**[Supplementary material]**

# The east bank of the Tiber below the Island: two recent advances in the study of early Rome

Albert J. Ammerman*

* *Department of the Classics, Colgate University, 13 Oak Drive, Hamilton, NY 13346, USA (Email: aammerman@colgate.edu)*

*Received: 27 January 2017; Accepted: 14 February 2017; Revised: 20 March 2017*

The main purpose of the supplementary material is to outline the pathway of the fieldwork that we carried out in Rome between 1985 and 2014. This background is essential to understanding the coring that was done at the site of Sant'Ombono over the course of three field seasons (2012–2014). Here, emphasis will be placed on the deep cores that we drilled in the Velabrum and on the east bank of the Tiber in three cycles (1996, 1998 and 2003) and also the percussion cores that we made at Sant'Omobono in 1998. A brief account will then be given of the cores taken more recently at the site in 2012, 2013 and 2014. An overview on the sequence of our investigations on early Rome is also found in Ammerman (2016: 304–308). At the end of the supplementary material, Table S1 gives the correspondence between the core numbers used in Figures 1, 2 and 3. The cores made within the area of Sant'Omobono itself are distinguished by placing SO before the core number.

## Section 1. The initial fieldwork in the Forum

When I first went out to Rome at the invitation of the Italian government to conduct environmental studies at archaeological sites in and around the Forum in 1985 (at the time I was the head of a research group at the University of Parma), the state of knowledge was quite different than it is today. None of the cores shown in Figure 1 had been taken. At that time, there were only one or two sites in Rome that went back to the end of the Bronze Age. Today there are at least seven sites of this age or earlier, as shown by the red dots with Roman numerals in Figure 1 (for the names of the sites, see

Ammerman 2016: 308, fig. 6). Brock and Terrenato (2016: 655–56) have recently reviewed the literature on this subject, and this is not the place to repeat what they have said (on the dating of the skeletons that rest on the natural soil at the base of Boni's deep sounding in the centre of the Forum and how this question can now be resolved, see Ammerman 2016: 308).

The first step was taken in 1985 when we began working on the profile of the natural relief of the Forum basin. This had not been done before. It called for making a series of cores down to the natural soil on the line from A to A' in Figure 1. These were the first deep, machine-made cores drilled for the purpose of archaeological research in Rome. Previously, cores had been taken by geologists and civil engineers for other reasons. We established the profile of the basin, and this information in combination with other environmental and archaeological lines of evidence now led to a new hypothesis for the origins of the Forum—namely, a major project of land reclamation in what had previously been a low and seasonally wet place (Ammerman 1990: 641–45, 2016: 301–302).

**Section 2. The coring on the Capitoline Hill**

The next step was the project on the Capitoline Hill where one of the main aims was the mapping of its natural relief for the first time. The work began in 1993, and it involved the study of more than 40 deep, machine-made cores (not shown in Figure 1), as well as the examination in the field of geological outcrops around the hill and those exposed in the galleries dug inside the hill itself. In short, this study produced the first reliable map showing the contours of the natural relief of the Capitoline and also a much better knowledge of the geology of the hill (Alvarez *et al.* 1996: 751–54, figs 1–2; Ammerman & Terrenato 1996: 38–42, figs 5–6). We once again observed the purposeful transformation of the landscape in the time before the Republic: in this case, a large artificial terrace was created at the north-west corner of the Temple of Jupiter Optimus Maximus for its emplacement on the Capitolium, the southern summit of the Capitoline Hill (Ammerman & Terrenato 1996: 42–44). It was the success of the projects in the Forum and on the Capitoline that then led the City of Rome to commission me to conduct the first of three cycles of deep cores in the Velabrum.

**Section 3.1. The start of coring in the Velabrum in 1996**

While advances in the archaeology and topography of ancient Rome were made over a broad front in the twentieth century, the Velabrum was an area that always lagged behind. There were two main reasons for this: 1) the dense urban fabric of the modern city in this part of Rome; and 2) the deeply buried position of most of its archaeological sites (Ammerman 2013: 170–73). For the study of early Rome, the Velabrum—the valley between the Forum and the Tiber—represented the large missing piece in the middle of the puzzle. Thus, the first cycle of coring in 1996 was carried out as a pilot project towards a new edition of Lanciani's *Forum Vrbis Romae*. The locations of the first eight cores are shown in Figure 3 (nos 1–8). What was revealed was more than anyone expected. Only a few highlights (again with an emphasis on early Rome and environmental archaeology) will be mentioned briefly here. The big surprise of the first cycle was the discovery of the clay beds in the Velabrum (Ammerman 1998: 215–20, figs 2–3). Previously, no good source of clay for making ceramics was known within the area of the ancient city on the east side of the Tiber. Documented by seven of the first eight cores, the beige colour in Figure 1 gives the location and size of the clay beds, which are some 2–3m thick. This discovery led, in turn, to characterisation studies on the 'clay' in the clay beds and the earliest roof tiles in Rome, which date to the last quarter of the seventh century BC. In short, the work of a team of specialists now made it possible to show—based on petrography and neutron activation analysis (INAA)—that the fingerprints of the clay and those of the roof tiles matched one another (Ammerman *et. al.* 2008a: 10–25). At the same time, the deep cores offered no support for the idea that, during the first millennium BC, there once was a large standing swamp or *palude* in the bottom of the valley (for the traditional view, see e.g. Lanciani 1897: fig. 1). This was one of the misconceptions about the Velabrum that classical scholars had held for many years (Ammerman 1998: 220–21, 2006: 307–307, 2013: 171–72). Finally, when deep cores were then drilled in the area near the Tiber in 1998 and 2003, there was the chance to draw, for the first time, the profile of the natural relief of the lateral valley that begins upstream with the Argiletum, passes through the Forum Basin and then runs through the

Velabrum on its way to the Tiber (see the line from B to B' in Figure 1; this profile was first published in Ammerman & Filippi 2004: 14–16, fig. 6).

**Section 3.2. Coring in the Velabrum and on the east bank in 1998**

A second cycle of cores was undertaken in 1998, and the third one was then done in 2003 (cores 9–24 in Figure 3). At the start of the work in 1998, four more deep cores were drilled in the Velabrum where core 11 (in Figure 3) now yielded a stratigraphic sequence of considerable interest. It showed a lower gravel pavement resting at *c.* 5.96m asl, a fill deposit on top of it and then a second upper gravel pavement standing at *c.* 6.87m asl (Ammerman & Filippi 2014: 17–18). This was the fourth case of transforming the landscape that we had observed in the study of Rome before the Republic. The three other cases of landscape transformation are: 1) in the Forum basin, 2) on the west side of the Capitoline Hill and 3) at the foot of the north slope of the Palatine Hill (Ammerman 2006: 299–300, fig. 2; 2013: 177–78, 2016: 306).

During the second half of the 1998 field season, the focus of attention shifted to the east bank of the Tiber (cores 13–17 in Figure 3). Two of the cores (13 and 14) now produced evidence that the east bank once stood in a different position: that is, some 100m back from where it stands today. In 1998, there was also the opportunity to make a series of five percussion cores within the area of the site of Sant'Omobono (for the locations of these cores, SO 4 through SO 8, see Figure 3; on this method of coring, see Ammerman *et al.* 2008b). Two of them are of particular interest for our present purposes. The core identified as SO 8 was taken at d in Figure 2, where it was blocked by a thick slab of *cappellaccio*, the pebble tuff used for making walls and pavements in early Rome, at *c.* 6.33m asl: in a position some 20cm lower than the ground level of the podium of the archaic temple (at D in Figure 2). In short, the core was probably blocked by part of the structural remains (in *cappellaccio*) connected with the open public space in front of the temple on the east bank. The other core (SO 6 taken at c in Figure 2) produced a long sequence of alluvial sediments (often with banded Tiber silts) at elevations from 8.4m down to 5.45m asl—with only a few small weathered pieces of the *cappellaccio* recovered in the sediments between 6.8 and 7.6m asl. In short, this core together with the two nearby deeper cores (25 and 26 in Figure 2) led to the realisation that the east bank had once stood in this place.

### Section 3.3. Coring on the east bank in 2003

When four more deep cores (18, 19, 20 and 23 in Figure 3) were then drilled on the east bank in 2003, they provided further support for this conclusion (e.g. Ammerman 2006: 299–300, fig. 6). Below 6m in elevation, all of them again produced long sequences of alluvial sediments with banded silts and sands, whose grain sizes varied with the energy of the running water in which they were deposited (Ammerman & Filippi 2004: fig. 14). By using the Malvern Mastersizer at Colgate University, it was possible to run an extensive series of soil samples and carry out the granulometric analysis of the alluvial sediments.

### Section 4.1. The start of a new cycle of research at Sant'Omobono

In December of 2008, a convention was drawn up by the City of Rome that now placed the study of the finds from the previous excavations at Sant'Omobono in the hands of Paolo Brocato at the University of Calabria and Nicola Terrenato at the University of Michigan. The next few years were then spent in sorting material in the storerooms at the site, classifying the artefacts and trying to put in order the documentation of the previous excavations conducted by Colini and his co-workers at the site since 1937. A synthesis of what came out of this work was then published by Brocato and Terrenato (2012). In addition, there was the long-term goal of opening new excavations at Sant'Omobono in order to increase what was known about the archaic temple and other early parts of the site (e.g. Brock & Terrenato 2016: 657–59; Diffendale *et al.* 2016). The previous excavations had not dealt well with the challenge of digging below the high water table of the modern city. Trial excavations were conducted on a small scale in 2011. Terrenato and I had worked together on a number of projects over the years—among them the north slope of the Palatine, the Capitoline Hill and the Royal Stoa in the Athenian Agora. Thus, when plans were being made to move forward on a larger scale at Sant'Omobono in 2012–2014, it was natural for him to ask me to participate in the project.

## Section 4.2. Coring at Sant'Omobono in 2012

My tasks during the 2012 season were to train Andrea Brock, a graduate student at the University of Michigan, who was planning to write a dissertation on the Forum Boarium, and to supervise and record the cores that were made in the field. As an initial step, I demonstrated how to make cores with a Dutch soil auger. In addition, we drew up the form to be used in recording each of the cores made in this way. Three of the six cores (SO 11, 12 and 13) were made in the area of the future deep sounding called trench A7. Here the main question of interest was whether or not it was possible to go down to a depth of 2.5–3m in the ground without the cores being blocked by structural remains. If we encountered such remains, it would not be a good place to attempt making a deep sounding down to about 7m asl. The three cores all started at elevations in the range of 11.9–11.4m asl, and there was the positive result that each of them went down successfully in a series of 'cuts' (entries) without being blocked. Two of them managed to reach an elevation of 8.6m asl. The soils recovered were fills consisting of Tiber silts with very few artefacts in them. This was a good start. From the beginning, the plan was to bring in Cobra equipment in 2013 and make even deeper percussion cores in the area where trench A would eventually be excavated. If they too were successful (that is, not blocked), this would be a good place to excavate a deep sounding in 2014 (trench A7 would be taken down to a depth of 4m in the ground at the start of the 2014 season) and then make at the base of it several percussion cores with the aim of reaching elevations in the range of 3–4 m asl. This would make it possible to reach depths well below the ground level of the archaic temple. This was the plan that Terrenato and I developed, and it turned out to be a good research design.

## Section 4.3. Coring at Sant'Omobono in 2013

For the fieldwork in 2013, Cobra coring equipment could not be found in Italy by the Michigan team. I learned about the problem only two weeks before the field season began. I then arranged with a colleague in Athens to rent his equipment and send out three of his graduate students to help in taking the cores. Five deep percussion cores were made at Sant'Omobono during the second week of June (SO 14–18), and all of them were productive. I supervised the work in the field and documented the steps in making each core. For our present purposes, the first two cores (SO 14 and 15) were the ones that were drilled in the area of trench A7. They both went down easily: the deepest core (SO 14) reached an elevation of 7.42m asl. In short, there was the green light to dig the deep sounding called trench A7 at the start of the 2014 season.

As planned, I subsequently went out to China later in June and travelled for several weeks. The rest of the 2013 field season in Rome was not without its logistical problems, however. Although one normally uses a rock saw to open the PVC tubes and cut through the soils and sediments, such a saw could not be found in Rome in 2013. The saw that was eventually used did not do a good job of cutting open the percussion cores. In turn, this limited the quality of the study and the documentation of the respective entries. At the end of the field season when the deep excavation in trench D10 had reached the ground level of the archaic temple, the plan was to make two cores (SO 20 and SO 21), using a Dutch soil auger, to a depth of 1.5m in front of the temple. But when there was the chance to make the two cores, they were recorded and sampled incorrectly in my absence. As trench D10 was backfilled with several metres of soil at the end of the 2013 season, this represented a major lost opportunity for the project. Thus, plans were made for me to take the lead in the coring and to be at the site for all four weeks of the field season in 2014, when there would be the unique opportunity to take percussion cores in the bottom of trench A7.

**Section 4.4. Coring at Sant'Omobono in 2014**

In the following year, 13 percussion cores were made at the site. This meant that a total of 18 cores of this kind were taken at Sant'Omobono in 2013–2014 (for the location of the cores, see Brock & Terrenato 2016: 658, fig. 2, where the numbers of the respective cores are unfortunately not given). In addition, we took six cores using a Dutch soil auger in 2013 and 2014 (their locations are not shown on the published map). Again, the percussion cores made in 2014 were of good quality, and they now covered a wider area at the site. My role in the fieldwork was: a) to choose the places where the cores were made; b) to select the bits used for the respective entries; c) to photograph the fieldwork in progress (when a core was made); d) to record the sequence of the entries in each core on the form that we developed for this purpose; e) to photograph each entry in a given core once it had been opened and cleaned; and f) to supervise the flotation work that led to the recovery of the seeds.

**Section 5. Do the seeds occur *in situ*?**

In light of the slope now documented in the area of trench A7, this question becomes one of major interest. Brock and Terrenato (2016: 659) take the optimistic view that the seeds appear to be *in situ*. In the context of the dynamic processes in site formation taking place on such a slope, it is reasonable to have doubts about this. As stated in the text of this article, it should be regarded as an open question at the present time. There are several factors that one needs to keep in mind. In using the term 'deposits' to describe the dark stratigraphic units from which the seeds were recovered, it was easy for Brock and Terrenato to consider that the seeds came from low-energy contexts such as features (that is, a deposit in the common archaeological sense of the term; for instance, a deposit of votive figurines). In the geomorphological sense of the term, it is entirely possible for a colluvial deposit on such a slope to include archaeological materials, but the artefacts found in it should not be considered to occur *in situ*. As stated in the text, there is good evidence for colluvial gravels on the slope just above trench A7: recall that core SO 25 was blocked by colluvial gravel. There is also good evidence from the cores for the rapid inflation of the land surface as a consequence of alluvial processes linked with flooding by the Tiber. In other words, site formation in the area of trench A7 involved a combination of two quite different geomorphological processes. And both of them could contribute to archaeological materials of small size being moved on the site's surface. To sort this matter out, it will take detailed studies in the earth sciences. On one hand, it is possible that a few of the seeds may even occur *in situ* (that is, they are found in a place near where they were processed, consumed or discarded). On the other hand, there is a good chance that most of the seeds recovered from the cores in trench A7 have experienced some degree of displacement due to geomorphological processes. The dating of more seeds from each of the three dark soil horizons would help in sorting out this problem.

**Table S1. This table gives the correspondence between the numbers of the cores in Figure 3 (the Velabrum series) and the numbers used to identify the same cores when they are shown in Figures 1 and 2 (the core numbers used in Ammerman & Filippi 2004: fig. 3).**

Note: In the case of Figure 3, there are the 24 cores—numbered in sequence (from 1–24)—that were made in the Velabrum series (see Ammerman 2006: fig. 6; Ammerman *et al.* 2008a: fig. 1). In the publication of the profile of the natural relief of the valley from the Argiletum to the Tiber (Ammerman & Filippi 2004: figs 3 & 6), different numbers (in series) were given to the selected Velabrum cores that were used on the map and in the profile. Their correspondences are given in Table S1 below. In this article, Figure 1 is based in large part on the 2004 map. This time all 24 of the Velabrum are shown on the map in terms of their location, but only the ones on the 2004 map have numbers. For a given core and its appearance on any one of the maps, there are three cases to consider: 1) the number used for it on the respective maps is listed in the columns of the table below; 2) the core has a number in Figure 3 but it is shown without a number in Figure 1 or Figure 2 (indicated as 'without no.' below); and 3) the core appears on Figure 3, but it is not shown or does not occur on Figures 1 and 2 (indicated as 'not on map' below).

| Figure 3 | Figure 1 | Figure 2 |
|---|---|---|
| 1 | without no. | not on map |
| 2 | 22 | not on map |
| 3 | without no. | not on map |
| 4 | 20 | not on map |
| 5 | 23 | 23 |
| 6 | without no. | not on map |
| 7 | without no. | not on map |
| 8 | without no. | not on map |
| 9 | without no. | not on map |
| 10 | without no. | not on map |
| 11 | 21 | not on map |
| 12 | without no. | not on map |

| | | |
|---|---|---|
| 13 | 26 | 26 |
| 14 | 25 | 25 |
| 15 | without no. | not on map |
| 16 | without no. | not on map |
| 17 | without no. | not on map |
| 18 | without no. | not on map |
| 19 | without no. | not on map |
| 20 | without no. | not on map |
| 21 | without no. | not on map |
| 22 | without no. | not on map |
| 23 | 27 | 27 |
| 24 | without no. | not on map |

*Figure 2 (full caption). Map of the Forum Boarium and nearby areas (after Coarelli 1988: fig. 1). The monuments and bridges with red letters are the following: A) Ianus Quadrifrons; B) the Round Temple; C) Temple of Portunus; D) Temple of Fortuna (where percussion core OS 17 was made in 2013); E) Temple of Spes; F) Temple of Juno Sospita; G) Temple of Janus; H) Theatre of Marcellus; I) Pons Fabricius; J) Temple of Aesculapius; and K) Pons Aemilius. The map includes those cores taken in the area that are shown in Figure 1 (nos 24–27), as well as the two sites with radiocarbon dates that go back to the time before the ninth century BC—the red dots labelled respectively VI (where the five percussion cores were made in trench A7) and VII (where core 26 corresponds with core 13 in Figure 3; on the early wood recovered by this core, see Ammerman & Filippi 2004: 16). Within the site of Sant'Omobono, four other places are indicated as well: a) percussion core SO 36; b) percussion core SO 31; c) percussion core SO 6; and d) percussion core SO 8.*

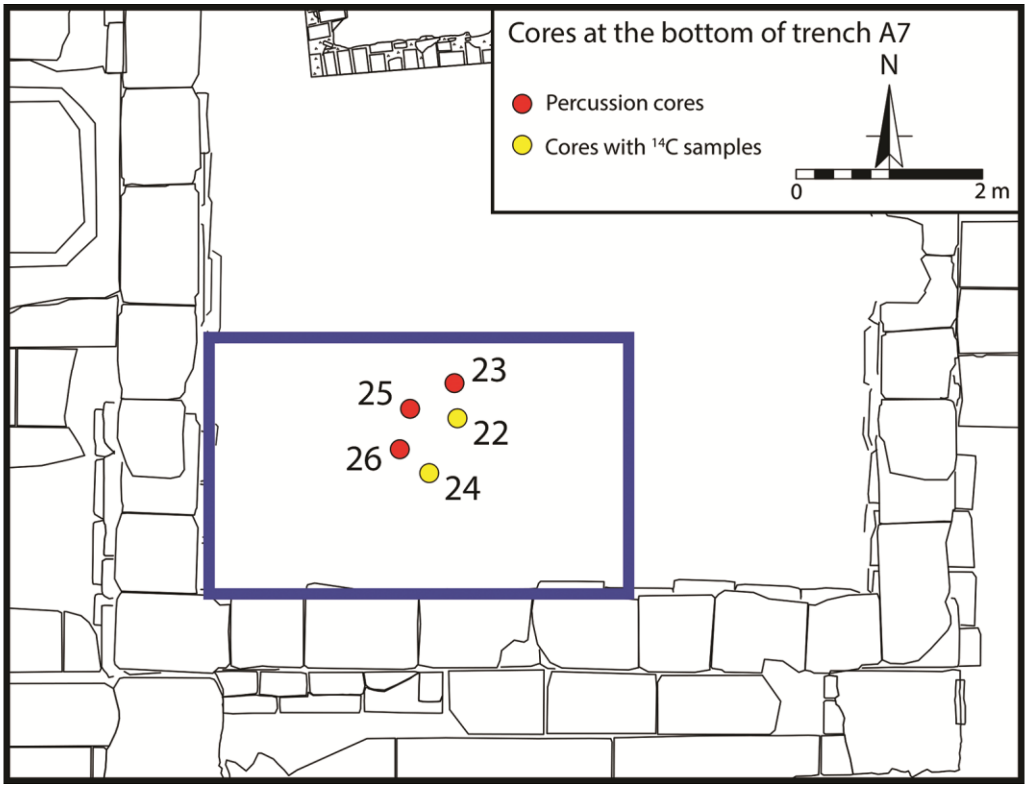


*Figure S1. Plan of trench A7 within the western* cella *at Sant'Omobono (after Brock & Terrenato 2016: fig. 5). The plan shows the locations of the five percussion cores (SO nos 22–26) that were made there in 2014.*

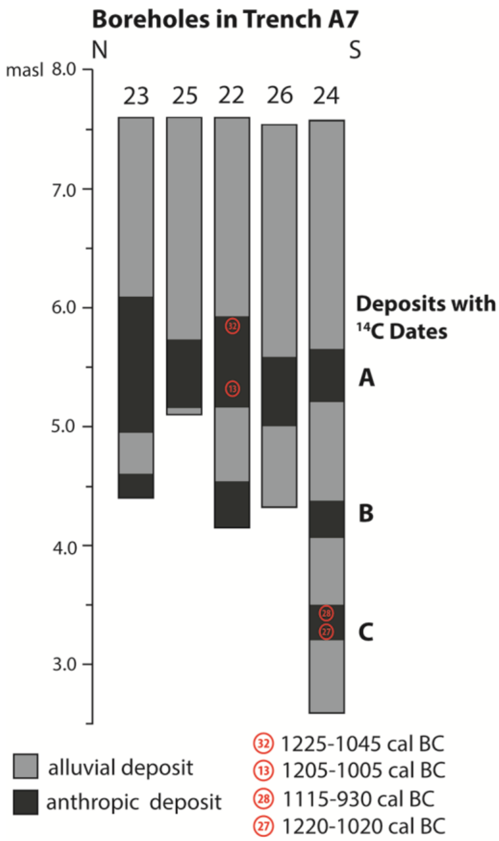


*Figure S2. Schematic diagram of the deep stratigraphy observed in the five percussion cores (boreholes) made in the base of trench A7 at Sant'Omobono (after Brock & Terrenato 2016: fig. 6).*

**References**

AMMERMAN, A.J. 1990. On the origins of the Forum. *American Journal of Archaeology* 94: 627–45. https://doi.org/10.2307/505123

– 1998. Environmental archaeology in the Velabrum, Rome: interim report. *Journal of Roman Archaeology* 11: 213–23. https://doi.org/10.1017/S1047759400017268

– 2006. Adding time to Rome's *imago*, in L. Haselberger & J. Humphrey (ed.) *Imaging ancient Rome*: 297–308. Portsmouth (RI): Journal of Roman Archaeology Supplement.

– 2013. Looking at early Rome with fresh eyes: transforming the landscape, in J.D. Evans (ed.) *A companion to the archaeology of the Roman Republic*: 169–80. Oxford: Wiley Blackwell. https://doi.org/10.1002/9781118557129

– 2016. On Giacomo Boni, the origins of the Forum and where we stand today. *Journal of Roman Archaeology* 29: 209–311.

AMMERMAN, A.J. & D. FILIPPI. 2004. Dal Tevere all'Argileto: nuove osservazioni. *Bullettino della Commissione Archaeologica Comunale di Roma* 105: 7–28.

AMMERMAN, A.J. & N. TERRENATO. 1996. Nuove osservazioni sul colle Capitolino. *Bullettino della Commissione Archaeologica Comunale di Roma* 97: 35–46.

AMMERMAN, A.J., I. ILIOPOULOS, F. BONDIOLI, D. FILIPPE, J. HILDITCH. A. MANFREDINI, L. PENNISI & N.A. WINTER. 2008a. The clay beds in the Velabrum and the earliest tiles in Rome. *Journal of Roman Archaeology* 21: 7–30. https://doi.org/10.1017/S1047759400004359

AMMERMAN, A.J., N. EFSTRATIOU, M. NTINOU, K. PAVLOPOULOS, G. GABRIELLI, K.D. THOMAS & M.A. MANNINO. 2008b. Finding the Early Neolithic in Aegean Thrace: the use of cores. *Antiquity* 82: 139–50. https://doi.org/10.1017/S0003598X00096502

BROCATO, P. &. N. TERRENATO (ed.). 2012. *Nuove ricerche noll'area archeological di S. Omobono a Roma*. Arcavacata di Rende: University of Calabria.

BROCK, A.L. & N. TERRENATO. 2016. Rome in the Bronze Age:  late second-millennium BC radiocarbon dates from the Forum Boarium. *Antiquity* 90: 654–64. https://doi.org/10.15184/aqy.2016.65

DIFFENDALE, D.P., P. BROCATO, N. TERRENATO & A. BROCK. 2016. Sant'Omobono: an interim status quaestionis. *Journal of Roman Archaeology* 29: 7–42. https://doi.org/10.1017/S1047759400072032

LANCIANI, R. 1897. *The ruins and excavations of ancient Rome.* New York: Bell.