 27*). The technique used for the west part of the room is characteristic: *opus incertum* masonry

[64] For study of some Pompeian cisterns and cistern mouths: Sear 2004.

[65] The same design occurs in the threshold decoration of corridor V 1,18m' at the opening of *triclinium* V 1,18m in the House of the Greek Epigrams. There are several well-preserved mortar floors decorated with more elaborate tessera insertions in the House of the Greek Epigrams. In House V 1,15, the *triclinium* later to be transformed into *taberna* V 1,14i presents a mortar floor decorated with randomly set *tesserae* (Boman & Nilsson 2006–2007, 150). Both these houses had wall decorations typical of the 2nd style. For images, see www.pompejiprojektet.se/insula.php.

[66] The East Property most likely possessed two rooms entered from the east and using the property's west boundary (cf. ground-plan in *Fig. 8*) as the rear wall. Significant damage, not least due to consecutive extensive rebuilding in antiquity and in more recent times, as well as the 1980 Avellino earthquake, makes the detailed study of the inner divisions within the old East Property challenging and time-consuming.

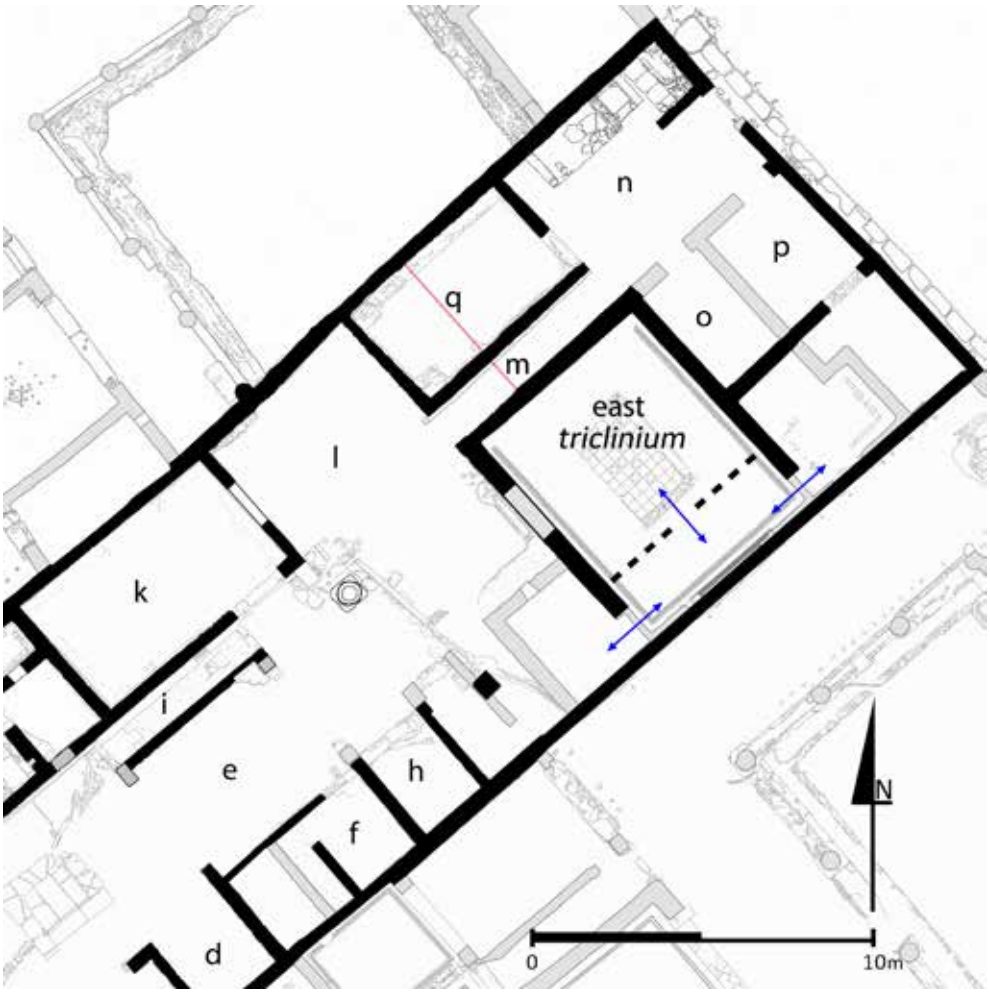

Fig. 26. East triclinium *(later V 1,26o) of V 1,23.10 (later North House of Caecilius Iucundus) with surrounding architecture in the 1st-century BC phase. Blue arrows mark accesses to the* triclinium *by an antechamber with a corridor-like layout. The red line indicates the course of the robbed west boundary of the former East Property. Illustration: Henrik Boman & Ezequiel Pinto Guillaume.*

inserted between supporting *tuffelli*-pillars. Two such pillars are easy to spot in the façade towards courtyard V 1,23l, one fuctioned as frame to the large window, another formes the north-west quoin of the room (*Fig. 27*).

Inside, decorations fallen from the the north-west corner of the room reveal a wall-shell of *tufelli* that abuts the truncated wall embedded in its north wall, whereas the corresponding, outside wall-shell consists of *opus incertum* only. Inside the room, the full extent of the west delimitation wall can be followed all the way south to the *tufelli*-built door-jamb of the presumed antechamber (*Fig. 28*). Above and beside this door-jamb, the state of the extant ancient masonry indicates that here one or maybe two *tufelli* pillars collapsed and were repaired in antiquity. Different materials, brick, concrete, and a mix of *tufelli* and concrete were used for and recycled in the repairs. The collapse within the old wall most likely occurred during the subsequent enlargement of the room in the imperial period, when the former east *triclinium* was converted into the main dining room (V 1,26o) of the double-*atrium* house of Caecilius Iucundus. The enlargement signified the removal of the antechamber and the creation of a new doorway towards the south. Obviously a number of repairs and adjustments were needed. The west wall was strengthened by means of a brick-built pillar replacing the former south window frame, the window was walled-up, as was the former doorway. At higher elevation, the collapse within the wall was remedied and arrested by means of a new concrete core. The new room was totally decorated in the 4th style.

There are no explicit criteria for dating the creation of the east *triclinium* (later V 1,26o). The similarity between the size and proportions of its window and those of the window of the better-dated west *triclinum* (V 1,23k) may be reckoned as the strongest on-site-argument. The *tufelli*-supported masonry (*vittatum simplex*) is another. In this house, it occurs only in the enlargement towards the west of the *triclinium*, and for the partition wall between kitchen and latrine (V 1,23n, *Fig. 6*). Both these measures evidence the changed configuration of functions and the endowment of higher status to

Fig. 27. Opus incertum *masonry supported by* tufelli *framework. West façade towards courtyard V 1,23l of the east* triclinium *(later V 1,26o). To the right, later brick repair replacing the original southern* tufelli *frame of the blocked window. Photograph: Hans Thorwid.*

the house in this building phase, preceding the merge of the North and South House of Caecilius Iucundus. No *vittatum simplex* is found in the South House of Caecilius Iucundus, to which the North House was to be annexed some two to three generations later. In contrast, in the 2nd-style peristyle area (V 1,18i) of the House of the Greek Epigrams, *tufelli* occur abundantly (*Figs. 23, 24*), especially as material for supports to the concrete walls where openings were bridged. That this choice of material only provides circumstantial evidence for dating, marking relative rather than absolute chronology, is demonstrated by its use in a rebuild occurring in the south part of the *insula*, which by building archaeological sequence belongs in a rebuild of the imperial period. In the small house V 1,3 (*Fig. 1a*), clearly imperial (probably post-earthquake AD 62/63) *tufelli* frame the doorways leading from the *atrium* (V 1,3,2) to the rebuilt *cubicula* on its west side (*Fig. 29*).[67] This is one example among many demonstrating how an *insula*-based perspective offers modifications to received ideas about dating criteria in Pompeian building archaeology.

A more conclusive piece of evidence of the chronological context of the east *triclinium* (later V 1,26o) is retrieved

[67] The imperial *tufelli*-quoined door-jambs in V 1,3,2 stand on older thresholds, which correspond to the *atrium* floor, which in turn is placed above an earlier floor (not seen in *Fig. 29*) related to presumably early imperial brick architecture in the southern part of the *atrium* of House V 1,3. *Tufelli*-framed doorways are also noted in architecture dated to the Julio-Claudian period in the House of the Bronze Bull: Staub 2013, 46.

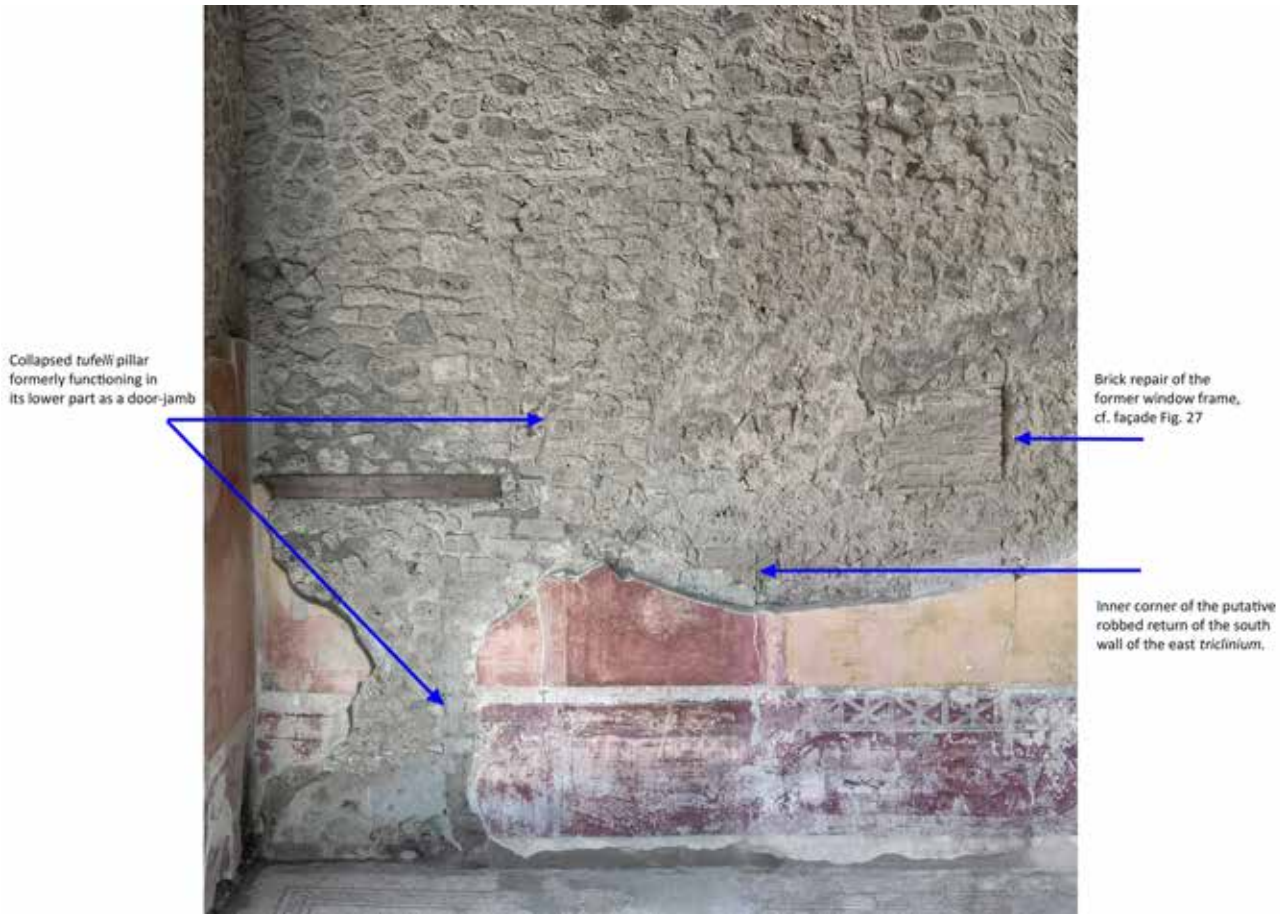

Fig. 28. West interior elevation of triclinium *V 1,26o. The fallen-off 4th-style decorations reveal construction techniques of and repairs to the wall. Two* tufelli *pillars preserve their original position: one framed the entrance of the antechamber, the other standing further north is the putative mark of the return of the wall dividing the earlier east* triclinium *from its antechamber. Above doorway level, the partly collapsed* tufelli *pillar is embedded in an* opus incertum *fill. This repair belongs to the later phase when the east* triclinium *was transformed into V 1,26o. A brick pillar, substitute for the former window frame (more conspicuous in the exterior elevation,* Figs. 12b, 13, 27*), assures the strength of this fill. Photograph: Hans Thorwid. Feature highlights: Henrik Boman.*

by comparing its size and layout with securely dated 1st-century BC examples elsewhere in Pompeii. In this search the remote approach offered by digital plans proved most rewarding. The detailed city plan accompanying the volume *The world of Pompeii* allowed us to produce screenshots at the same scale to compare our room-plan to those of other houses, sampled for comparison on the criterion that they were known for well-preserved 2nd-style wall-decorations.[68] The digital plan study showed that the measured surface of the east *triclinium* and its laterally positioned entrance antechamber compares especially well to the famous "Elephant Room" of the House of the Ilion Sanctuary (I 6,4).[69] Furthermore, in both, light intake was provided by a large window, opening over a garden area. In the case of V 1,23, the window of the east *triclinium* (later V 1,26o) provided a view along the main axis of the house, through the wide *tablinum* (V 1,23e) to the entrance (*Figs. 12b, 13*).

Inside the east *triclinium* (later V 1,26o), analysis of the partly collapsed *tufelli*-built west wall suggests a probable ap-

[68] Digital plan on CD accompanying Dobbins & Foss 2007. For a list of the houses with the most diagnostic 2nd-style decoration in Pompeii: Strocka 2007, 306. The seminal work on the 2nd style was published by Beyen in 1938. For a plan of the location of the medium-size and largest houses, Heinrich 2002, p. 54.

[69] A valid *comparanda* in design is also furnished by the west *triclinium* V 1,23k. The broken angle of its entrance is similar in concept to that suggested for the east *triclinium* (later V 1,26o). Its division in two parts, antechamber by the doorway and *triclinium* proper, was commented upon by Mau 1876, 245, guided by the floor decoration (in much better condition in his day), and the difference in height of the roofing. The high roof above the antechamber is here understood as part of the organization assuring rain water flow towards west and the room functioning as large downpipe V 1,20f inside workshop V 1,20 (*Fig. 25*).

Fig. 29. The imperial-age tufelli*-framed door-ways leading from the* atrium *towards the* cubicula *of House V 1,3, west wall of* atrium *V 1,3,2. Photograph: Hans Thorwid.*

proximate location for a robbed division between the original *triclinium* and its antechamber (*Fig. 28*). In its south extreme the wall has a particularly wide *tufelli* structure (plausibly conceived as two closely set pillars with a concrete fill in-between). The interpretation is that this pier had several functions: to back the return of a room divider, support the bridging of a doorway, and carry the weight of the roof. The inner dimension of the room may be estimated at *c*. 26.5m^2.[70]

1ST CENTURY AD. LARGE HOUSE OPULENCE AND BUSY WORKING PREMISES

The remodelling of the north part of the *insula* towards the end of the 1st century BC merits the term gentrification. In the imperial period, this development continued in the three large residences, the House of the Greek Epigrams, the double-*atrium* house of Caecilius Iucundus, and the House of the Bronze Bull. In parallel, outside and around them, work and business areas gained more space. Regarding this, the final period of life in the city block, the possibility of discerning the activities conducted in the working premises is greater than for earlier periods. Some, such as, the *caupona* (V 1,13) and the former dwelling (V 1,15) now converted into a bakery, defined as such by two ovens located in the garden area of the house (V 1,15h),[71] appear to have had the status of independent businesses, separated from influence exercised from the large residences. Others, in contrast, clearly may be defined as dependencies to the residences. This goes for the cloth-dyeing workshops opening on Via di Nola (V 1,4–5) furnished with water by means of rainfall-collecting in *atrium* house V 1,3 and an aqueduct connection directed into house V 1,3 from the kitchen area of the House of the Bronze Bull. The fullers in V 1,2, although lacking direct connection to the water

[70] Measured on the 3D model as 4.6 m (west wall as measured from the north extreme of the investigated *tufelli* structure) x 5.8 m (north wall), that is *c*. 26.5 m^2. To be compared to the *c*. 25 m^2 of the west *triclinium* V 1,23k (surface including antechamber—this room had no built dividing wall).

[71] The formerly closed façade of room V 1,14i was demolished to create a shop-opening onto Via del Vesuvio. The late 2nd-style decoration of its south wall was enriched with a central vignette agreeing with 4th-style aesthetics: Ehrhardt 2012, 98.

supply in V 1,3,[72] most probably belonged to the same dyeing enterprise. Second-floor apartments with direct access from the street (V 1,12 and V 1,21), and thus separate from the first floor dwellings, is another new feature that makes its appearance in this period.[73]

The House of the Bronze Bull, the most important among the residences in this city block from the start to the end of Pompeian city-life, seems to be at the centre of the important cloth and dyeing business of the south-east workshops, and underwent important enlargement and restructuring, both concerning workshops and residence.[74] Most of the south-western area was totally restructured; only the large tufa foundation blocks under the brick-built façades of the entities V 1,32.1 to V 1,3 bear witness of the original, unbroken structure dating back to the late Samnite building boom.[75] After a first enlargement in the 1st century BC, a second, larger expansion into the neighbouring west area took place in the Augustan–Claudian time, as indicated by the associated wall decorations in various parts of the house. It comprised a bathing suite (V 1,7,19,20), a kitchen (V 1,7,l), and along the north border, the large reception room (V 1,7g)—the largest roofed space in this city block (*c.* 50 m^2). Two new doorways allowed communication with the small house V 1,3 in the south-west corner of the *insula*, thus creating a double-*atrium* complex.[76]

The double-*atrium* house of Caecilius Iucundus, V 1,23.10 & V 1,26

The creation of another double-*atrium* complex, the House of Caecilius Iucundus, by the merging of the North and South Houses of Caecilius Iucundus, is of special importance to Pompeian archaeology because, thanks to the 3D documentation undertaken, it is now firmly anchored in time. Confirmation of the stylistic dating, to the 40s AD, of the high-quality wall decorations in the *tablinum* (V 1,26i) of the South House of Caecilius Iucundus was acquired thanks to the bird's-eye view provided by the 3D model. This alternative view of the ruin brought attention to a series of piers in brick (*opus testaceum*) or brick-and-block (*opus vittatum mixtum*) technique (*Fig. 30*). Obvious additions to the concrete architecture, they occur on both sides of the old boundary between the North and South Houses (*Fig. 31*), and most significantly so in two of the three new passages opened in the former boundary (*Figs. 32, 33*).

All these piers were of structural importance, set to carry load from upper floors and to secure vulnerable parts of the architecture, such as new or enlarged wall openings. The brick-and-block technique was preferred for the top of the columns of the peristyle porticoes, given new height in this building phase.[77] The dating of these strengthening devices, and through them of the merge of the two houses, is secured by graffiti inscribed into the painted plaster covering of a new column, raised from the base and built fully in brick-and-block technique (*Fig. 34*). It is one of a pair supporting the roof of a decorative portico front extending a pre-existing exedra (V 1,26r), the centre of the three east garden rooms (V 1,26s-r-t), into the garden space (cf. *Fig. 1b*). The inscriptions on the bright-red painted plaster covering of the column, lost today but published in the 19th century,[78] both stated the name of the emperor, "*TI CLAUDI CAESARIS*" and "*TI CLAUDI*".

In the preliminary report published on our work in the House of Caecilius Iucundus, Arja Karivieri and Renée Forsell interpreted this exedra as an intermediary addition, created between two separate decoration phases:[79] the earlier understood as the merge of the two houses, characterized by 3rd-style decorations, and the later entailing a new fashion in wall decoration, the 4th style.[80] The time estimated to have lapsed between the two, "a couple of decades", is slight, because damage observed in the east garden rooms led to the conclusion that the 4th-style phase occurred prior to the earthquake of

[72] Flohr 2011, 4, erroneously concluded there was a water line passing from the *atrium* V 1,3 into the fullers' premises. Instead the fullers could have drawn water from the maybe privately sponsored street-fountain (fountain head without built basin) outside the façade between V 1,3 and V 1,4: Staub 2013, 23.

[73] Leander Touati 2010, 152–154.

[74] Staub 2013; Borgard 2002, 61–62.

[75] The façade from V 1,3 to the east *insula* corner is preserved in its original form and material of large tufa blocks. The importance of the main house can be seen in the imposing entrance façade with its large order of pilasters. Figured capitals crowned those, framing the entrance to the residence. One of the figured capitals was found during excavations of the street-front part of this house in 1838, and is now preserved in the on-site storage area at Pompeii: Inv. nr: SAP 2954. On the capital, see von Mercklin 1962, 71–73.

[76] Doorways between the kitchen area, room V 1,7i, to corridor V 1,3b and through *cubiculum* V 1,7,15 of the *atrium* area and corridor V 1,3,3. In a final stage, House V 1,3 regained some of its independence. The rear passage, serving the domestic work area of the House of the Bronze Bull was closed off, maybe contemporary to the creation of the hearth in the *atrium* (V 1,3,2) of House V 1,3, underlining its acquisition of self-sufficiency. Staub 2013, 106.

[77] Dexter 1974, 45–46. A discussion on the varying builds of the peristyle columns is reserved for a forthcoming study projected by Arja Karivieri and Renée Forsell.

[78] *CIL* IV, 4089–4090.

[79] Karivieri & Forsell 2008, 135. The understanding of the 3rd style in the house as Augustan suggested in *PPM* III (A. de Vos), 575, gave an erroneous point of departure for the development.

[80] Karivieri & Forsell 2008, 133, 136–137. Red colour dominated the garden space. It was used for columns, *plutei* (low garden walls), and the gutter along the *pluteus*, as demonstrated by the addition of the lustrous red-painted stop of hydraulic plaster that was introduced where the east gutter was interrupted by the floor of the new garden exedra. The change to a yellow–white–green palette and a higher *pluteus*, presented by Karivieri & Forsell 2008, 135 as part of the pre-earthquake 4th-style phase, most probably occurred after the earthquake of AD 62/63.

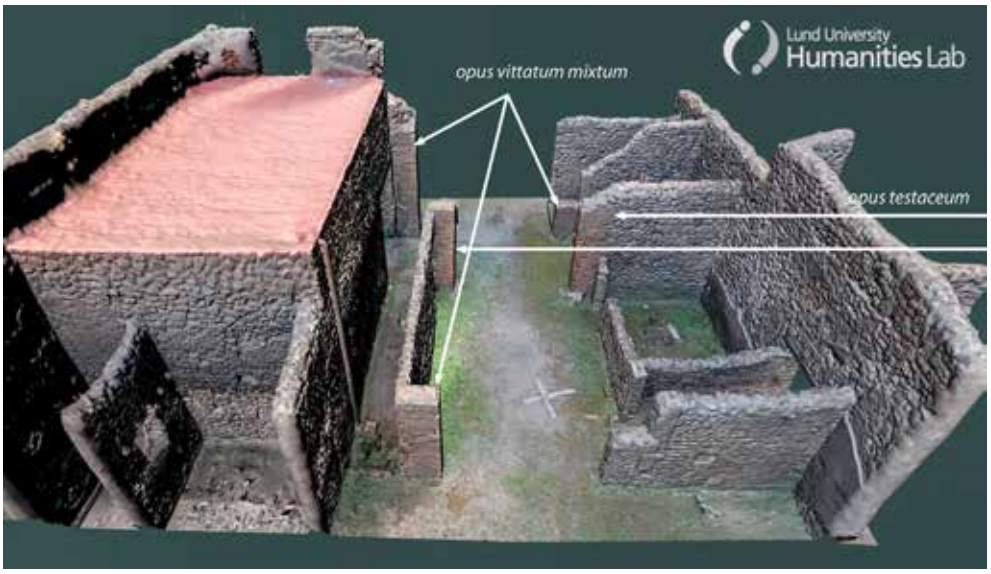

Fig. 30. Bird's-eye view of the middle section of the North House of Cacilius Iucundus centred on its tablinum *(V 1,23e). Masonry in brick-and-block* (opus vittatum mixtum) *or brick* (opus testaceum) *technique characterizes a series of structural elements, load bearing piers and strengthening pillars in both parts of the new double-*atrium *house. Visualization: 3DHOP software. Feature highlights: Henrik Boman.*

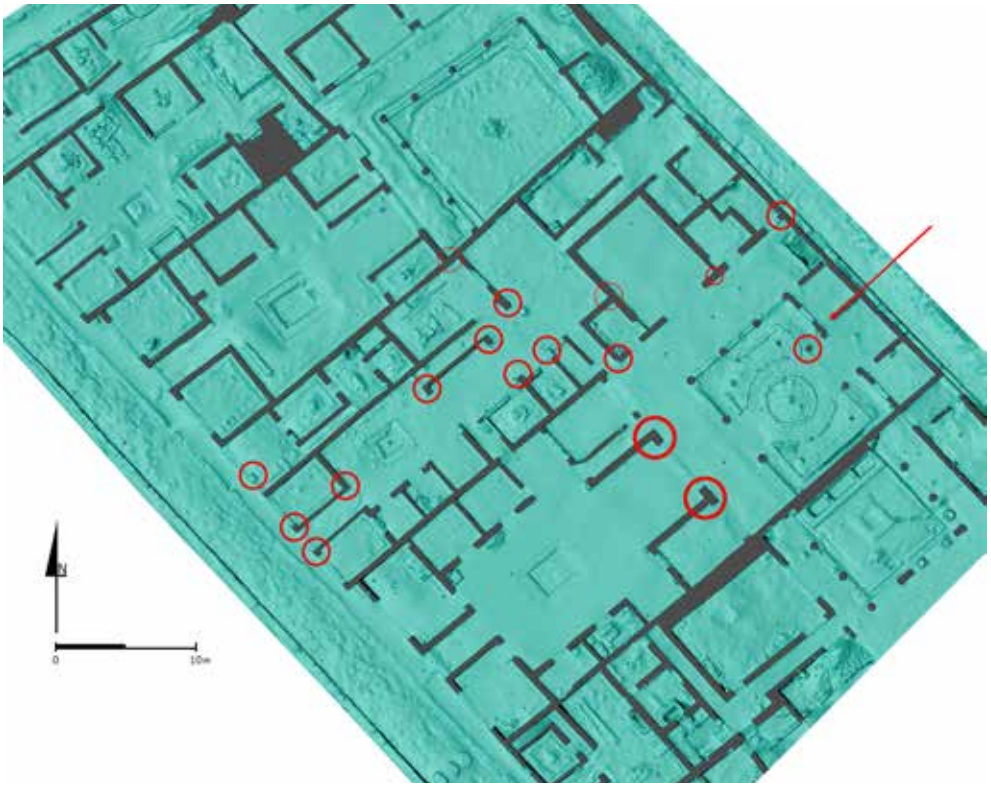

*Fig. 31. The distribution and use of brick or brick-and-block masonry reveals its structural part in the architecture of the merge of the two houses to create the double-*atrium *house of Caecilius Iucundus. The arrow indicates the graffiti-inscribed column giving the name of Emperor Claudius (the intricate patchwork masonry characterizing the columns of the peristyle porticoes is left unaccounted for). Visualization: 3D Studio Max software. Feature highlights: Henrik Boman.*

AD 62/63.[81] A second 4th-style phase involving earthquake repairs of extant decorations, such as the large-scale (*megalography)* wildlife on the south wall of the garden, and partial or whole rebuilds of more spaces, some of which were work in progress in AD 79.[82] Thanks to the bird's-eye-view approach this understanding is now revised, and instead of the four phases presented above, we now recognize one single huge remodelling phase (the merge), and some post-earthquake

[81] Karivieri & Forsell 2008, 136.

[82] Karivieri & Forsell 2008, 136–137.

Fig. 32. Brick pillar functioning as a door-jamb in the South House of Caecilius Iucundus. Doorway opened in the east extreme of the former boundary. View towards south and the cellar below the east portico rooms (V 1,26s,r). Photograph: Hans Thorwid.

*Fig. 34. The brick-and-block built front column of exedra (V 1,26l) of the South House of Caecilius Iucundus onto the plaster of which two graffiti inscriptions: "*TI CLAUDI CAESARIS*" and "*TI CLAUDI*" could be read in the 19th century. Room V 1,26s (east portico) and north portico in the background. Photograph: Hans Thorwid.*

adjustments. The remodelling is firmly dated in the Claudian period by the joint evidence of the exedra graffiti (V 1, 26l) and the high quality, late 3rd-style paintings in the *tablinum* (V 1,26i) of the South House of Caecilius Iucundus.

This conclusion states that the 3rd style of the *atrium-tablinum* area of the South House of Caecilius Iucundus belongs to the same modernization as some, if not all garden rooms decorated in the 4th style. This fact, perhaps not surprising as such,[83] is of undisputable value to scholarship on Roman painting in want of a fixed anchorage in time for the transition of the two fashions in interior decoration.[84] However, for the present study, the main importance resides in the bird's-eye view (that is, of 3D visualization) shown as way to disentangle and obtain better understanding of the building archaeological development.

The value of the bird's-eye view to the understanding of the new architecture was first noticed during the study of the *atrium-tablinum* area of the North House of Caecilius Iucundus (*Fig. 30*). This visualization of the architecture highlighted the similarity in position and thus in function of the brick and brick-and-block masonry, later identified as characteristic traits of the merge. The shaft of the column of the garden

[83] For dating the 4th style in the 40s AD: Strocka 2007, 307, 317. For contemporary use of the two styles in Pompeii: Ehrhardt 2012, 221.

[84] For the lack of temporal fix points concerning the 3rd style in general: Strocka 2007, 314.

Fig. 33. Wall section in opus vittatum mixtum*, support to masonry bridging two openings in the former boundary. View from the west garden portico of the South House of Caecilius Iucundus. The west doorway (left in image) opens on the corridor (V 1,23l') leading to open courtyard (V 1,23l) of the North House; the east doorway is the entrance to the new room (V 1,26n) built to flank the large* triclinium *V 1,26o (previously the east* triclinium *of the northern building). Photograph: Hans Thorwid.*

exedra, in the bright red-painted plaster cover of which the graffiti to Emperor Claudius were found (*Fig. 34*), is built of brick-and-block masonry.[85] Apparently interchangeable, the two techniques occur at strategic points in both parts of the double-*atrium* house (*Fig. 31*). Introduced in places where bridging large openings required solid reinforcement to carry the weight of a second floor, these piers were used throughout to secure vulnerable points of the new architecture. Among the openings, the two easternmost passages through the former boundary between the houses, are of particular importance for the temporal contextualization of the new need for sturdy piers. Both passages open into the north wall of the garden portico (V 1,26l), the rear (northern) wall of which was fully rebuilt to create a new configuration and add prestige to the peristyle area, by creating rooms V 1,26n-o-p and the two passages between the North and South Houses (*Fig. 35*). The easternmost of the passages provided direct access (through room V 1,26q) between the kitchen area (V 1,23n) located in the North House of Caecilius Iucundus and the cellar beneath the east portico rooms of the South House of Caecilius Iucundus (V 1,26s-r). The famous archive of Caecilius Iucundus was found in this area, on the floor above the portico; the opening beneath was secured by means of a brick pillar functioning as a door-jamb (*Fig. 32*). The second opening, linking the garden area (V 1,26l) with the courtyard (V 1,23l) of the north house, had higher status. Much wider than the former, it was divided in two by a sturdy pier in brick-and-block technique separating the corridor (V 1,23l') towards courtyard (V 1,23l) and the new room V 1,26n (*Figs. 33, 35*). The second floor, still preserved to some elevation above room V 1,26n was no doubt accessed by means of staircase built in the new stairwell room V 1,23h'.

[85] Brick-and-block technique may also be noted in the upper half of the columns of the peristyle (V 1,26l) porticoes but, as shown by the cork model in the MANN that was made close in time to the unearthing of the area, many were found in a fragmentary condition. A watercolour by the Swedish architect I.G. Clason, made in 1884 (Leander Touati 2021, fig. 10), documents the area and renders some of the peristyle columns with upper parts restored.

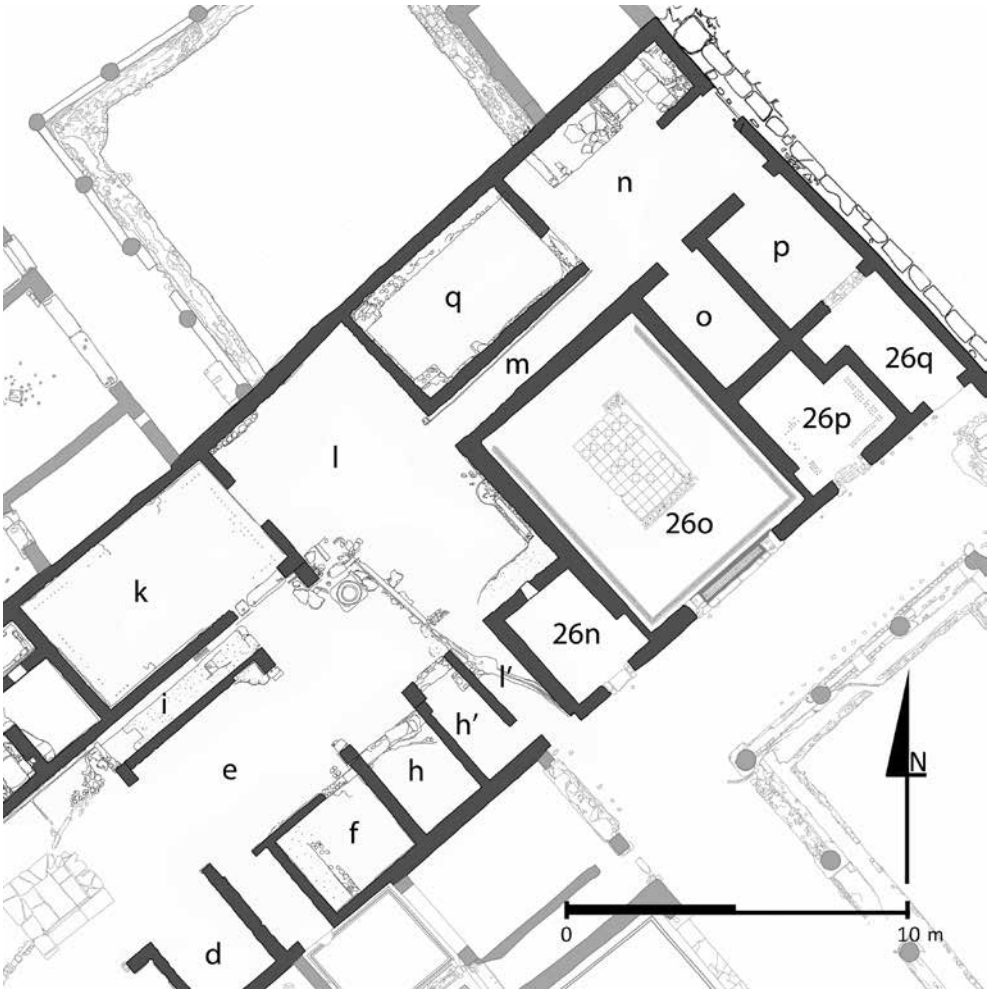

*Fig. 35. East part of V 1,23.10 in its Claudian design. All rooms east of corridor V 1,23l' are now turned south, towards the lavish peristyle of the new double-*atrium *house, linking the North and South Houses of Caecilius Iucundus. Illustration: Henrik Boman & Ezequiel Pinto Guillaume.*

Brick and brick-and-block pillars were also used to reinforce concrete masonry (or functioning as supports and load-bearing elements during construction) in newly built wall or in mendings of old walls. One newly built example belongs to the wall section (replacing the old boundary) right of the entrance to the *triclinium* V 1,26o (former east *triclinium* of the North House), now become the stateliest of the banquet rooms of the new double-*atrium* house, directly accessed from the north portico of the peristyle garden.[86] A breach in the plaster at the right hand side on the portico side of the doorway, caused by the removal to museum storage of the well-known erotic painting found here in the 19th century (*Fig. 36*),[87] reveals the block-and-brick reinforcement of the masonry beneath. The 4th-style decoration of the portico, to which the erotic scene belonged, clings directly onto the brick-and-block masonry. Similarly, the 4th-style decorations of the west wall of *triclinium* V 1,26o adhere directly to the brick pillar added to this wall to replace the no-doubt formerly *tufelli*-built south window frame in this wall (*Figs. 27, 28*). This action must have been called for by the instability and partial collapse of the old *tufelli* framework wall during the enlargement works, which also called for the walling-up of the former window (*Figs. 12b, 13*). Similarly, in *triclinium* V 1,23k, erosion in progress has revealed a brick repair beneath the late 3rd-style decoration of the north wall. Finally, brick was the material chosen to support the new, enlarged rear opening of the lavish south *tablinum* (V 1,26i) of the new double-*atrium* house (*Figs. 33, 37*). Most significantly, for the identity and dating of the large reorganization of the two houses just described, the chronologically diagnostic 3rd-style wall decorations still cling to these sturdy brick jambs.

[86] Amounting to *c.* 43 m² as measured on the 3D model.
[87] Inv. MANN 110569, today on display in the MANN, formerly in the Cabinetto Secreto.

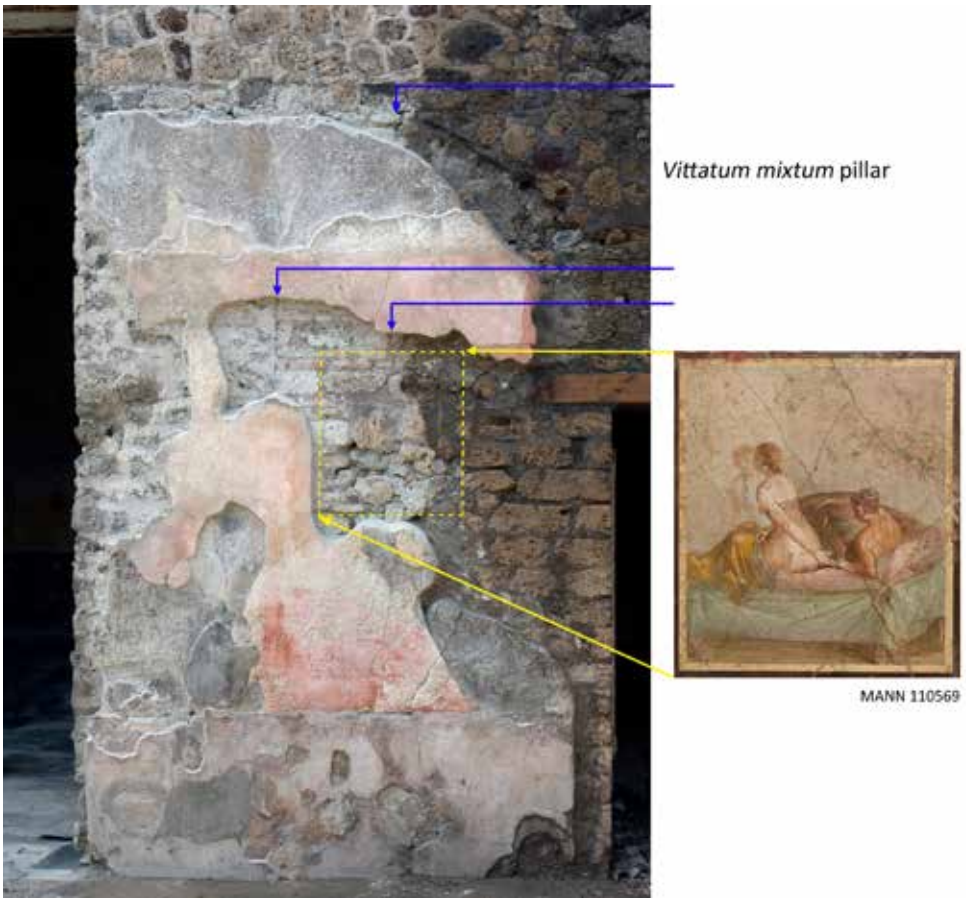

Fig. 36. Opus vittatum mixtum *pillar functioning as reinforcement in the wall replacing the old boundary, on the right side of the large doorway of* triclinium *V 1,26o. The wound in the plaster corresponds to the original emplacement of the well-known erotic painting MANN 110569. Photographs: Hans Thorwid. Feature highlights: Henrik Boman.*

The amount of evidence of this large construction phase is overwhelming, and it took the bird's-eye view to reach an understanding of this building process and its extent.[88] The overall result of the merge was the much more stately appearance of the South House of Caecilius Iucundus and the introduction of important new, first-floor functions. One important functional key was the stairwell V 1,23h' (*Fig. 35*).

Close study of all features in and around corridor V 1,23l' helped to establish a building sequence, which positions the chronological anchorage of the merge, obtained from the mapping of *opus testaceum* and *opus vittatum mixtum* featuring in the double *atrium* house, in its larger chronological context. A same mortar pavement, extending northwards some distance into courtyard V 1,23l, served as floor in the corridor as well as in the two more new rooms on each side of it, V 1,23h' (stairwell) and V 1,26n (*Fig. 35*). Regarding the two rooms, this re-used mortar pavement, served not just as floor but also as foundation to their walls. The pre-merge dating of this floor was secured by the find of a string of wall plaster, remain of the coating of the pre-merge boundary, that the floor abuts (*Fig. 38*). Thus, the established sequence from oldest towards more recent reads as follows: 1. the standing pre-merge (late Samnite) boundary; 2. the pre-merge mortar floor abutting the revetment of the boundary; 3. the opening of the passage through the boundary; 4. a new piece of floor positioned on top of dismantled boundary section, and the construction of the two rooms (V 1,23h' and V 1,26n) creating the corridor in between.[89] The introduction of one more contribution to the

[88] For comprehensiveness it is worth noting that the two techniques were used for load bearing vertical supports of the architecture of the North House of Caecilius Iucundus (cf. *Fig. 31*): the two brick piers framing the street-front entrance, and another also in brick, pertaining to the *atrium* side of the entrance corridor (V 1,23a). The brick and brick-and-block piers at, and beyond the east side of the *tablinum* presumably served as supports for roofing both the *tablinum* and, east of it, the area V 1,23g. The stairwell V 1,23h' permitted access to the first floor above room V 1,26n and a presumed passage above area V 1,23g leading to a balcony added to the south wall of *triclinium* V 1,23k.

[89] Note that this building sequence demonstrates that the three-partite garden front of the north portico of V 1,26l, although consisting of both new structures and rebuilds of old ones, does not contradict the idea of a concerted layout of a "*drei-Raum-Gruppe*" (V 1, 26n-o-p) advocated

Fig. 37. Tablinum *of the House of Caecilius Iucundus (V 1,26i) with wall decorations in the late 3rd style, dated stylistically to the Claudian period. Note the brick piers to which the decorations cling (cf.* Fig. 33*). Photograph: Hans Thorwid.*

high standard of the new double-*atrium* house, the piped aqueduct water, belongs to the construction works of the merge. The pipe passes through corridor l' in a furrow dug into the pre-merge floor, beneath the brick-and-block built southwest quoin of room V 1,26n (*Fig. 39*) from where it continues beneath the floor of the north peristyle portico (V 1,26l) to a distribution box situtated in the garden gutter.

Piped water in *Insula* V 1

Aqueduct water for domestic use (in the kitchen situated in the North House, V 1,23n) and for display (water jets in both parts of the double-*atrium* house) belong to the Claudian merge. The water supply line was introduced by way of the North House.[90] The channel cut for the lead pipe in the mortar floor of corridor V 1,23l' makes its way into the south, most lavish part of the House of Caecilius Iucundus (*Fig. 39*). To enter this abode, the pipe passes beneath the brick-and-block pier that constitutes the south-west quoin of the new room V 1,26n (*Figs. 33, 35*)—thus providing a stratigraphic situation of importance for understanding and dating. From here, it passes beneath the floor of the north portico of peristyle V 1,26l into a distribution box in the garden, where one line branches off and, as another indication of its dating, passes beneath (i.e. predates) the mosaic floor, viewed as an integrated part of the stylistically dated *tablinum* (V 1,26i) decorations. The pipe continues beneath the *atrium* (V 1,26b) floor, to feed the now lost *impluvium* fountain.[91]

Connecting *Insula* V 1 to the aqueduct system demanded that the feeding pipes passed beneath the street from the water tower on the opposite side of Via del Vesuvio. Such works must have represented considerable disturbance to the traffic

by Dickmann 1999, 324–325, but that this configuration did not occur until the merge of the Claudian period.

[90] For more on the piped aqueduct lines in the House of Caecilius Iucundus: Karivieri & Forsell 2006–2007, 128–130.

[91] The course of this pipe beneath the mosaic floor was traced by means of a metal detector: Jansen 2001, 34–35.

Fig. 39. Corridor (V 1,23l') leading from the open courtyard of the North House (V 1,23l) towards the portico of the South House (V 1,26l). The lead pipe of the aqueduct line passes beneath the brick-and-block-built south-west corner of room V 1,26n. Vertical view looking west. The arrow indicates the position of the former boundary's north face. Feature highlight: Henrik Boman. Photograph & ortho-mosaic: Hans Thorwid.

Fig. 38. Doorway between the two parts of the double atrium *house of Caecilius Iucundus, viewed towards south, from corridor V 1,23l' towards the persityle area V 1,26l. The arrows mark the position of the dismantled boundary. The lower arrow points at the plaster coating remain of the pre-mege boundary. Feature highlights: Henrik Boman. Photograph: Arja Karivieri.*

in the city, and so repetitive interventions of this sort were probably avoided. This argument may be used to suggest that at least the two southernmost of the three large houses of the *insula* received their connections contemporaneously. A bend in the line that fed the fountain in the garden of the House the Greek Epigrams (where the well had been taken out of function, its mouth covered) suggests that this connection was made from the first water tower in Via del Vesuvio, not the second as for the neighbours further south. Still, it is probable that the date of the introduction of piped water into the House of Caecilius Iucundus may also apply to the House of the Bronze Bull: the dating of the remains of this latter house is based on relative arguments, hence its latest large rebuilding phase is somewhat broadly referred to as Julio-Claudian. Anyhow, it is in the imperial period that the House of the Bronze Bull received its private bath suite (V 1,7,19,20) and its imposing fountain garden (*nymphaeum*, V 1,7b),[92] the most exclusive of all the prestigious architecture in this city block (*Figs. 40, 41*).

The House of the Bronze Bull and its dependencies

For obvious reasons, imperial-age Pompeii is by far the period richest in remains: it should come as no surprise that the architecture reflects the varied economic conditions experienced over the three generations of city life that it encompasses. Some new features, such as the introduction of first-floor apartments above the service areas or workshops of the houses, may well be connected to the introduction of aqueduct water in the 40s AD. This offered a steady, independent water supply to all Pompeians by means of the more than 40 public fountains, situated at or close to cross-roads all over the city. In *Insula* V 1, it may have triggered the reconstruction of its whole south-west corner and the Via del Vesuvio street-front premises (*Fig. 1a*).[93] In the last building phase, there are also signs that may be interpreted as a change of function of the large house beyond. The doorway between the service area of the House of the Bronze Bull and House V 1,3 was walled-up, which must have rendered deliveries to the kitchen (V 1,7l) more complicated—from the *posticum* (V 1,9) by way of the lavish peristyle instead of through corridor V 1,3,3. Changes to the large *nymphaeum* (V 1,7b) included both closing old pipes and adding series of new ones, as well as new water features. These measures suggest the conspicuous display in the reception area underwent continued upgrading as a way of signalling social prestige.[94]

[92] Staub 2013, 45–47.
[93] Leander Touati 2010, 152–154. On the agency of the aqueduct line: Leander Touati forthcoming.
[94] Staub 2013, 46–47. A scenario is that as the working premises of the (smelly) textile business expanded in the surrounding workshops, inter-

Fig. 40. Atrium *and peristyle areas of the House of the Bronze Bull. Aerial view, courtesy of Prof. J.-P. Brun, Centre Jean Bérard.*

Fig. 41. Nymphaeum *of the House of the Bronze Bull (V1,7b). Photograph: Hans Thorwid.*

However, it is also worth noting that the latest repair of the painted decorations of the *nymphaeum* wall (of its marble painted half columns) is of remarkably low quality for such a lavish monument.[95] All these factors contribute to the suggestion that both expansion and regression were in play during the last decades of Pompeian city-life.

At the beginning of our fieldwork, according to accepted opinion on the presence of extensive brick masonry, we assumed that the south-west street fronts of *Insula* V 1 (from workshop V 1,2 on Via di Nola up to that of V 1,27 on Via del Vesuvio) constituted a typical example of post-AD 62/63 earthquake architecture.[96] Today this certitude has faded. Evidence yielded during clearing the ancient floor levels of the *atrium* and the *fauces* of the small house V 1,3 (rooms V 1,3,1–2) show that the brick architecture used as repair of its southern wall and of the east wall of the *fauces,* including relieving arches—earlier hinted at as possible post-earthquake measures for sustainability,[97] do not belong to the latest building phase. The implication of this example is that building material or technique cannot be understood as decisive for dating when we deal with so short intervals of time as these; many factors other than time may intervene.

Concluding remarks

ON BUILDING PRACTICE

Choices of building techniques, materials, and the question of dating

Considering the development of a whole city block, as we have done, attenuates the risk of pitfalls when drawing generalized conclusions on building practices and the dating of its lesser units. Each major building phase in a house has its own characteristics concerning the building material used, plausibly related to the entrepreneur in charge and his suppliers of stone and mortar ingredients. In this respect, even when the *insula* knew a common strategy of building, as in the late Samnite building boom, the result was that a wall section belonging to one house differed from its neighbours in appearance but not in technique—a fact that is most clearly demonstrated by the rear, east *insula* perimeter (*Fig. 2*).[98]

Once the use of boulders in framework walls, the so-called *opus africanum* technique, had fallen out of favour, the choice of material used for the piers—remaining the load-bearing elements of framework throughout—presumably depended on the decisions of the builders, sometimes experimenting (for example with framework-bearing *tufelli* piers) but mostly sticking to acknowledged, sustainable solutions. Brick, used as sole sheeting material or in solid piers, increases in importance among the possible choices, as does the brick-and-block technique from the middle of the 1st century BC onwards.[99] Small building blocks (mostly in tufa but limestone may also be used) had a still-longer period of use, from the 2nd century down to the end of Pompeian city-life.

The combination of different factors optimizes the chances of approaching the question of dating successfully. Graffiti of the kind found in the South House of Caecilius Iucundus (*Fig. 34*) furnish, of course, the best lead; especially when, as in this case, the texts neatly agree with the date ascribed to the style of the diagnostic wall decorations found in the house. Even so, the combined testimony of the texts and the wall-paintings only achieves full potential for understanding building history when the common characteristics of the structural environment to which they belong is fully mapped and understood. Establishing building sequence should take precedence over dating by building material. Single ashlar pillars or door-jambs do not necessarily make a framework masonry of old-fashioned *opus africnum* type, nor does the practice of using *tufelli* to frame doorways indicate a date in the Republican period, as is all too frequently stated in Pompeian building archaeological assessments. In this *insula*, the understanding of *tufelli*-built parts of the architecture as belonging in the late Republican period is correct for the House of the Greek Epigrams (*Figs. 23–24*) and for the North House of Caecilius Iucundus (*Figs. 7a, 27–28*), but not for House V 1,3 (*Fig. 29*).

Furthermore, technique may differ with the kind of structure involved. Formwork casting of concrete walls seems to pertain primarily to long, most likely jointly projected structures, such as most of the rear, east perimeter of the *insula* (*Fig. 14*). In the shorter inner divisions, formwork lines are not common. Particularly when dismantling older walls and raising new ones nearby, old building material at hand was re-

est in the large house as a dwelling correspondingly (and understandably) diminished. It could be that the owner preferred some other place to live in and that the old house was used mainly for receptions; that the large house, still linked to the small house V 1,3 by a passage between the two *atrium*s (V 1,3,2 and V 1,7,4) through corridors V 1,3b and V 1,3,3, and the business were left to the management of a trustee.

[95] The redecoration of parts of the *nymphaeum* wall and columns (V 1,7b), together with parts of the entrance *lararium* (V 1,7,5) constitute the only 4th-style decorations of this house: Staub 2013, 74–75.

[96] Leander Touati 2010, 130–131.

[97] Leander Touati 2010, 131.

[98] For a photographic mosaic showing the full façade, see *Fig. 2* above, or www.pompejiprojektet.se, Façade—Vicolo di Caecilius Iucundus.

[99] According to Wallat 1993, 366, the oldest building in *vittatum mixtum* technique in Pompeii is the Herculaneum Gate, in which limestone, rather than tufa, is used for the blocks. There, bricks of a kind designated by Wallat as the Odeion group occur beneath both 2nd- and 3rd-style decorations.

used.[100] The *insula*-encompassing perspective demonstrates its importance in helping avoid pitfalls in dating.

Earthquake damage versus late repairs

The longevity of use of the building materials may explain why we are unsuccessful in finding clear evidence of the one most-cited destructive events in Pompeian building history, the earthquake of AD 62 or 63. Only two previously-suggested cases now remain undisputed, both from the double-*atrium* House of Caecilius Iucundus. The examples of earthquake damage reported here concern architecture already undermined by weak ground conditions. In both cases, the damage was caused by the earthquake but exacerbated by the poor condition of the structures: the management of wastewater drained to the street beneath the two garden rooms (V 1,26s,r) built on top of a cellar,[101] and a waste pit (*pozzo nero*) by the south wall of rear-shop V 1,24b.[102] An example from another house in *Insula* V 1 that may be considered is the use of brick-and-block technique for a series load-bearing piers set between openings in the north portico garden façade of the House of the Greek Epigrams (*Fig. 24*).[103] Inside the Epigram room (V 1,26y) both wall sections adjoining the doorway were damaged not too long before the AD 79 eruption. The painted decoration of the wall east of the doorway was restored in a style imitating the old 2nd-style decorative scheme.[104] In this case and that of the garden room (V 1,26s) of the House of Caecilius Iucundus, the wall decorations of the interiors were not restored, whereas painted plaster remains and the new colour palette occurring around the peristyle suggest that effort was invested on the exterior. This situation indicates more concern with the appearance of the porticoes and the garden area, probably because these were more frequently seen by visitors than the interior of the small, secluded "private" garden rooms. It could be that the repair (probably 4th style), copying the original 2nd-style scheme observed left of the doorway when exiting the Epigram Room (V 1,18y), added to the fact that the wall west of the doorway and the corner section of the adjoining east wall (*Fig. 20*) only display crude masonry, may be apprehended as redecoration that was ongoing at the time of the eruption. The fact that the south garden (V 1,18i) wall was not painted, only dressed in a white plaster coat (*Fig. 4*),[105] may indicate another part of the house that was undergoing restoration as well. However, we can be sure that damage was there in the case of the Epigram Room, but not exactly when and why it occurred.

Today, it is agreed that the eruption of Mount Vesuvius was preceded by tangible seismic activity—preliminary tremors—and it is generally believed that these, as well as the earthquake of AD 62/63 recorded in contemporary literature, were the cause of so much reconstruction and redecorating work, some still in progress in AD 79. The small finds made in *Insula* V 1 during the excavations in the 19th century may be used to illustrate the inhabitants' response to this precursor activity and disturbance. In the two most important houses of the *insula*, the double-*atrium* House of Caecilius Iucundus (V 1,26.23.10) and the House of the Bronze Bull (V 1,7.9), the lack of small finds, both of everyday and valuable kind, is probably indicative of decisions taken to move away, in time. The business archive of Caecilius Iucundus, the historically most important find in this *insula* and for Pompeian life in general, was probably considered as of little future use or viewed as a too-heavy-to-move part of the fixtures and furnishings. The latter attitude most likely applied to the eponymous bronze bull functioning as the spout for the *impluvium* fountain in the *atrium* (V 1,7,4) of the House of the Bronze Bull, and the bronze portrait of "our Lucius" in the *atrium* (V 1,26b) of the House of Caecilius Iucundus. The situation in the House of the Greek Epigrams was very different: it contained much material, different kinds of *instrumentum domesticum*, among which were a full silver table set for four persons, jewellery, including a valuable emerald necklace and matching earrings, and much more. *Insula* V 1 bears witness to the city dwellers' different reactions to exceptional danger occurring in their everyday context: whether to leave, or attempt to wait it out.[106]

ON HOW TO OPTIMIZE WORKFLOW IN FUTURE *INSULA* STUDIES

The building historical conclusions merit further anchoring within the larger historical framework of which they form part: the late Samnite opulence of the Pompeians partaking as allies in Roman warfare, the impact of and rivalry between the

[100] See the image documentation on the webpage, www.pompejiprojektet.se/insula.php, for instance, the ashlars used in the division between rooms V 1,13d and V 1,13f of the *caupona* or the large stones and ashlars occurring disorderly in the masonry of the north wall of the large banquet room of imperial date in the House of the Bronze Bull, V 1,7g.

[101] Part of its west and south walls sank into the cellar: Karivieri & Forsell 2006–2007, 136.

[102] Rear-shop V 1,24b (once south-west *atrium cubiculum* of V 1,23): Leander Touati 2010, 131, fig. 23, 129.

[103] Masonry of the pier framing the large window of room V 1,18m and the one separating the opening of the corridor V 1,26q from the doorway leading into the eponymous room V 1,18y. It could well be that the original portico (columns and roofing) were affected as well.

[104] Staub-Gierow 2006–2007, 115 and fig. 16.

[105] Staub Gierow 2005, 148.

[106] Osteoarchaeological studies of the bones of the dead of the eruption confirms that they represent a cross-section of a normal population: Lazer 2009, 219, 267.

two groups of city-dwellers caused by the establishment of the veteran colony in 80 BC, the wealth of the early imperial period, and so forth. This discussion needs space of its own and belongs elsewhere.[107] In pursuit of the building archaeological perspective of the present text, it is instead of importance to explain the strategy of study that we would adopt if we were to continue our work in a different *insula*.

Today photogrammetry should be used as the basis of the 3D documentation. It should be applied from the start, in order to enable remote assessment and teamwork in interpretation as soon as possible. This should be done bearing in mind the fact that early modelling implies the need for further acquisition and additions to the model. Adding the lower parts of the walls, progressively exposed by the archaeologists, is important to ensure the link between walls and floors. Cleaning of floors need not start with the entire surfaces: for the model, the juncture with the walls is the crucial part of the floor documentation. If time and finance are short, work may stop at this point, to be resumed by regular archaeological investigation in a second phase. To free floors is important, not least for the understanding of the past use of space, by understanding fixed installations and remodelling. If the investigation turns to excavation, photogrammetry should be used to secure an unbiased scheme of documentation of successive horizons of removed layers, and photography to represent interpretative conclusions of meaningful horizons.

The analysis should first concentrate on the perimeters, then expand to the recognition of boundaries between houses, and only then turn to the detailed study of inner divisions. This hierarchy of study is based on the general rules gained from our experience in *Insula* V 1 concerning the original construction process. Most important is the understanding of the house boundaries as primary constructions, as enclosures securing property borders. Studying them, we learn to identify early use of space and the original *insula* divisions.

As demonstrated, property borders enclose inner space with bonded, preferably perpendicular returns, whether they are composed of concrete masonry or ashlars. As a rule, inner divisions, which are walls enclosing rooms, are secondary. They do not bond with the boundary. They abut it. Robbed boundaries leave marks—a vertical "wound" in the masonry of the enclosing boundary occurs when we have a robbed wall return; a sudden change in masonry texture and composition is more likely to represent a quoin, or a fully robbed corner. The implications of adjustments in wall alignments must always be considered. In old framework walls, aligned ashlar-built pillars may be indicative of a robbed perimeter/boundary. The difficulty in spotting such remains underlines the, at times, great complexity that resides in the task of identifying early, subsequently abandonned plans and plot borders.

The study of inner division and partition walls, using traditional wall documentation combined with the 3D model's capability of bird's-eye perspectives and sectioning, help identify recurring characteristics of a house, and optimally link them to a building phase. The potential of the 3D technique is particularly important today, as systematic and extensive restoration,[108] aiming to secure the ruins for visitors, makes traditional wall study all the more arduous.

The difficulties and pitfalls to understanding that are presented above emphasize the importance that the study should be both performed and returned to under team discussion, and that the areas of responsibility originally assigned should be adjusted if necessary when underway and, if needed, permitted to overlap. Once such areas of responsibility are assigned, a schedule for result reports and team discussion should be set in order to ensure that progress is shared and data compared. Teamwork and open access to all data collected, optimally on a digital platform, are the best way to ensure that the work will be carried to completion.

Apart from new understanding of the building archaeological development of *Insula* V 1, the detailed account above also generates conclusions of more general impact. A major conclusion is that building archaeological analysis by aid of 3D models forces the study to focus on the ancient building process. This is an achievement in itself, because it facilitates understanding of the whole, otherwise easily obscured in the vast mass of particularities. It contributes to establish an ordered hierarchy in the analysis of the *insula*, to underline the importance of that the characteristics of one property is recognized before comparing it with the neighbouring ones, and only then, proceed to suggests the generalized dating impact of single features, such as particular masonry techniques or choices of building materials. In our Pompeian case, we have learnt that understanding boundaries can be equated with approaching major developments over time. Inner divisions and non-bearing partitions were easily changed when new fashions in living, or altered economic and social situations created a desire for new room dispositions, while changes in the course of boundaries had a different tenor, responding to alteration in property extent and life conditions, which in turn may be linked to political and social transformation, that is, to history.

[107] One recent contribution: Leander Touati 2021.

[108] Often including coating the ancient wall surfaces with a thin layer of modern cement.

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Bibliography

Bergmann, B. 2007. 'A painted garland. Weaving words and images the House of the Epigrams in Pompeii', in *Art and inscriptions in the ancient world*, eds. Z. Newby & R. Leader Newby, Cambridge, 60–101.

Beyen, H.G. 1938. *Die Pompejanische Wanddekoration vom Zweiten bis zum Vierten Stil* 1, The Hague. https://doi.org/10.1007/978-94-011-9028-2

Boman, H. 2008. 'The interaction between street and houses in the north-west corner of *Insula* V 1', in *Nuove richerche archeologiche nell'area vesuviana (scavi 2003–2006). Atti del convegno Internazionale, Roma 1–3 febbraio 2007*, eds. P.G. Guzzo & M.P. Guidobaldi, Rome, 87–92.

Boman, H. & M. Nilsson 2006–2007 (pr. 2008). 'The commercial establishments V 1.13; V 1,14–16; V 1,20–21', *OpRom* 31–32, 139–154.

Borgard, P. 2002. 'A propos des teintureries de Pompei', in *Les artisans dans la ville antique* (Collection Archeologie et histoire de l'antiquité, Université Lumière-Lyon 2, 6), eds. J.-C. Béal & J.-C. Goyon, Paris, 55–60.

Campanaro, D.M. forthcoming. 'A roof for the *atrium* of the House of the Greek Epigrams in Pompeii? A three-dimensional critical study'.

Dell'Unto, N., M. Callieri, M. Dellepiani, A.-M. Leander Touati, M. Lindgren, S. Larsson & C. Larsson 2013. 'Pompeii revived. Scanning mission—*Insula* V 1', in *Archaeology in the digital era. Papers from the 40th Annual Conference of Computer Applications and Quantitative Methods in Archaeology (CAA Southampton 26–29 March 2012),* eds. G. Earl, T. Sly, A. Chrysanti, P. Murrieta-Flores, C. Papadopoulos, I. Romanowska & D. Wheatley, Amsterdam, 199–207. https://doi.org/10.1515/9789048519590-022

Dexter, C. 1974. The Casa di Cecilio Giocondo in Pompeii, Ph.D. thesis, Duke University, Durham, North Carolina.

Dickmann, J.-A. 1999. *Domus frequentata. Anspruchsvolles Wohnen im pompejanischen Stadthaus*, Munich.

Dobbins, J.J & P.W. Foss 2007. *The world of Pompeii*, London & New York. https://doi.org/10.4324/9780203866191

Ehrhardt, W. 1987. *Stilgeschichtliche Untersuchungen an römischen Wandmalereien. Von der späten Republik bis zur Zeit Neros*, Mainz.

Ehrhardt, W. 2012. *Dekorations- und Wohnkontext. Beseitigung, Restaurierung, Verschmeltzung und Konservierung von Wandbemalungen in den kampanischen Antikenstätten* (Palilia, 26), Wiesbaden.

Fiorelli, G. 1860. *Pompeianarum Antiquitatum Historia* 1, Naples.

Flohr, M. 2011. 'Cleaning the laundries 3. Report of the 2008 campaign', *Fasti On Line Documents & Research* 214, 1–13.

Geertman, H. 2007. 'The urban development of the pre-Roman city', in *The world of Pompeii*, eds. J.J. Dobbins & P.W. Foss, London & New York, 82–97. https://doi.org/10.4324/9780203866191-15

Hansen, T. 2016. Urbanisation of *Insula* V 1. Three-dimensional approach to Pompeian domestic architecture. Investigating 3D models of *Insula* V 1, M.Phil. thesis, Lund University.

Heinrich E. 2002. *Der zweite Stil in Pompejanischen Wohnhäusern*, Munich.

Jansen, G. 2001. 'Water pipe systems in houses of Pompeii', in *Water use and hydraulics in the Roman city* (AJA Colloquia and Conference Papers, 3), ed. A. Koloski-Ostrow, Dubuque, Iowa, 27–40.

Karivieri, A. & R. Forsell 2006–2007 (pr. 2008). 'The House of Caecilius Iucundus, V 1,22–27. A preliminary report', *OpRom* 31–32, 119–138.

Karivieri, A. & R. Forsell 2008. 'New results from the campaigns of 2003–2006 in Casa di Caecilius Iucundus (V1 22–27)', in *Nuove richerche archeologiche nell'area vesuviana (scavi 2003–2006). Atti del convegno Internazionale, Roma 1–3 febbraio 2007*, eds. P.G. Guzzo & M.P. Guidobaldi, Rome, 103–108.

Lazer, E. 2009. *Resurrecting Pompeii*, Abingdon. https://doi.org/10.4324/9780203885161

Leander Touati, A.-M. 2008. 'Shared structures—common constraints. Urbanisation of *Insula* V 1', in *Nuove richerche archeologiche nell'area vesuviana (scavi 2003–2006). Atti del convegno Internazionale, Roma 1–3 febbraio 2007*, eds. P.G. Guzzo & M.P. Guidobaldi, Rome, 117–123.

Leander Touati, A.-M. 2010. 'Water, well-being and social complexity in *Insula* V 1', *OpAthRom* 3, 105–161. https://doi.org/10.30549/opathrom-03-06

Leander Touati, A.-M. 2021. 'History in Pompeii', in *Usages of the past in Roman historiography* (Historiography of Rome and its Empire, 9), eds. A. Damtoft & A. Jönsson, Leiden & Boston, 298–325.

Leander Touati, A.-M. forthcoming. 'Classical materiality in action'.

Ling, R. 2005. *Pompeii. History, life and afterlife*, Stroud, Gloucestershire.

Mau, A. 1876. 'Scavi di Pompeii. Ott. 1875 a Sett. 1876', *BdI*, 241–249.

Mau, A. 1877. 'Scavi di Pompeii', *BdI*, 92–99, 129–141.

Mau, A. 1882. *Geschichte der dekorativen Wandmalereien in Pompeji*, Berlin. https://doi.org/10.1515/9783111447193

Mau, A. 1884[4]. *Pompeji in seinen Gebäuden, Alterthümern und Kunstwerken dargestellt von Johannes Overbeck*, Leipzig.

Pfanner, M. 1989. 'Über das Herstellen von Porträts. Ein Beitrag zu Rationalisierungsmassnahmen und Produktionsmechanismen von Massenware im späten Hellenismus und in der römischen Kaiserzeit', *JdI* 104, 157–257.

Potenziani, M., M. Callieri, M. Dellepiane, M. Corsini, F. Ponchio & R. Scopigno 2015. '3DHOP. 3D heritage online presenter', *Computer & Graphics* 52, 129–141. https://doi.org/10.1016/j.cag.2015.07.001

PPM = G.P. Carratelli & I. Baldassarre, eds. 1990–1999. *Pompei. Pitture e mosaici* 1–10, Rome.

Robinson, M. 2006–2007 (pr. 2008). 'Evidence for garden cultivation and the use of bedding-out plants in the peristyle of the House of the Greek Epigrams (V 1,18i) at Pompeii', *OpRom* 31–32, 155–159.

Saliou, C. 1999. 'Les trottoirs de Pompéi. Une première approche', *BABesch* 74, 161–218. https://doi.org/10.2143/bab.74.0.541754

Sear, F. 2004. 'Cisterns, drainage and lavatories in Pompeian houses, Casa del Granduca', *PBSR* 72, 125–166. https://doi.org/10.1017/s0068246200002695

Staub, T. 2013. The Casa del Torello di Bronzo (V 1,7) in Pompeii. Investigating a residential house and its complex water system, Ph.D. thesis, Stockholm University.

Staub Gierow, M. 2005. '*Insula* V 1. Casa degli Epigrammi Greci (V 1,18.11.12)', in *Nuove richerche archeologiche a Pompei ed Ercolano. Atti del convegno Internazionale, Roma 28–30 Novembre 2002*, eds. P.G. Guzzo & M.P. Guidobaldi, Rome, 144–149.

Staub Gierow, M. 2006–2007 (pr. 2008). 'The House of the Greek Epigrams V 1,18.11–12. Preliminary report 2000–2004', *OpRom* 31–32, 105–117.

Strocka, V.M. 1995. 'Das Bildprogramm des Epigrammzimmers in Pompeji', *RM* 102, 269–290.

Strocka, V.M. 2007. 'Domestic decoration. Painting and the "four styles"', in *The world of Pompeii*, eds. J.J. Dobbins & P.W. Foss, London & New York, 302–322. https://doi.org/10.4324/9780203866191-31

von Mercklin, E. 1962. *Antike Figuralkapitelle*, Berlin. https://doi.org/10.1515/9783111715582

Wallat, K. 1993. '*Opus testaceum* in Pompeji', *RM* 100, 353–382.