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COSA (ORBETELLO, GR): 70 YEARS OF EXCAVATIONS AND NEW DIRECTIONS

Le Terme pubbliche di Cosa, localizzate al centro del tessuto urbano della colonia, sono oggetto di indagini da parte della Florida State University a partire dal 2013. Gli scavi sono condotti con lo scopo di mettere a fuoco la funzione e il ruolo dell'esteso complesso, utilizzato tra il I e il II secolo d.C., e di comprendere a pieno le soluzioni tecniche adottate dai coloni per risolvere i problemi di approvvigionamento idrico. Le attività di indagine stratigrafica sono supportate da una campagna di rilievo di ortofoto funzionali alla ricostruzione dello scavo, di indagini geofisiche e di ricostruzione paleoambientale.

INTRODUCTION: HISTORY OF THE EXCAVATIONS AND OF THE COLONY

This year we celebrate an important milestone, with the past excavation season (2018) marking the 70th anniversary of investigation at the site of Cosa¹. For many years the flagship of American archaeology in Italy, study of Cosa began in 1948 under the auspices of the American Academy in Rome and the direction of Frank Brown. Brown and his students conducted a series of campaigns between the 1950s and 1980s and investigated major environs of the colony including the Forum², the Arx³, the Port⁴, and some house blocks⁵.

1) Thanks to the Soprintendenza Archeologia, Belle Arti e Paesaggio per le province di Siena, Grosseto e Arezzo for inviting us to present the ongoing work at Cosa.

2) BROWN 1951.

3) BROWN *et al.* 1960.

4) MCCANN 1987.

5) BROWN *et al.* 1993.

During the 1990s, a team directed by Elizabeth Fentress⁶ reinvestigated portions of the colony, reinterpreting earlier findings and shedding light on the Late Antique and Medieval phases of Cosa⁷.

Drawing on these seminal works, *Cosa Excavations*, a partnership of Florida State University, Bryn Mawr College, and the University of Tübingen under the direction of Andrea U. De Giorgi and Russell T. Scott, investigates the nucleation and evolution of the colony, for instance pinpointing another revival to the mid-2nd century CE, through the lenses of excavation, digital configurations, geophysical survey, and geoarcheological analyses.

The story of Cosa, compiled from these projects, unfolds as follows. Cosa boasts a history spanning more than 1300 years. The archaeological record, known from several surveys in the region, documents the original cultural signature of the territory during the Bronze and Iron Ages and demonstrates that the implementation of the colony in the 3rd century BCE was the catalyst for the transformation of the landscape. Cosa was founded in 273 BCE as a Latin colony on the eve of the first Punic war, after the defeat of Vulci and *Volsinii* at the hand of Tiberius *Coruncanius*. Perched on a karstic limestone promontory overlooking the Tyrrhenian sea and measuring approximately 13 hectares, the city commanded a vast territory of 550 square kilometers, extending from the mouth of the Albegna river all the way to Vulci, an expanse of land which the Roman administration intended to be occupied by the early colonists. Yet the city's narratives of settlement still beg questions about the agencies involved, rationales, and outcomes.

Occupation, albeit in a discontinuous sequence of at least six foundations and episodes of recession, continued at the site through Late Antiquity and into the Middle Ages. For instance, settlement was disrupted around 70 BCE - a disruption variously attributed to Sullan reprisals or assaults by pirates - but the colony was substantially rebuilt under Augustus. Our recent excavations of the bath complex at Cosa reveal further insights concerning the story of this town.

EXCAVATION: THE BATH COMPLEX OF COSA

Cosa's public bath complex is located at the center of the town, to the northeast of the Forum and between streets 5, 6, O, and N (fig. 1)⁸. Excavations of the area began in 2013 based upon the identification of the bath block during Brown's initial survey of the town. Our investigation has concentrated on the bath complex for two reasons.

The first is an interest in bringing the study of the Forum area to its completion and understanding the social significance of the bath structure adjacent to this central colonial space. Secondly, there is a concern for understanding how colonists provisioned this type of amenity at a site where water is scarce and precipitation rates are low. During our excavations, several rooms of this bath - hot rooms, cold rooms, and service areas - have emerged, as well as evidence supporting multiple phases, which contributes to the overall picture of Cosa as an evolving town.

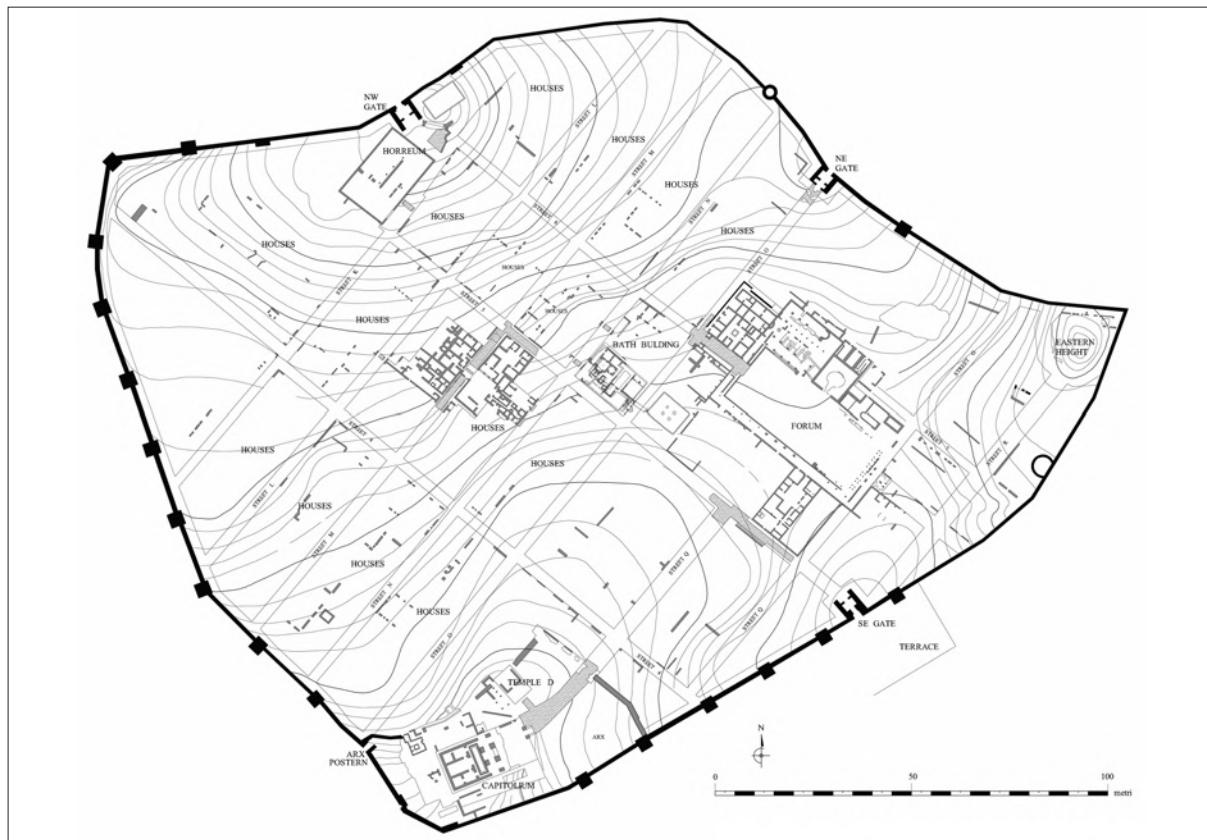
From Street O, three large limestone slabs form a staircase that descends into the bathhouse. The first room the bather enters is the *apodyterium*, identified by the preserved *cocciopesto*-lined bench that runs along its southern and eastern walls⁹.

6) FENTRESS *et al.* 2003.

7) Additionally, from 2005 to 2012 the University of Barcelona investigated a house block adjacent to the Forum; publications are forthcoming (see MORENO ALCAIDE, CAMPAÑA PRIETO 2018).

8) SCOTT *et al.* 2015. Concurrent with our excavations, another house block is being excavated by the University of Florence (see this volume).

9) E.g. *apodyterium/tepidarium* at the Terme Centrali, Herculaneum.



1. SITE PLAN OF COSA, 2017 (Florida State University, *Cosa Excavations*)

The floor of this and the other rooms in the cold sector situated in the southern area of the bath are paved in waterproof *cocciopesto*, consistent with other baths in the area¹⁰. The construction of the walls of the *apodyterium* and cold rooms is characterized by an *opus incertum* technique (fig. 2, illustrated in green; fig. 3), although some renovations were conducted in the western area of the bath in *opus vittatum* at a later date (fig. 2, illustrated in purple; fig. 3).

To the east of the *apodyterium* is a space that is likely the *frigidarium* of the bath. Its floor is paved in a tessellated *signinum*, a paving technique that dates to at least the 2nd century BCE in central Italy¹¹. Future excavation in this area will expose the extent of the room, as well as any potential architectural features (*piscina*, benches, other bathing accoutrements, etc.).

While the cold rooms are constructed in stone and mortar, the warm and hot rooms are built in *opus latericum* (fig. 2, illustrated in red). The juncture between these two construction techniques was exposed in the east terminal wall of the complex in 2014, with stone quoining identifiable in the *incertum* wall, thus signifying this line in the wall was a *terminus* of the *incertum* construction technique. Whether the two construction types (*latericum* and *incertum*) are contemporaneous or the *incertum* rooms pre-date the *latericum* architecture is unclear at this point, but we hope to answer these questions in upcoming seasons.

10) CARANDINI 1985.

11) CARANDINI 1985, p. 54. The *apodyterium/tepidarium* of the small baths in the villa at Settefinestre. The pavement in this area dates to the late Republic.



2. STATE PLAN OF COSA'S BATH COMPLEX (Florida State University, *Cosa Excavations*)



3. COLORIZED OPUS VITTATUM WALLS IN WESTERN AREA OF COMPLEX (STONE HIGHLIGHTED IN GREEN; CERAMIC MATERIALS HIGHLIGHTED IN ORANGE) (Florida State University, *Cosa Excavations*)

Several chronological indicators, on the other hand, do provide evidence for potential dating of the phases recognizable in the bath. In the southern area of the bath, a few fragments of late Republican pottery were found in a sounding trench near the entryway. Also, a coin of the early 1st century BCE (C18.69) with a Roman trireme and a helmeted head of Minerva was recovered in the area of the *apodyterium*. It may be inferred that the *incertum* areas of the bath can be dated to the late Republic or early Empire, during the days of the Augustan floruit.

In the northern areas of the bath (an area that likely corresponds with a 2nd century CE construction phase) the earliest legible coin (C16.270) dates to the final years of the 1st century CE (Nerva). Stamped bricks from the *figlinae Oceanae Maiores* that date to the mid-2nd century CE have been found *in situ* in this area, allowing for a *terminus post quem* for these portions of the structure. Coins of Commodus (C18.115), Gordian III (C18.244), and Philip I (C18.157) were concentrated in the service corridor along the northern end of the building, the latter two representing perhaps part of Cosa's 3rd century CE revival described by Fentress. The appearance of the coin of Commodus is intriguing, though, as it further supports an Antonine construction phase that is evidenced in the brick stamps discussed above.

Overall, the archaeological record of the bath is in harmony with the general numismatic trends at the site, with an uptick in the circulation of Antonine issues¹². How this phase of the site's apparent functionality ushered in the *res publica Cosanorum* is the question at issue¹³.

DESIGNING COSA'S BATH

The layout of the rooms in the heated portion of the bath is similar to other contemporaneous bath construction in central Italy¹⁴. At least one transitional room (*tepidarium?*) can be identified; its connection between the cold and warm sectors of the bath was found in 2018. Through an arched passageway, one proceeds into this *tepidarium* to reach the *caldarium*, through which the circular *laconicum* at the center of the bath was accessible. Another warm room, excavated in 2017, may have acted as a *tepidarium*, although *tubuli* found in the debris layers that filled the space and an opening for a *praefurnium* (furnace) in the north wall suggest otherwise.

Due to the steep gradient of the hill in this area of Cosa, precise calculations must have been carried out during the preliminary design and construction of the bath.

The slope of the hill has a 10-11% upgrade from north to south, yet the known difference between the elevations of floors in the southernmost and northernmost excavated areas of the bath is only 5 centimeters (106,00 meters asl at the entrance of the *apodyterium* to the preserved mosaic floor of the *caldarium*, 105,95 meters asl). Great care was undertaken when constructing and renovating the complex.

The positioning of the bath's two *praefurnia* is also a testament to the builders' skill. Two heated rooms, which are contiguous but not part of a continuous hypocaust system fed by a single *praefurnium*, have been excavated. The first *praefurnium* lies in the western portion of the bath, feeding hot air beneath the semicircular *alveus* into the *caldarium* and *laconicum*. The second is situated along the northern wall of the northeastern heated space (*tepidarium?* second *caldarium?*). The former furnace was placed at the same level as the preserved hypocaust subfloor, while the latter was built into the *latericum* wall, about half a meter above the mostly destroyed floor of the service corridor¹⁵. In order to heat two distinct spaces that are set at the same level, it was necessary to elevate one of the furnaces; the builders of Cosa's bath were prepared to respond to the need for multiple heating solutions in one building.

12) Marcus Aurelius and Commodus, BUTTREY 1980, p. 33.

13) FENTRESS *et al.* 2003, p. 138.

14) E.g. Cures Sabini, the *villa* at San Vincenzino (LI), and the later bath of Betitius Perpetuus Arzygius at Roselle.

15) This second furnace may have been a later addition given evidence for reconstruction in the hypocaust subfloor. Strong evidence of burning and the presence of an opening into the hypocaust of this northeastern room are indicative of a *praefurnium* and indeed there is no other conduit into this area that could have heated it. Other such elevated furnaces are rare, but one can be found in the baths beneath the Piazza della Signoria in Florence.

SUPPLYING WATER TO COSA'S BATH

As previously mentioned, Cosa occupies a waterless site and receives modest annual rainfall: between 420 and 450 millimeters per year. The potential for environmental pressures affecting the colony's water supply, and perhaps even explaining periods of perceived decline, necessitates an understanding of the feasibility of devoting water to this social amenity. The reconstruction of water movement throughout the bath is still a work in progress, but it is currently understood as follows.

The main supply to the bath is provided by a large reservoir to the south of the bath at the juncture of Streets O and 5, along the northwest corner of the Forum. Based upon the original polygonal walls, of which the northern is still visible, the reservoir is believed to have been built contemporaneously with the city walls of Cosa in the early to mid-3rd century BCE. Later, the reservoir was reduced in size by the insertion of *opus incertum* walls on its east, west, and south. At the time of this reconfiguration, the floor of the reservoir was slightly raised, and four piers were added to provide a roofing structure. All walls of the reservoir are lined with *cocciopesto*. It seems probable that these modifications coincided with the implementation of the bath complex, though currently this theory cannot be conclusively argued.

At its reduced size, the reservoir has a capacity of 750 cubic meters (750.000 liters) and seemingly provided the bath with adequate resources. The reservoir is fed by runoff from the Forum square, channeled through a conduit in its southeastern corner.

Another, smaller conduit sits 2,08 meters up the eastern edge of the northern wall and links the reservoir and a small cistern of unknown dimensions, accessible via a limestone *puteal*, laying close to the bath¹⁶. At the western corner of this northern wall, a large conduit stretching from the floor of the reservoir to a height of about 2 meters provides the necessary amount of water to a large cistern beneath the bath (hereafter, LCUB).

By taking the potential capacity of the LCUB, we can speculate water usage in the bath itself, providing insight into maintenance and hygienic habits. While other pools and elements of the bath might have used the water held by the LCUB, only the *caldarium's alveus* (apsidal pool) is known to us at this point.

This small, heated pool held approximately 1767 liters and was fed by a now missing system of pipes leading from the elevated cistern (*castellum aquae*) situated just to the south of the *caldarium*. Depending on whether the entire capacity of the LCUB (approximately 92.294,4 liters)¹⁷ was allocated to fill the elevated cistern¹⁸, and in turn the *alveus*, or varying increments of that capacity, our small heated pool could be filled with water between 52 and 13 times without replenishing from the reservoir¹⁹.

With the LCUB filled once in a single year, therefore, the *alveus* could be drained and refilled at most once per week and at least once per month, yet both frequencies are too low to be realistic.

16) For a 3D model of this reservoir and cistern system, see <http://www.cosaeexcavations.org/home>.

17) This number was reached by taking the dimensions of the LCUB and the water line present in the *cocciopesto* lining (15,18 x 3,80 x 1,6 meters = 92,2944 cubic meters = 92.294,4 liters; DE GIORGI 2018, p. 16).

18) This elevated cistern was likely filled with water from the LCUB via a bucket and chain water lifting device.

19) The increments taken for this exercise were 100% (92.294,4 liters), 75% (69.220,8 liters), 50% (46.147,2 liters), and 25% (23.073,6 liters) of the LCUB capacity.

At 100% capacity, the water in the LCUB could fill the elevated cistern 11 times and the *alveus* 52 times.

At 75% capacity, the water in the LCUB could fill the elevated cistern 8 times and the *alveus* 39 times.

At 50% capacity, the water in the LCUB could fill the elevated cistern 5 times and the *alveus* 26 times.

At 25% capacity, the water in the LCUB could fill the elevated cistern 2 times and the *alveus* 13 times.

Extrapolating these numbers, for the *alveus* to be filled once a day, the LCUB would have to be filled to its evidenced capacity (i.e. 92.294,4 liters) at least 7 times in one year, which seems a reasonable rate of occurrence²⁰. On the other hand, if only 25% of the LCUB capacity is used to fill the *alveus*, then for a daily changing of water, this volume (23.073,6 liters) would need to be supplied roughly once every two weeks to the cistern, which is also not inconceivable²¹. It appears that if the Cosans did experience a drought or other dire situation wherein the water supply was compromised, the reserved water in the LCUB could sustain bathing practices for quite some time. Precautions were likely taken in the design of this reservoir and adjoining cistern, so that when the LCUB was at low capacity (25%), the bath could still be used and steps towards austerity would not be completely necessary.

BUILDING SUPPLIES: ANEPIGRAPHIC BRICK STAMPS

The bath has given us plenty of materials to study, among them the raw building materials themselves. During the excavation of the bath in 2016 and 2017 alone, over 200 fragments of ceramic building material that feature anepigraphic brick stamps were found. While these materials have been generally overlooked in the past²², the amount of excavated and *in situ* markings on ceramic building material at Cosa allows for new considerations and hypotheses about the use of these stamps. The three groupings shown in fig. 4 - types of markings which appear only on *bessales* in our bath - represent only 13% of the types of anepigraphic stamps seen in the bath at Cosa. More stamped materials were found in 2018, adding to the growing catalog, which will figure into our final publication of the bath.



4. BESSALES WITH ANEPIGRAPHIC STAMPS FROM THE BATH COMPLEX
(Florida State University, *Cosa Excavations*)

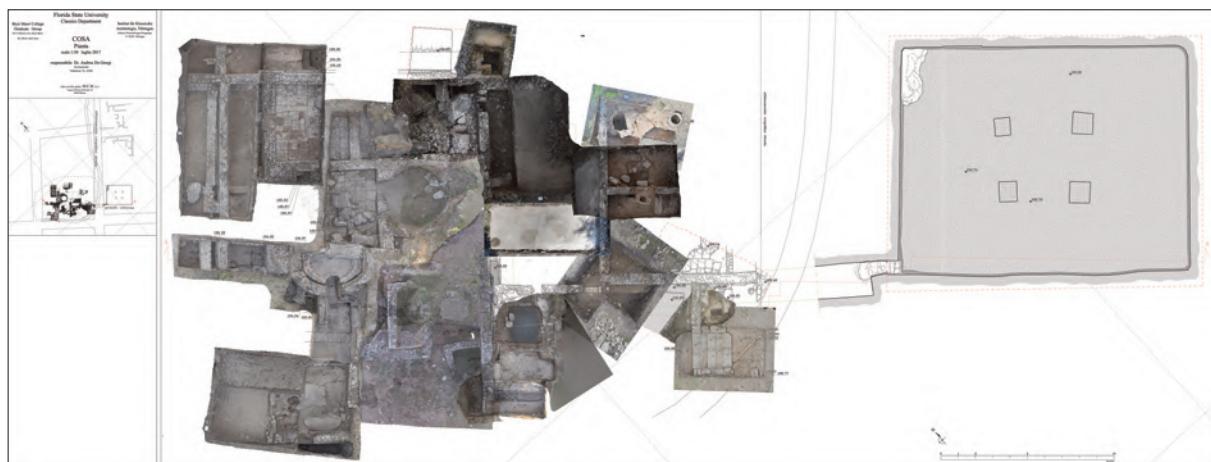
20) The LCUB's capacity of 92.294,4 liters is only $\frac{1}{8}$ the capacity of the reservoir (750.000 liters) to which it is attached. Therefore, the reservoir would not need to be filled entirely even once in this hypothetical year for the LCUB to be subsequently filled 7 times.

21) Approximating 28 times per year. The rate at which the water in *alvei* and other pools of Roman baths were changed is relatively unknown (FAGAN 1999, p. 183). Some estimates have been made (FARRINGTON 1999, pp. 107-108) and there is evidence outside of Italy that bath water was changed daily. The infrastructure in place in this *alveus* at Cosa, however, reflects a frequent changing of water; evidence of a conduit (lead or terracotta *fistula*?) for draining the pool is clear in the extant architecture.

22) TUOMISTO 2005.

DIGITAL APPROACHES: TAKING TRADITIONAL EXCAVATION METHODS TO THE NEXT LEVEL

In addition to traditional methods of excavation and artifact analysis, several other new avenues are being explored by the *Cosa Excavations* team. Orthographic imagery of Cosa is produced by Matthew Brennan of Indiana University and Allison Smith of Florida State University to document both the excavations and the colony more broadly. Using traditional photography, an Unmanned Aerial Vehicle (UAV), Agisoft Photoscan and Metashape, RealityCapture, and Adobe Photoshop, we have been able to model not only small artifacts found in the field and items in Cosa's museum, but also entire trenches excavated over the course of the season. We have also been able to overlay orthographic photographs of the finalized trenches excavated since 2014 onto the site plan (*figg. 5-6*).



5. ORTHOGRAPHIC IMAGES OVERLAIDED ON THE STATE PLAN, 2014-2018 (Florida State University, *Cosa Excavations*)

While we produce orthographic images depicting trenches at closing, as seen in *fig. 6*, other photomodels are made throughout the season to record layers which must be removed and to illustrate the stratigraphic process of excavation at Cosa. With these and other materials, a virtual archaeological space is being constructed by Matthew Brennan and others at Indiana University. Not only can these visualizations and interactive records be used by other archaeologists, but the various models can also be integrated into the classroom, interactively illustrating the destructive nature of archaeological practices and helping to explain why certain measures were necessary to take in the field.

UNDERSTANDING THE BIG PICTURE: GEOPHYSICAL SURVEY AT COSA

Another new avenue of exploration is the geophysical survey, which has been conducted since 2013 in partnership with Richard Posamentir of the Institute for Classical Archaeology of Tübingen and the technicians of GGH in Freiburg. It is a work in progress, intended to explore the unexcavated sectors of Cosa, and with another main impetus of testing the validity of the “gridded city” hypothesis. As shown in *fig. 7*, the actual extents of some streets are at variance with Brown’s image of the city.

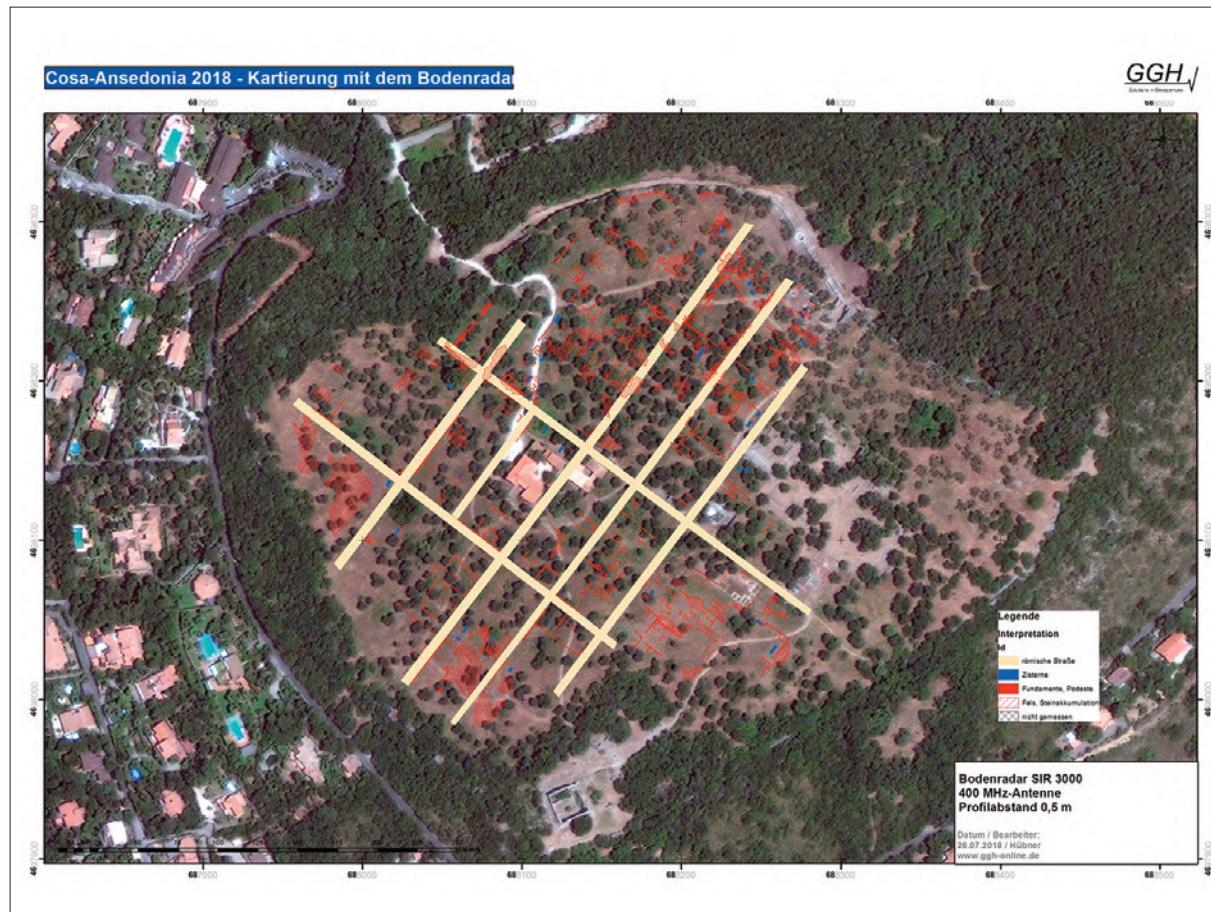
Along these investigatory lines, Street N may have not reached the perimeter of the walls. More fundamentally, *fig. 8* illustrates that Street N is obliterated by the imposing silhouette of a conspicuous building of ashlar masonry. Approximately 65 meters long on the short side, the edifice appears to be lined with rooms, possibly *tabernae*. This structure is slated to be investigated by the Tübingen group via several exploratory trenches in 2020.



6. MODEL OF A 2018 TRENCH, DESIGNATED “CENTRAL SOUNDING II”, AT CLOSING
(Florida State University, *Cosa Excavations*)



7. COSA: RESULTS OF THE GEOPHYSICAL SURVEY (Institute for Classical Archaeology of
Tübingen, GGH in Freiburg)

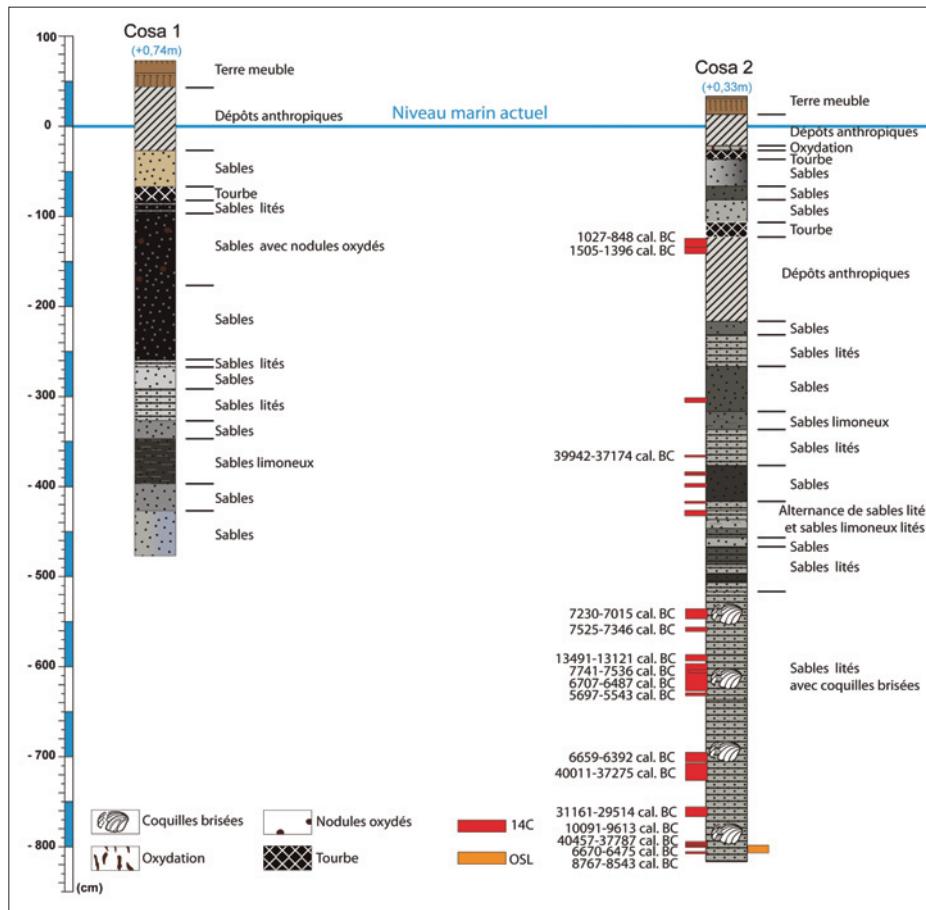


8. GEOPHYSICAL SURVEY RESULTS SHOWING THE MAIN FEATURES RECORDED TO DATE (Institute for Classical Archaeology of Tübingen, GGH in Freiburg)

CLIMATIC CONTEXT: CORING AT COSA

The traditional representation of Cosa is as a colony cyclically flourishing and declining. *Cosa Excavations* has begun to investigate how ecological downturns may account for phases of retrenchment at the site, especially as one considers that Cosa occupies a waterless promontory and, as discussed, receives modest annual rainfall each year. With a view toward better establishing the intersection between human agency and the environment, beginning in 2018 *Cosa Excavations* has started a program of coring along the port. We partner with Jean-Philippe Goiran of the University of Lyon and aim at garnering a better understanding of the geoarchaeological and paleoenvironmental contexts in which the city nucleated and grew.

Our first season of coring in the area of Cosa's ancient port led to results that inform sedimentation processes that long preceded the foundation of the city (figg. 9-10). For now, an anthropic peat level ^{14}C dated to around 1027 cal. 848 BCE retrieved by Core Cosa 2 at the depth of 1,5 meters enables us to build the initial plateau for future research, all the more as this layer may be compatible with samples further south in the area of the Burano lake, thus shedding light on the interplay between freshwater bodies, saltmarshes. Further coring has been planned for the 2020 season.



9. THE 2018'S CORING PROGRAM RESULTS (Université de Lyon)



10. MAP POSITIONING OF THE 2018'S CORING SAMPLES (Université de Lyon)

CONCLUSION: 70 YEARS AND COUNTING

Though great strides have been made in discovering, interpreting, and reevaluating the state of affairs at Cosa over the last 70 years, there are still many avenues to explore. *Cosa Excavations* has been eager to combine legacy data and traditional excavation techniques with new approaches as we work towards a fuller understanding of the long and complex history of the colony. The excavation of the bath, in particular, will add new information to our knowledge of small, central Italian thermal complexes. In the next few years we hope to publish the results of the investigation of the bath complex with appendices on digital applications, the georadar survey, and geoarcheological analyses discussed above.

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