Digital Digging on the Molyvoti, Thrace, Archaeological Project: IDig and a New Web Application

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Abstract: *Twenty years ago, the idea of widespread technology integration in archaeological research was beyond imagination. The excavation in Molyvoti, a walled classical city situated along the coastal region of Aegean Thrace identified as Stryme, the Thasian emporion, exemplifies the transition from traditional to modern technological methodologies in archaeological studies. The excavation endeavors at Molyvoti, which trace their origins to the 1950s, serve as a compelling illustration of the shift towards incorporating advanced technologies for research purposes.*

Key words: Aegean Thrace, Stryme, databases, material registration
Ключови думи: Егейска Тракия, Стриме, бази данни, регистриране на находки

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Situated amidst the prominent Greek city-states of Abdera, Dikaia, and Maroneia[1], along the Aegean coast, lies the classical city of Molyvoti, frequently associated with the polis and *emporion* of Stryme, a Thasian *apoikia* (**Fig. 1**)[2]. The city had two harbors: one to the south of the city, with moles built along the edges, and another harbor in the current Elos Lagoon, southwest of the city. A cemetery consisting mainly of tumuli lays outside the city walls, to the northeast, at the interface with the mainland, while other burials were located to the southwest of the city. It is worth noting that in their majority the tumuli are aligned in the N-S axis, probably along one or more an-

[1] For geospatial data and coins types of the Mints, see Abdera: https://nomisma.org/id/abdera_thrace; Dikaia: https://nomisma.org/id/dicaea_thrace; Maroneia: https://nomisma.org/id/maroneia

[2] *Arrington et al.* 2016. About Dikaia, a city that have been referred to the Athenian Tribute list as being close to Abdera, see *Triantaphyllos, Tasaklaki* 2012; *Triantaphyllos, Tasaklaki* forthcoming; and *May* 1965. For Maroneia, see *IThrAeg* 320-338; *Psoma, Karadima, Terzopoulou* 2008. For the Greek Colonist in Thrace, see *Isaac* 1986; *Tiverios* 2008; *Damyanov* 2015.

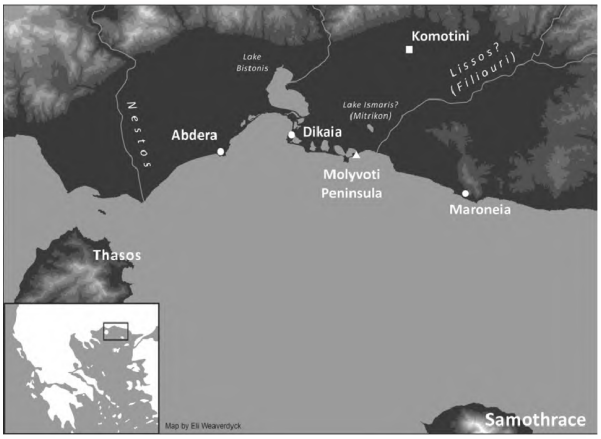

Figure 1. Map of Aegean Thrace. (©Eli Weaverdyck).

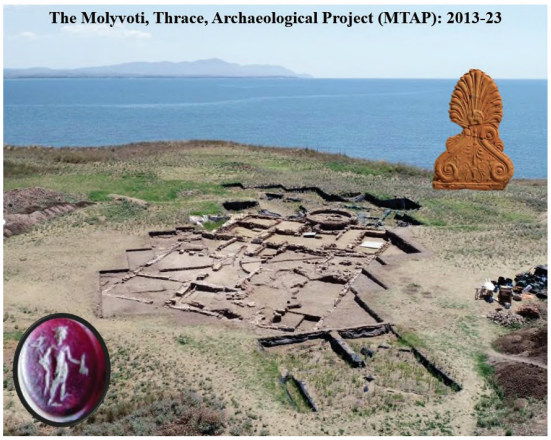

Figure 2. The House of the Gorgon and the house of Hermes in Stryme.

cient roads connecting the city to the Thracian hinterland[3].

A primary feature of the site is its subterranean aqueduct, likely dating back to its initial establishment, visible today from the sea[4]. Comprising interconnected tunnels linked to wells, this aqueduct facilitated water access for the inhabitants, likely pooling ground water. It represents a significant feat of public infrastructure akin to the grand projects such as the Eupaline aqueduct of Samos or Perachora.

The fortified city measures over 63 hectares; some of the eastern section has fallen into the sea and is not included in this calculation[5]. Building *insulae* measure about 70 m x 35 m and there are intersections. The new 4th-century grid plan of *insulae* consists of eight structures, four on the long side, measuring 17.6 m by 17.6 m each, having a common spine wall. Up to now, only two houses have been excavated in their entirety, and many more have been partially revealed (**Fig. 2**). The second house, the House of Hermes, has a different organization and range of finds than the House of the Gorgon, with implications for activity at the site as well as broader issues of domestic archaeology. At the northeast, northwest, and southwest, 4th-cen. city walls have been identified[6].

The fine ware, lamps, loom weights, clay figurines etc. shed light on daily activities and social practices. An eastward orientation (Ionia) was manifest in earlier and later phases of the city's life (archaic period/end of classical), while from the end of the 5th century BC and the first half of the 4th century BC much of the imported fine ware is Attic in origin but there are also regional imitations (**Fig. 3**)[7]. The large number of amphoras, stamped tiles from Thasos and especially coins from the excavation and urban survey is striking (approximately 600 coins come from only two houses), and highlight trade activity and networks[8].

A destruction that took place in the mid-4th century BC is related to Philip II's campaigns in Thrace but life resumed, albeit in a limited manner. What is noteworthy is that there is no final, second destruction horizon, but instead strong indications that the city was slowly abandoned

[3] *Bakalakis* 1967: 3-17; *Triantaphyllos* 2000; *Terzopoulou* 2004; *Terzopoulou, Tasaklaki, Arrington* 2023; *Tasaklaki, Leou* forthcoming. For the *chora* formation in general, see *Baralis* 2008.

[4] *Bakalakis 1967*: 38-45.

[5] For the Landscape, as well as the urban development, see *Arrington, Terzopoulou, Tasaklaki, Weaverdyck* 2022; *Arrington, Terzopoulou, Tasaklaki, Makris, Hudson* 2023.

[6] *Terzopoulou, Tasaklaki, Arrington* 2023. See also, note 11. For houses, both excavation research and publications in this field, were limited, see *Arrington, Terzopoulou, Tasaklaki* forthcoming. Complete houses have been unearthed at Abdera and Zone in Aegean Thrace, for which there are only annual reports in Praktika tes en athenais Archaiologikes Hetaireias (PAE 1973 and so on). For the Hellenistic house found at Maroneia, see *Karadedos* 1990 and *Lavvas, Karadedos* 1990.

[7] For Attic pottery found at the site of Molyvoti, see *Bakalakis* 1967; *Triantaphyllos, Terzopoulou* 2012; *Arrington, Padgett* 2019; For the Ionian orientation, see *Tasaklaki* forthcoming C.

[8] For the coins, see *Tasaklaki* forthcoming A and B. For Networks, see *Karambinis* 2019.

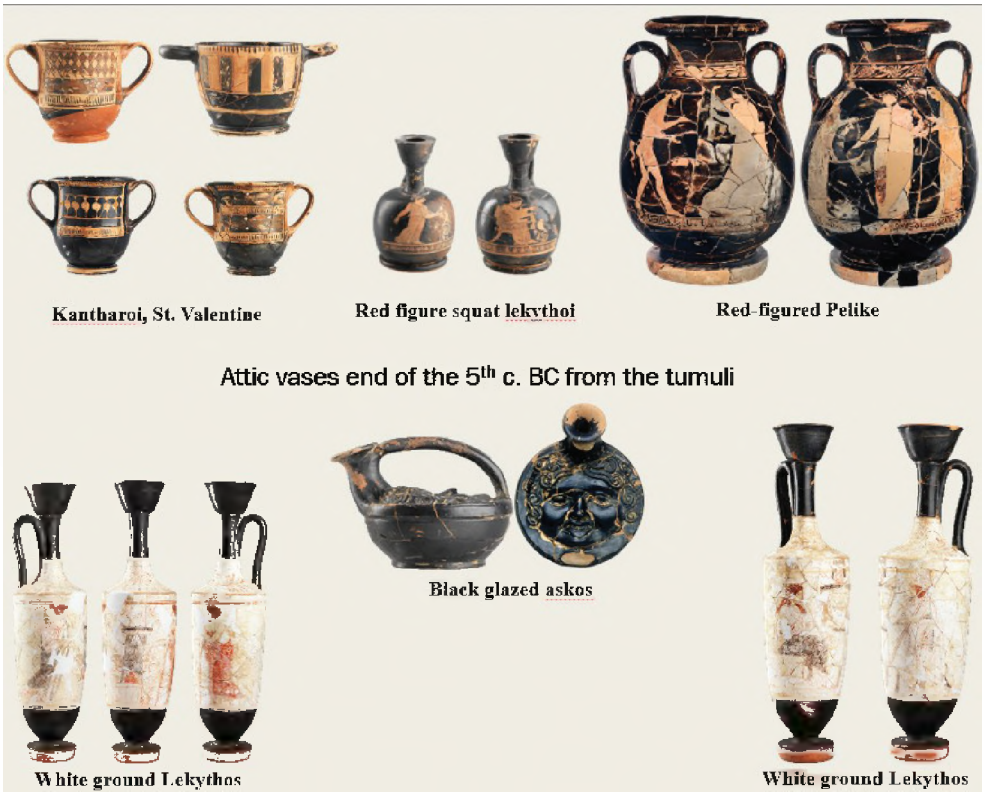

Figure 3. Attic pottery found at the necropolis. (©Ephorate of Antiquities of Rhodope).

at the beginning of the 3rd century BC, during a time of insecurity and instability for the region of Aegean Thrace, as economic networks were disrupted. In contrast, life went on in the *chora*. The survey revealed the edges of the Classical–Hellenistic chora and a significant shift in settlement patterning in the post-Hellenistic periods. An extra-mural sanctuary detected in 2015 and the focus of the 2023 excavation season will be presented in a future preliminary report.

The excavation endeavors at Molyvoti, which first began in the 1950s, are a compelling illustration of the transition towards the incorporation of advanced technologies for research objectives (**Fig. 4**). It exemplifies what was beyond imagination twenty years ago: the idea of widespread technological integration in archaeological research.

The initial excavation, led by Bakalakis in 1957[9], faced challenging and occasionally harsh conditions, lacking transportation vehicles and even basic water supplies. By 1993, when Triantaphyllos initiated a subsequent phase, conditions had improved, and advancements such as geophysical studies were introduced. However, as new theoretical perspectives emerged over time, accompanied by an increasing number of inquiries, novel methods of investigation became available. Furthermore, the wealth of material unearthed necessitated innovative approaches to management.

Thus, the Molyvoti, Thrace, Archaeological Project (MTAP)[10], a *synergasia* spanning two fieldwork phases of 5 years each – the first results already published in 2016-, with a two-year hiatus due to the pandemic, had to encounter new challenges[11]. Employing focused excavation, pedestrian surface survey, geophysical survey, and geomorphological prospection, the project has delved into the urban structure of the

[9] *Bakalakis* 1967.

[10] For MTAP, see https://scholar.princeton.edu/mtap/home. (https://mtap.scholar.princeton.edu/). Preliminary results of the first period of excavation 2013-2015 have been published in *Arrington et al.* 2016. For previous research, see *Bakalakis* 1967; *IThrAeg* 287-288; *Triantaphyllos, Terzopoulou* 2012; For the coins found at the site, see *Psoma, Karadima, Terzopoulou* 2008; *Loukopoulou, Psoma* 2008.

[11] *Arrington, Terzopoulou, Tasaklaki, Tartaron* forthcoming.

Figure 4. Excavation by Bakalakis in 1957. (©Ephorate of Antiquities of Rhodope).

city and its relationship to the *chora* and the hinterland from a diachronic perspective. And of course, to our many specialists we have added a new position: the IT expert. This interdisciplinary approach allows for a comprehensive exploration of the city's history and its interactions with broader social dynamics. For example, we can examine how zones of activity (urban and rural, with economic, sacred, and political functions) functioned as nodes in broader networks of communication and exchange in an evolving Mediterranean world.

But in the process of finalizing the publication of the House of the Gorgon, which was unearthed during the first campaign, we confronted numerous challenges that prompted us to explore new digital approaches during our second campaign[12]. A significant issue, common to many excavations, was the isolation of scholars analyzing the finds after the season, leading to a lack of awareness regarding one another's discoveries and updates.

Another challenge we faced was how to effectively present the project results while addressing the specific requirements of each artifact type and context information. Similar to many archaeological projects, our forthcoming print publication of the House of the Gorgon is structured by artifact type, allowing specialists to offer detailed insights into the finds and connect them to broader discussions in their specialized subfields. While context information is documented in the book, for a reader to recover assemblages and connect the find contexts that are shared across different chapters requires considerable effort. The read must work with indexes and inventories and lists, flipping back and forth from one part of the book due to another. And due to the constraints of print space, some data had to be omitted, so it is impossible for a reader to recover complete contextual information. Not every pottery sherd was inventoried, and not every inventoried object was catalogued.

Figure 5. Taking measurements with a Leica Total Station.

To manipulate such a large and diverse amount of material in the traditional way is an extremely difficult and time-consuming task. To remedy these problems, we turned to digital methods. Our starting point was the configuration of iDig. The *iDig* application, developed for the Athenian Agora by Bruce Hartzler, moves in this direction[13]. Designed as an archaeological tool for gathering data in the field, with some changes it could accommodate specialties like numismatists. It allows field archaeologists to record excavation data easily, accurately, and consistently in real time and then process and share it quickly with specialists and vice ver-

[12] Ibidem.

[13] The application was first developed for the *Agora* excavations in Athens (http://agathe.gr/) and is now being used by many projects. Bruce Hartzler and Georgios Verigakis created this very significant tool for archaeologists and all related disciplines. For further info, see http://idig.tips/ and https://www.youtube.com/watch?v=gyBPYfEFE-k (downloaded 30-06-2024). Dimitris Baloukidis configured the application in MTAP and especially in relation to coins.

Figure 6. Coins registered with the IDig app.

sa. Each team member instantly records every artifact, architectural element, sketch, photograph, 3-D rendering, soil description. It communicates with aLaser rangefinder (in our case, a Leica Total Stations) in the field (**Fig. 5**). An excavator can see and track data from a number of useful perspectives: top plan, cross section, and spatial and temporal matrix layouts. 3-D Orthomosaics created through photogrammetry are updated at least once a week and form the base plan on which the data is mapped along with the help of the total station. Those project members work at the dig house, such as the registrar or the zooarchaeologist, work on their own iPads[14]. Every afternoon, all devices are synced. Thus, the zooarchaeologist, for example, has the most up-to-date contextual information, and the trench supervisor has the most up-to-date readings of the bones from his or her contexts.

Regarding coins, relevant information was inputted in two stages both by the supervisor of the excavation and the numismatist. In the first stage, the supervisor enters an ID number, fabric, and co-ordinates (**Fig. 6**)[15]. At the same time, if the iconography is legible and furthermore identifiable, the numismatist can add the issuing authority, obverse/reverse description, and date. In the second stage, i.e. after conservation, which takes place either in tandem or just after the end of the excavation season, measurements (weight and diameter), details of description from a default list, references, and professional photographs of the artefact are added.

Careful data entries and continuous updates are necessary prerequisites for having the desired results in the initial stage of the study of the material. Thus, the numismatist and archaeologists have in a very short time the most important information related to each coin,

[14] The application is available for download via *iTunes*.

[15] First presentation of the use of IDig in the field and especially regarding coins was in the 9th Joint Meeting of the ECFN and Nomisma.org, Viminacium, 21-25 September 2021, Costolac, Serbia: 'Numismatic data related to the classical city Molyvoti and the IDig application' (https://fundmuenzen.org/2021/09/21/the-9th-joint-meeting-of-ecfn-and-nomisma-org-2021/ (visited 20.09.2024).

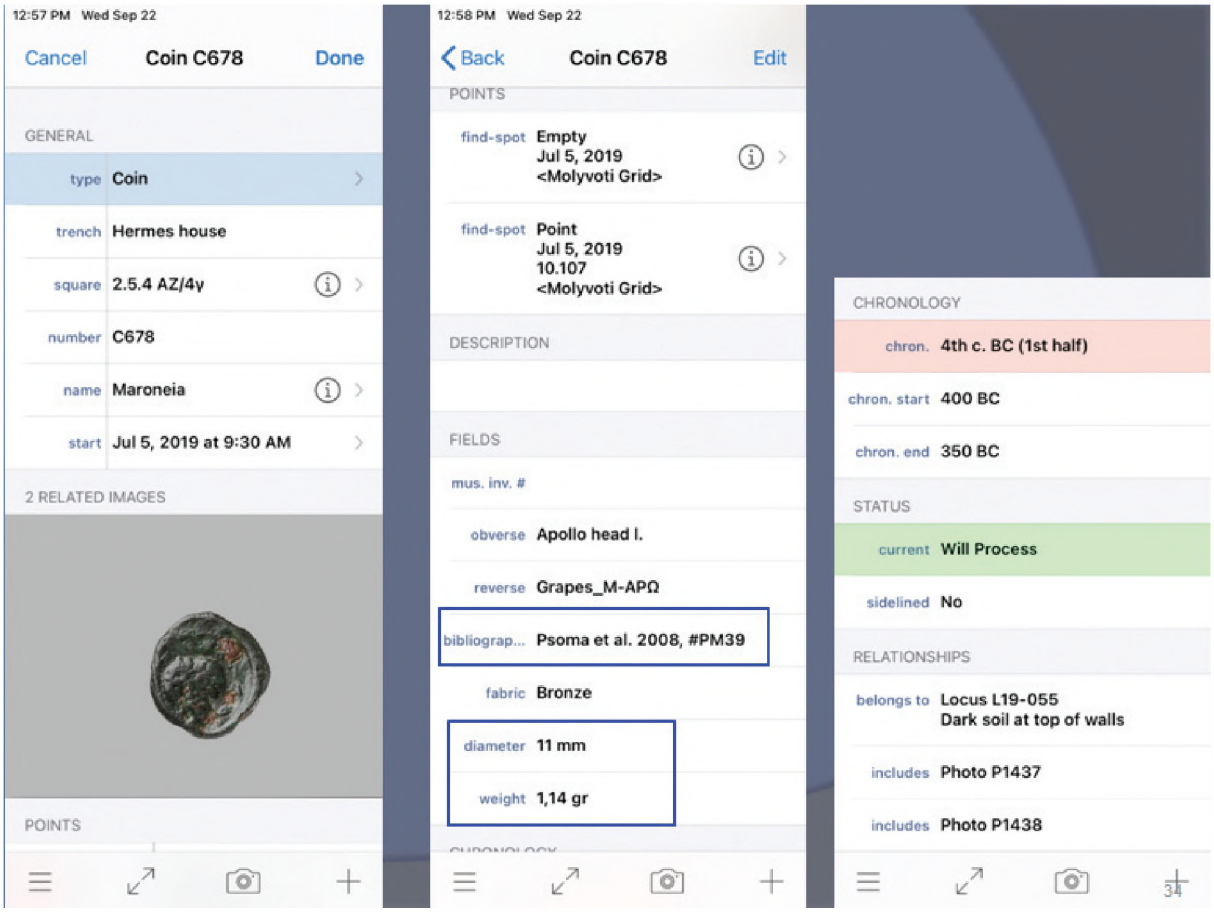

Figure 7. Info regarding coins added to the IDig app.

i.e. issuing authority, obverse / reverse, date and fabric (**Fig. 7**). These data in collaboration mainly with fine pottery and other special finds (like lamps, amphoras, loom weights etc.) provide a clear picture of a locus or of the area selected with a pencil area. For example, in the pastas of the house we have found 37 finds, 13 of which are coins (**Fig. 8 a-b**). In the *andron* we have 4 finds and only 1 coin (**Fig. 8 c-d**). Coins can be sorted by date, issuing authority or both. Specific coins also can be isolated by removing them from the screen. Unfortunately, for now this is the only way to isolate Roman coins for example. But by having an IT specialist on the project, the application is constantly being modified to fit the researchers' needs.

The iDig application facilitates the workflow and collaboration across the entire project during the field season. But it is less successful with the post-season study, as scholars working on the material after excavation has ended and they have returned to their respective institutions are not able to see one another's work and updated results, because they need to have access to the iPads. But those iPads cannot contain the data from an entire excavation (rather than one excavation square) and cannot be constantly syncing while people are no longer together. Consequently, we decided to create a new web application that accommodated the iDig data (**Fig. 9**)[16]. With the assistance of Dimitris Baloukidis, MTAP took the next step with this application, creating a web-based rather than iPad-based platform, which facilitates study outside of the field season. This web application also could complement our print publications, providing a more comprehensive presentation of the finds, and facilitating the exploration of

[16] For a more detailed presentation regarding programming and the language used in the Web Dig site of the site, see *Arrington et al.* forthcoming, which is going to be submitted to Hesperia. Here we only present the environment of site as a tool for material study and our future goals.

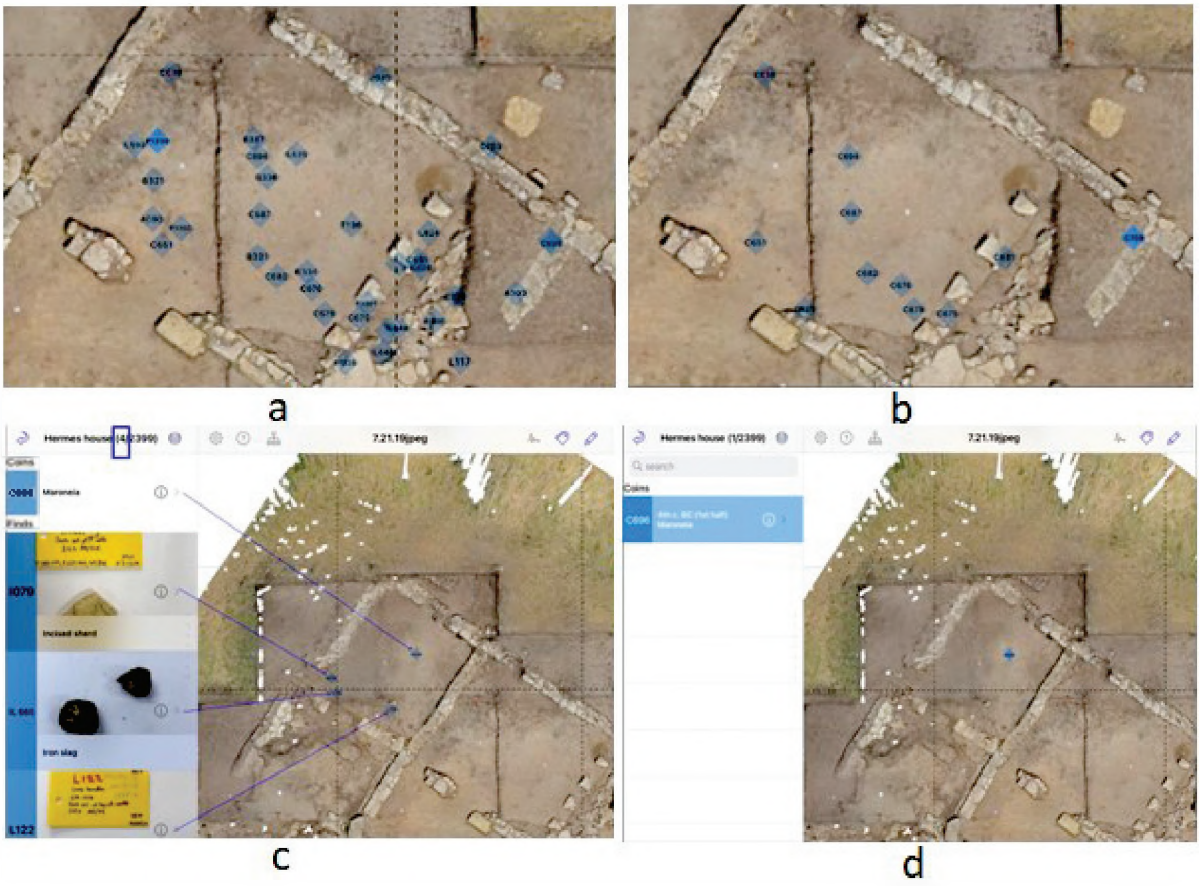

Figure 8a-8d. Findings at the Pastas vs coins, c-d: Findings at the Hadron vs coins.

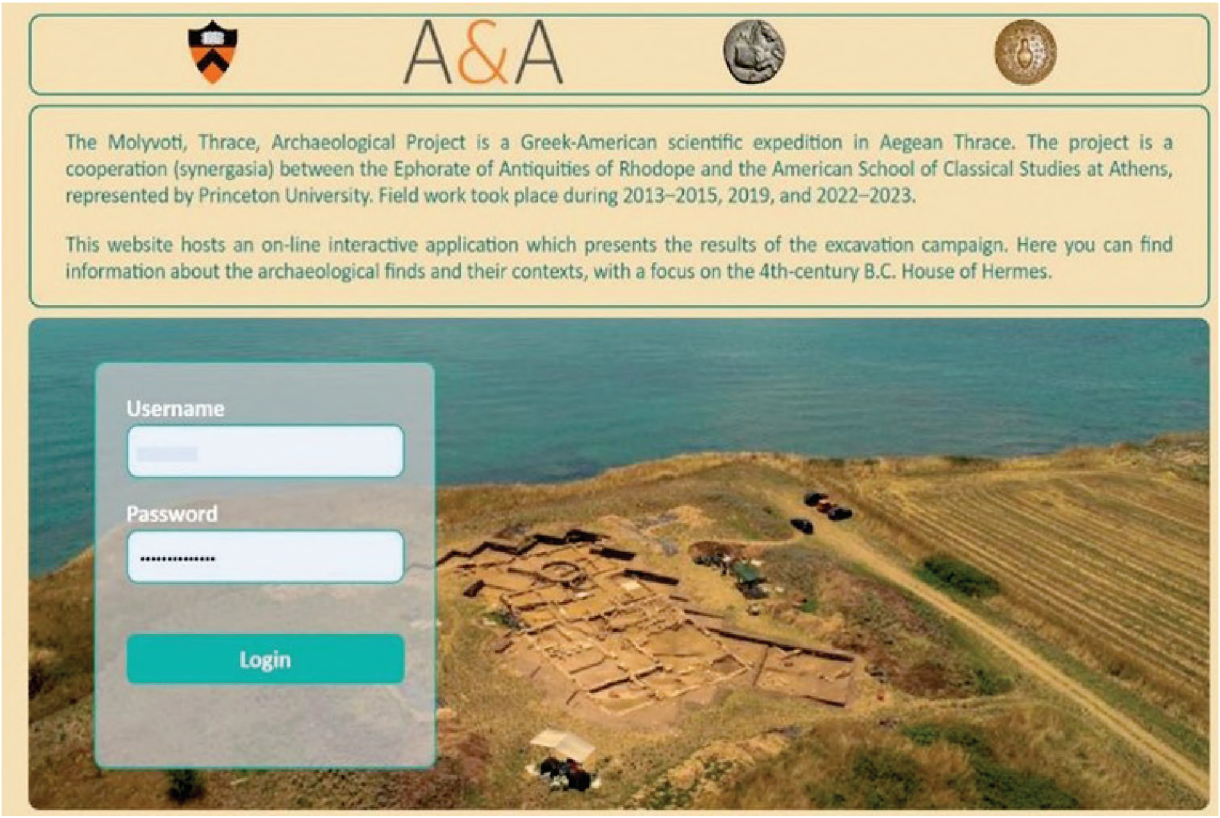

Figure 9. Web-app for the MTAP.

context. A reader of the book would be able to see complete contextual information for an artifact. rapidly on the web application.

The data recorded on iDig in and out of the field for the House of Hermes amounts to more than five thousand records, most of them containing information about artifacts. The database contains all the data acquired on site by the different iPads running the iDig application during the excavation campaign, which can be exported from the iPads and uploaded to the web application. It requires neither compilation nor installation, only copying the source code and data files to a web server. Instructions are provided by various videos, with an aim of making it available widely, to disseminate the findings and the results and encourage public interest in our findings.

The application presents, much like iDig, the archaeological finds, features, and contexts with the relevant descriptions, images, spatial information, and visualization on a site plan generated through photogrammetry. The users can use the application to navigate the site, search for data, focus on certain areas of study, view cross sections and dimensions of the excavation loci, and obtain citation links for each publicized item. It will be made available as open-source software, so that other interested parties are free to use it. Efforts were made to present the large number of photographs and data seamlessly, to ensure data integrity and consistency, to provide several opportunities for item selection and preview, and to keep the Graphical User Interface simple and eloquent.

As for coins (**Fig. 10**), all necessary information regarding Issuing authority, Region, obverse and reverse description and inscription, date, fabric, dimensions and bibliography are present. If someone clicks on the field locus, they can see the description and what other artifacts are related to it.

At this stage, the application is a work in progress and serves primarily to aid in the study. We anticipate modifications and improvements to the platform as we receive feedback from scholars, students, and the public.

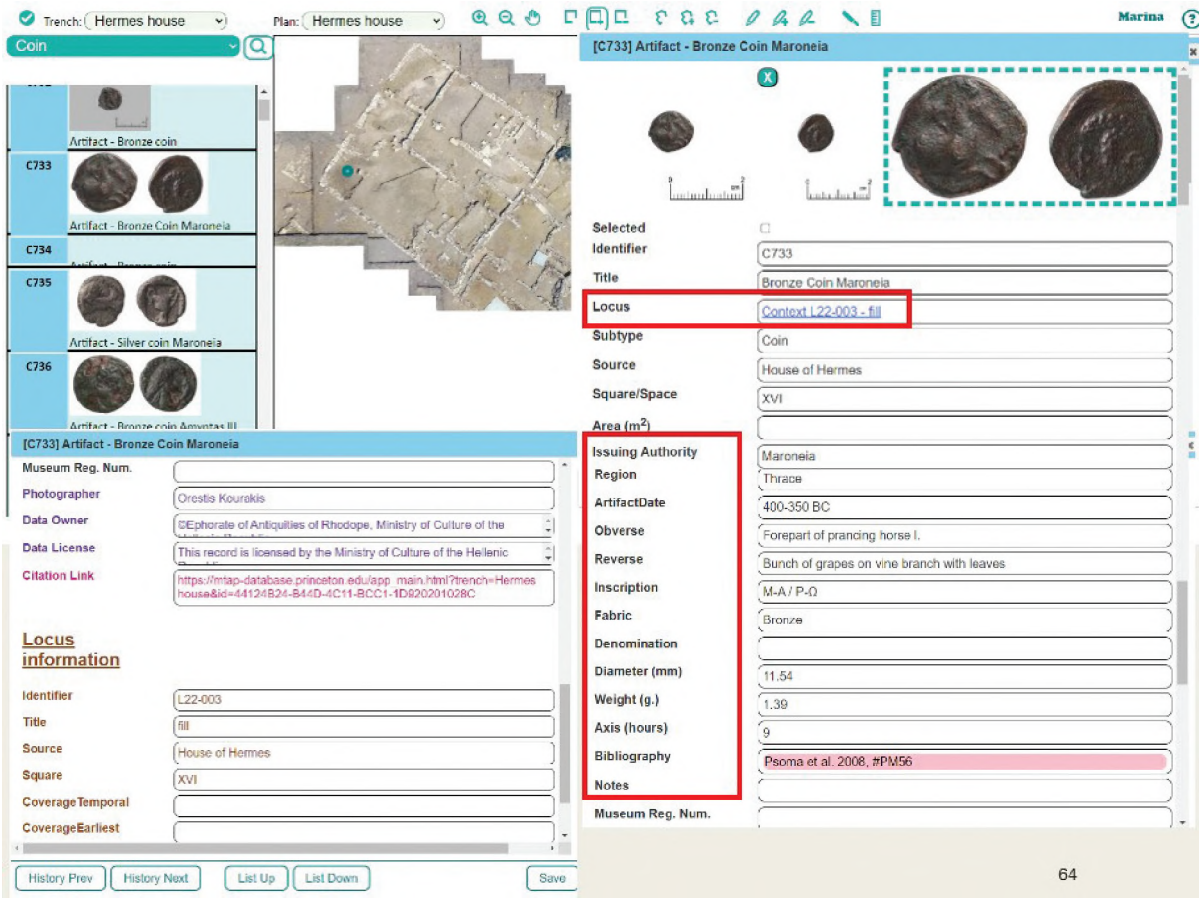

Figure 10. Info for Coins in the Web-app.

For the nearby future, it will work as a hybrid (print and digital) publication and presentation of the House of Hermes and the extra-urban temple site, which are separate "trenches" in the application. In addition, however, it should accompany the forthcoming publication on the House of the Gorgon by allowing readers of the book to obtain the complete list of findings from the house, rather than just the catalogued items. This online platform will enable convenient access to excavation findings and material publications, aiming to engage a wider audience with archaeological research.

Closing this paper, it is necessary to stress that we still dig dirt with trowels and pickaxes. In conclusion, while technology has undoubtedly enhanced the field of archaeology in numerous ways, the traditional practice of digging dirt with trowels remains an indispensable aspect of archaeological research. By combining modern technological tools -above the air, on the earth, under the earth - with traditional excavation methods, archaeologists can achieve a more comprehensive understanding of the past and continue to unravel the mysteries of ancient civilizations.

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Дигитални разкопки на Археологически проект Моливоти, Тракия: IDig и ново уеб приложение

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В рамките на Археологически проект Моливоти, Тракия (MTAP), експерти анализират керамика и нумизматични данни, а също фаунистични и органични останки, открити при теренните проучвания и целенасочени разкопки. Този интердисциплинарен подход позволява цялостно разбиране на историята на града и взаимодействията с по-широката обществена динамика. За систематично записване на всички археологически данни и с цел намаляване на времето за проучване, приложения като iDig са внедрени на място. Освен това са положени усилия за подобряване на публичната достъпност чрез разработването на приложението web-MTAP. Тази онлайн платформа дава възможност за удобен достъп до находки от разкопки и публикации на материали, с цел да ангажира по-широка аудитория с археологическите изследвания.