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A Dig through Archives and Depots

Rediscovering the Inlay Workshop of Tebtynis and Its Materials

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Abstract

Despite the key role of the Ptolemaic period in the history of glass technology, very little is known on the workshop activities and on the organization of the production. This is mainly due to the limits of the documentation currently available, consisting of very few archaeological contexts often poorly preserved. This contribution presents a first overview of the material and archival record related to the 1931 excavations in the Ptolemaic inlay workshop of Tebtynis (Fayum oasis, Egypt). Unlike other coeval sites, the data from Tebtynis revealed a complete set of evidence related to the stratigraphy and the topography of the craft area, to the shape and size of the kiln, to the furniture, the tools, the raw materials, and the finished products discovered. The interpretation of the data provides the opportunity to propose new hypotheses on the function of the spaces and the tools, but also on the chronology of the workshop, contributing to shedding light on the technological and empirical knowledge of the ancient Egyptian glassmakers in a crucial moment of glass history.

Keywords

glassmaking – Ptolemaic Egypt – inlay workshop

1 Introduction

Glass holds a central role in the history of science. Its origin and technological developments set the basis for producing tools able to verify hypotheses in the fields of astronomy, physics, biology, and environmental studies, leading to the so-called Scientific Revolution.[1] Historical researches on ancient glass devoted great attention to the literary sources, developing a combined philological and theoretical/philosophical approach to investigate the perception of glass in the Graeco-Roman world.[2] In his preface to the book *When Glass*

1 Lewis Mumford, *Technics and Civilizations* (London: Routhledge, 1934); Alan MacFarlan, Gerry Martin, *The Glass Bathyscaphe. How Glass Changed the World* (London: Profile Books, 2002); Seth Rasmussen, *How Glass Changed the World. The History and Chemistry of Glass from Antiquity to the 13th Century* (Berlin, Heidelberg: Springer, 2012).

2 Giovanni di Pasquale, "Scientific and Technological Use of Glass in Graeco-Roman Antiquity," in *When Glass Matters*, edited by Marco Beretta (Firenze: Leo S. Olschki, 2004), pp. 31–76; Marianne Stern, "Ancient Glass in Philological Context," *Mnemosine*, 2007, *60*/3:341–406.

Matters, Marco Beretta underlines the importance of an interdisciplinary dialogue between historians and specialists of different fields, in order to broaden our overall understanding on the history of scientific and technological knowledge.[3] This paper is intended to offer an additional perspective on the topic seen through the lens of Ptolemaic glass by combining archival studies, archaeological data and a chemical and mineralogical approach to pyro-technological problems. Specifically, the work aims to provide new suggestions based on the material evidence of the Ptolemaic inlay workshop in Tebtynis,[4] as recently emerged from the archival documents related to the excavations in the 1930s of the Italian archaeologist Carlo Anti and from the survey in the storage depots of the Museo Egizio of Turin, Italy (ME). Over the years, many authors have reported the existence of an "enamel workshop" in Tebtynis, following the short reports published by Carlo Anti after the 1931 field season.[5] However, at the end of the seven Italian campaigns, most of the structures unearthed, including the workshop, were damaged or covered by the sand and have not been extensively retraced or re-excavated ever since.[6]

In a recent work, a series of extracts from Anti's archive specifically related to the discovery of the "enamel workshop" were identified.[7] Starting from those data, the research here presented aimed at verifying Anti's hypothesis, which had never been examined before. The confirmation of the reliability of his interpretations was obtained thanks to a detailed scrutiny of the archival data and a first examination of the materials discovered in the craft area. After these preliminary steps, the project focused on the functional interpretation of the

3 Marco Beretta, "Preface," in *When Glass Matters* (cit. note 2), pp. vii–xiv.

4 For the importance of the Egyptian glass workshops in the study of the alchemical practice during the Ptolemaic and Roman period see: Matteo Martelli, "Greek Alchemists at Work: 'Alchemical Laboratory' in the Greco-Roman Egypt," *Nuncius*, 2011, *26*:271–311; Marco Beretta, *The Alchemy of Glass. Counterfeit, Imitation, and Transmutation in Ancient Glassmaking* (Sagamore Beach: Watson Publishing, 2009).

5 Carlo Anti, "Gli scavi della Missione Archeologica italiana a Umm el Breighât (Tebtunis)," *Aegyptus*, 1931, *11*:389–391; Id., "Gli scavi della Missione Archeologica italiana a Umm el Breighât (Tebtunis)," *Bollettino dell'Associazione internazionale di Studi mediterranei*, 1931, *2*:23–24; Id., "Archeologia d'oltremare IV, Campagna 1931," *Atti del Regio Istituto Veneto di Scienze Lettere ed Arti*, 1931–1932, *91*/2:1171–1193.

6 Vincent Rondot, *Tebtynis II. Le temple de Soknebtynis et son dromos* (Le Caire: IFAO, 2004).

7 Giulia Deotto, *L'Università di Padova in Egitto. Analisi e ricostruzione dello scavo a Tebtynis attraverso la documentazione inedita* (PhD Diss., University of Padova, 2015); Ead., "Dai documenti d'archivio alla ricostruzione del contesto: il caso studio di Tebtynis," in *Anti Archeologia Archivi. Congress Proceedings*, edited by Irene Favaretto, Francesca Ghedini, Paola Zanovello, Emanuele M. Ciampini (Venezia: IVSLA, 2019), pp. 289–308.

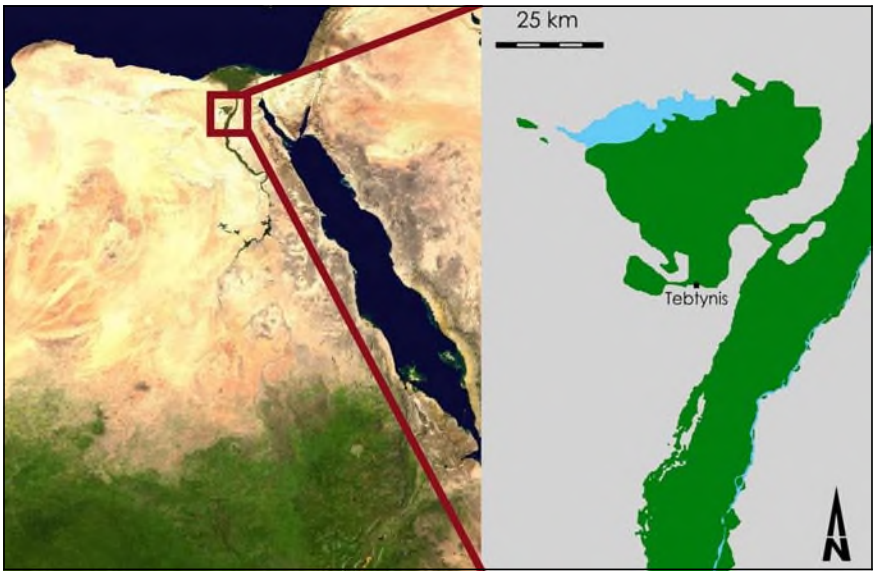

FIGURE 1 Localization of the archaeological site of Tebtynis (Fayum, Egypt)

structures, the spaces, and the material record, proposing new thoughts on the production processes and on the significance of the Tebtynis workshop, also in comparison with what is known from other coeval contexts.

2 The Archaeological Context

The ancient village of Tebtynis lies at the south-eastern edge of the Fayum oasis, in an area currently known as *kôm* Umm el-Breighât (Fig. 1). The site was first occupied during the Middle Kingdom (late Dynasty XII, approximately 1800 BC) and survived until the 11th century AD, when it was abandoned due to the gradual desertification of the area.[8] Most of the structures and artifacts discovered in the site, however, date back to the Graeco-Roman age.

The site is divided into three main sectors: heading north from the sanctuary of the god Soknebtynis, a long *dromos* connects the temple with the various districts of the village. The cemeteries lie just outside the town, in the southern and western part of the *kôm*.

8 Claudio Gallazzi, "La ricerca archeologica a Umm el-Breigat (Tebtynis)," in *Cento anni in Egitto: percorsi dell'archeologia italiana*, edited by Maria Casini (Milano: Electa, 2001), pp. 171–183.

During the years 1930–1936, the "Missione Archeologica Italiana in Egitto/ Italian Archaeological Mission in Egypt" (M.A.I.), directed by Carlo Anti, provided a preliminary overview of the topography of the site, bringing to light the Soknebtynis sanctuary, long forgotten after the surveys of the papyrologists Bernard Pyne Grenfell and Arthur Hunt at the turn of the 19th century.

Since 1936 and for over fifty years, the *kôm* remained at the mercy of *sebâkhin* and antiquities hunters. The excavations resumed in 1988 thanks to a joint mission of the French Institute of Oriental Archaeology (IFAO) and the University of Milan, which have been working there ever since.[9]

3 Anti and Bagnani's Excavations in Tebtynis and Their Archives

Carlo Anti (Villafranca di Verona, 1889 – Padua, 1961) was professor of archaeology at the University of Padova from 1922 to 1959. A leading figure of the Italian cultural scene, he was appointed Director of the Italian Archaeological Mission in Egypt in 1928 and starting from 1930 he conducted seven campaigns in Tebtynis. He chose to work with a multidisciplinary team, which included professional archaeologists, papyrologists, architects, and photographers. His closest assistant Gilbert Bagnani (Rome, 1900 – Ontario, 1985) joined the team in 1931; he was a talented archaeologist and would become a Professor of Classics at Trent University (Canada). Bagnani became the official field supervisor after Anti's election as Rector at his University in 1932 and took up the excavations when the Paduan professor had to remain in Italy. The dig continued until 1936 when Bagnani concluded his last mission in Tebtynis for a mix of political, financial and personal reasons.[10]

Anti and Bagnani documented their excavations through photographs, notes, diaries, reports, sketches, and technical drawings. These documents were preserved in their archives, recently rediscovered and studied by an international team of scholars. The Egyptian section of Anti's archive is composed of 1826 photographs, 121 diapositives, 26 plans and technical drawings, 1630 papers;[11] among them, 10 photographs were dedicated to documenting the

9 Claudio Gallazzi, Gisèle Hadji-Minaglou, *Trésors inattendus: 30 ans de fouilles et de coopération à Tebtynis* (*Fayoum*) (Le Caire: IFAO, 2019).

10 Donald James Ian Begg, "Anti and Bagnani: Their Working Relationship," in *Anti Archeologia Archivi* (cit. note 7), pp. 497–514.

11 Giulia Deotto, Alessandra Menegazzi, Carlo Urbani, Ian Begg, Luca Toninello, Luigi Magnini, Andrea Meleri, Laura Burigana, Giuseppe Salemi, Cinzia Bettineschi, Ivana Angelini, Paola Zanovello, "Current and Past Researches between Tebtynis and Padua,"

structure of the workshop and its annexes, 17 to illustrate the artifacts found during the excavations, while the building is visible in 27 pictures and 4 plans mostly devoted to show the sanctuary on the whole. Moreover, the structure and its artifacts were mentioned in 12 documents (reports, diaries, notes, and letters).

After Anti's death, his archive was split in three parts. Currently, the material regarding Tebtynis and the inlay workshop is essentially divided between the Museum of Archaeological Sciences and Art (MSA) of the University of Padua and the Istituto Veneto di Scienze, Lettere ed Arti (IVSLA) in Venice.[12]

Bagnani's archive was also split among two different locations: the Art Gallery of Ontario in Toronto and Trent University in Peterborough (Ontario, Canada). This archive proved to be a useful data source with reference to a series of documents and watercolors related to the findings of the 1931 campaign.

4 The Tebtynis "Enamel" Workshop: State of the Art

Despite the small number of documents related to the so-called *laboratorio di smalti* (enamel workshop) in his archive, Anti cited the structure various times in the preliminary publications of the excavations, which were especially focused on the temple.[13] The workshop was generally mentioned in connection with its artifacts, which were described as some of the major art finds in 1931. However, Anti never gave a precise location of the discovery in his accounts, because he was planning to dedicate a comprehensive publication to the work in Tebtynis, where he intended to offer a detailed discussion about every single

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in *Current Researches in Egyptology 2017*, edited by Ilaria Incordino, Stefania Mainieri, Elena D'Itria, Maria Diletta Pubblico, Francesco M. Rega, Anna Salsano (Oxford: Archaeopress, 2018), pp. 46–53.

12 Girolamo Zampieri, *I diari di Carlo Anti: rettore dell'Università di Padova e direttore generale delle arti della Repubblica sociale italiana: trascrizione integrale* (Verona: Accademia di Agricoltura Scienze e Lettere di Verona, 2011); Paola Zanovello, Giulia Deotto, "Carlo Anti a Tebtynis," in *Catalogo della Mostra Egitto in Veneto*, edited by Paola Zanovello, Emanuele M. Ciampini (Padova: Cleup, 2013), pp. 39–48; Carlo Urbani, "Carlo Anti e l'Istituto Veneto," in *Antichità Egizie e Italia. Proceedings of the III National Italian Congress of Egyptology in Veneto* (*Venice, 14–15 September 2012*), edited by Paola Zanovello, Emanuele M. Ciampini (Venezia: Ca' Foscari University Press, 2014), pp. 155–160; Alessandra Menegazzi, Carlo Urbani, "Gli archivi di Carlo Anti tra Padova e Venezia," in *Anti Archeologia Archivi* (cit. note 7), pp. 249–262.

13 Anti, "Gli scavi della Missione Archeologica italiana"; Id., "Archeologia d'oltremare" (both cit. note 5).

structure discovered by the mission. The only sporadic reference occurs in a letter from Anti to Pierre Jouguet, published in 1932 in the annual report of the *Académie des Inscriptions et Belles-Lettres*,[14] where he states:

> Dans la première cour on fait place à un plus grand nombre d'*idiotai*:[15] [...] une autre [maison] est employée pour l'atelier des fabricants d'émaux colorés.[16]

As a result of the surveys in the early 2000s, Rondot cautiously suggested that the workshop might be identified with either structure 20 D or 21 A on the Soknebtynis temple general plan.[17] It should be noted, however, that both buildings are located in the second courtyard and that 21 A was discovered only in 1932, according to the recent revision of the excavation progress.[18]

From its discovery onwards, the Tebtynis "enamel workshop" was cited by various scholars as one of the few Ptolemaic examples of glass (or faience) working facilities, yet all authors generically refer the structure to the *temenos* of the Soknebtynis temple.[19] Papyrological data offer very little evidence. There

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14 Pierre Jouguet, "Lettre de M. Carlo Anti sur les fouilles italiennes de Tebtynis (Égypte)," *Comptes-rendus des séances de l'Académie des Inscriptions et Belles-Lettres*, 1932, *4*:359–361.

15 In ancient Greek, the term *idiotai* refers to private citizens or, sometimes, simple workers and artisans.

16 Jouguet, "Lettre de M. Carlo Anti sur les fouilles italiennes" (cit. note 14), p. 360: "Within the first courtyard the number of *idiotai* grows: [...] another [house] is employed for the colored enamel workshop." The bibliographic citations and the archival documents are always cited in their original language. For consistency throughout the paper, texts in French and Italian are also reported in English. The translations are all the author's.

17 Rondot, *Tebtynis II* (cit. note 6). For details on the recent digitalization project of the plan the reader is referred to the bibliography in note 26.

18 Deotto, *L'Università di Padova in Egitto* (cit. note 7).

19 See e.g. Elisabetta Valtz, "Italian Excavations at Tebtynis 1930–1935: The Objects at Museo Egizio, Torino," in *Sixth International Congress of Egyptology*, edited by Jean Leclant, Vol. 1 (Torino: International Association of Egyptologists, 1992), pp. 625–628; Marianne Stern, Brigit Schlick-Nolte, *Early Glass of the Ancient World 1600 BC–AD 50. Ernesto Wolfe Collection* (Ostfildern: Verlag Hatje, 1994); Marie-Dominique Nenna, "Les ateliers de verriers dans le monde grec aux époques classique et hellénistique," *Topoi*, 1998, *8*/2:693–701; Susan Auth, "Mosaic Glass Mask Plaques and the Ancient Theater," *Journal of Glass Studies*, 1999, *41*:51–72; Marie-Dominique Nenna, Maurice Picon, Michèle Vichy, "Ateliers primaires et secondaires en Égypte à l'époque Gréco-Romaine," in *La Route du Verre. Ateliers primaires et secondaires du second millénaire av. J.-C. au Moyen Âge*, edited by Marie-Dominique Nenna (Lyon: Maison de l'Orient méditerranéen, 2000), pp. 97–112; Charis Mahnke, *Alexandrinische Mosaikglaseinlagen: die Typologie, Systematik und Herstellung von Gesichterdarstellungen in der ptolemäischen Glaskunst* (Wiesbaden: Harrassowitz, 2008); Julian Henderson, *Ancient Glass: An Interdisciplinary Exploration* (Cam-

is, indeed, a reference to a "glassworker" in a 1st century AD papyrus from Tebtynis published by Grenfell and Hunt.[20] Yet, unfortunately, the text is a simple acrostic bearing a list of professions (such as, among others, tablet-maker, engraver or goldsmith) in alphabetical order without any evident connection with the site itself.

After almost eighty years of speculations, the definite answer about the actual location of the workshop comes from Anti's diaries and notes. However, it should be noted that the available archival data show certain limitations: 1) the documentation does not always clearly distinguish the phases or functions of the different areas; 2) the photographs do not offer an overview of the inner rooms of the workshop and 3) the locations of specific findings are given only for a few particularly significant materials. Finally, 4) the temple has not been excavated systematically since 1936 and most of the structures have now been lost (at the hands of *sebâkhin* or antiquities hunters) or were buried again under the sand.[21]

Moreover, 5) the terminology used in the early 1930s does not fully correspond with modern vocabulary and can thus lead to bias and misunderstandings. For instance, in his preliminary papers, Carlo Anti uses the term 'smalti' (enamels): a detailed list of the various interpretations given to this term in the literature from the 1980s to date can be found in a paper from Deotto and colleagues.[22] This work will generally conform to the discussion proposed by Lucas and Harris, who suggest avoiding the terms enamel, paste or *pâte de verre* when referring to glass inlays since "the material used should always be called for what it is, namely, glass."[23]

The opportunity to link the archival papers with the collection of findings from Tebtynis preserved in the ME was indeed crucial to solving the issue. The

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bridge: Cambridge University Press, 2013); Andrew J. Connor, *Temples as Economic Agents in Early Roman Egypt: The Case of Tebtunis and Soknopaiou Nesos* (PhD Diss., University of Cincinnati, 2014); Katrine Larson, *From Luxury Product to Mass Commodity: Glass Production and Consumption in the Hellenistic World* (PhD Diss., University of Michigan, 2016).

20 Bernard Pyne Grenfell, Arthur Hunt, *The Tebtunis Papyri*, part II (London: 1907), pp. 56–58, nr. 278.

21 Rondot, *Tebtynis II* (cit. note 6).

22 Giulia Deotto, Cinzia Bettineschi, Paola Zanovello, Ivana Angelini, Gianmario Molin, "'Sempre nell'interno del santuario è stato trovato il materiale di un laboratorio di smalti colorati …': localizzazione e studio di un' officina tolemaica per intarsi," in *Proceedings of the Workshop: Horus, visioni dall'alto dello spazio archeologico*, edited by Giulia Deotto, Cinzia Bettineschi, Luigi Magnini, Luca Toninello (Padova: Padova University Press, 2017), pp. 83–90.

23 Alfred Lucas, John R. Harris, *Ancient Egyptian Materials and Industries*, 4th ed. (London: Edward Arnold, 1962).

extracts from Anti's and Bagnani's documentation dealing with the Tebtynis inlay workshop will be reported and discussed in the following paragraphs, giving a first critical review of their interpretation in the light of the technological knowledge acquired thanks to the most recent archaeological and archaeometric discoveries.

5 Interpretation of the Archival Sources

5.1 *Topography and Stratigraphy of the Structures*

The analysis of Anti's and Bagnani's archives provided an extraordinary opportunity to locate numerous structures and findings inside and outside the *temenos* of the Soknebtynis sanctuary, whose exact position had been completely lost over time. As for the workshop, the importance of its discovery is clearly reported in a letter to Roberto Paribeni[24] dated March 3, 1931, where Anti mentions the latest finds from the ongoing campaign:

> e poi un laboratorio di smalti figurati tolemaici con dei pezzi deliziosi, uno solo dei quali vale le 27.000 [lire] che mi hai spedito [...].[25]

The archival documents record that the workshop was found on February 27, 1931. At first, it was simply labeled as the third house to the south of the first pylon. Subsequently, the building was identified as number 17 on the temple general plan.[26] It was well documented by Anti's photographs: they illustrate a rectangular building, partially preserved in elevation, with an east-west oriented axis (Fig. 2). The structure comprises three rooms at floor level (17 B, 17 D, 17 E) and a cellar underground (17 C). Anti describes the stratigraphy of the various rooms; for 17 D he states:

> Nello strato superiore si trovano i mattoni crollati dall'alto e resti della copertura senza oggetti. Nello strato di m. 0.50 sopra il pavimento, chiuso

24 Roberto Paribeni was General Director of the Italian "Antichità e Belle Arti" from 1928 to 1933.

25 IVSLA, Anti's archive, Egypt, folder 9, n. 296: "and then, a workshop of figured Ptolemaic enamels with some exquisite pieces, just one of which is worth the 27.000 [lire] that you sent me [...]."

26 Andrea Carpinelli, Giovanni Azzalin, Giacomo Bilotti, Marika Cogo, Gianmarco Mason, Filippo Peruzzo, "Soknebtynis: planimetria digitale del tempio e del suo dromos," in *Proceedings of the Workshop: Horus, visioni dall'alto dello spazio archeologico* (cit. note 22), pp. 57–64; Alessandra Menegazzi, "La mappa del tempio tra restauro e ricomposizione," in ibid., pp. 65–68.

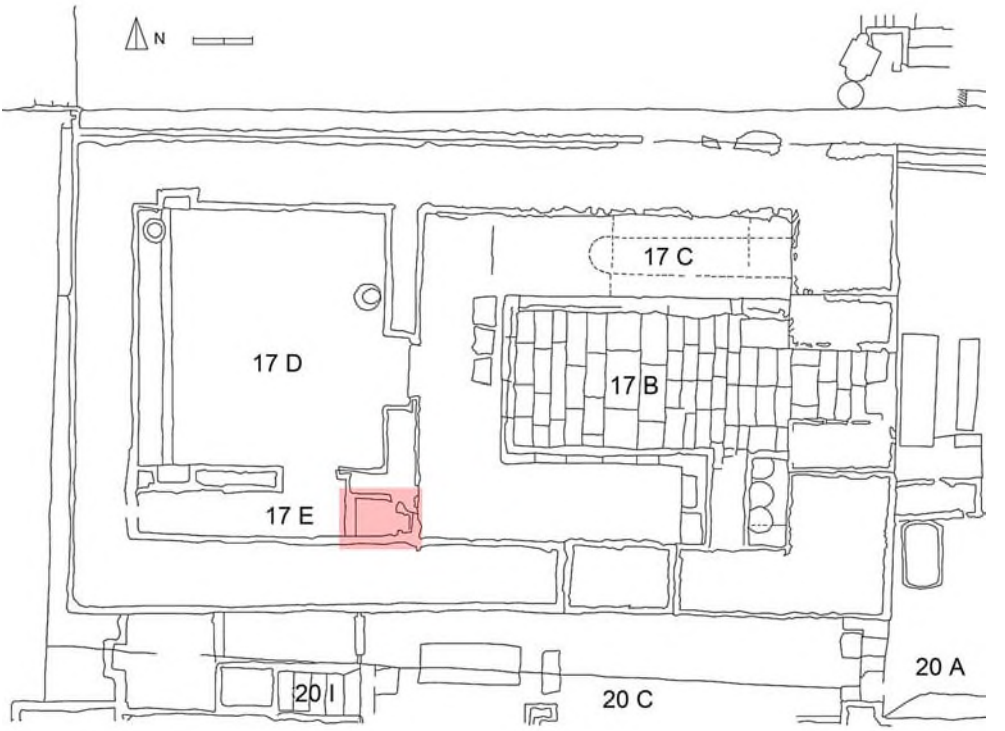

FIGURE 2 Detail of building 17 (North-Up), detail from the general plan. The kiln is highlighted in red.

> da un battuto antico entro terriccio fine con un po' di ωλέναι[27] si raccolgono elementi di figure di smalto e forme da fondere, che fanno pensare ad un laboratorio. Questo erano tutti in uno strato di terriccio finissimo alla superficie.[28]

Leaning against the western wall, Anti also recovered a counter made up of a few rows of bricks. Its chronology is not specified and yet, if coeval to the workshop, it could possibly refer to a working surface used during the production processes.

27 ωλέναι is the Greek word for "roof beams."

28 IVSLA, Anti's archive, Egypt, folder 7, dossier 1, n. 1: "In the upper layer, we found bricks collapsed from above and remains of the ceiling without objects. In the layer 0.50 m above ground, closed by an ancient earthen floor in a fine soil with a little ωλέναι, we gathered elements of enamel figures and molds, which suggest a workshop. All those materials came from a layer with fine soil on the surface."

FIGURE 3
The kiln in room 17 E, detail of the firing chamber
MSA, ANTI'S ARCHIVE, EGYPT, N. 273 PHOTO 028

Soon after, the excavations unearthed room 17 E, which yielded various objects described as enamels, molds and a bronze pestle. But the most significant finding in that room is "*un fornello fornito di lunghissima canna e quindi ad alto tiraggio*." The *fornello* (kiln) was described and partly illustrated in figure 3, but never indicated in the plan of the building or better shown in other photographs. However, the reasoned comparison between the textual and planimetric sources suggests that the furnace can be identified with good confidence in the tripartite structure located in the south-eastern wall of room 17 E on the general plan (Fig. 2). The term "canna" in Italian is rather ambiguous, as it may refer to a cane, a blowpipe, a bellow or a chimney. Considering the reference to the high draught ("*alto tiraggio*") and the peculiar niche embedded in the wall of the kiln, it is safe to assume that Anti is referring to a chimney. Therefore, the text can be translated as follows: "*a kiln with a very long chimney and thus with high draught*."

The identification of the kiln offered the chance to determine its shape and size, which are important pyro-technological indicators; the structure is quadrangular and its foundations (calculated inside the firing chamber[29]) measure

29 The measures were calculated starting from the georeferenced version of the general

approximately 65 × 70 cm, while the chimney embedded in the wall is 32 × 21 cm. The exact height is not known, but judging from historical photographs of building 17, it was probably preserved upwards of 1.2–1.5 meters. There are no images of the kiln itself, just a close detail of the stoke hole, which is irregularly shaped. On the upper left side of the opening, there are two circular hollows in the wall, possibly related to a small shelf or a sort of hangers. The structure bears a certain resemblance with the glass-blowing furnaces represented on the 1st century oil lamps discovered in Italy and Dalmatia, in terms of overall size, presence of a chimney, small lateral holes, and opening of the firing chamber, even if the elements for a detailed evaluation are lacking.[30] The strictest comparison can be made with a Ptolemaic kiln discovered in Karnak in the precinct of Mut's temple, that shows a similar tripartite structure, despite being preserved only in foundation.[31] The small dimension of the Tebtynis kiln suggests that it was used only for the secondary working of glass and not for primary production.

Room 17 B was furnished with a series of benches, a stone floor, and a small cellar. Because of its peculiar configuration, it was soon interpreted as a Roman *deipneterion* (δειπνετήριον);[32] yet, Anti notes that:

> La sistemazione a δειπνετήριον è evidentemente posteriore. […] ai piedi del muro S, carboni e cenere. La parete è anche annerita.[33]

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plan of the temple produced in the framework of the "Horus" project. See Andrea Meleri, "Elaborazioni GIS per il sito di Tebtynis – georeferenziazione della mappa di Anti," in *Proceedings of the Workshop: Horus, visioni dall'alto dello spazio archeologico* (cit. note 22), pp. 67–79; Giacomo Colombatti, Alessio Aboudan, Carlo Bettanini, Luigi Magnini, Cinzia Bettineschi, Giulia Deotto, Luca Toninello, Stefano Debei, Armando De Guio, Paola Zanovello, Alessandra Menegazzi, "Horus – A Drone Project for Visual and IR Imaging," *2017 IEEE International Workshop on Metrology for AeroSpace* (*MetroAeroSpace*), Padua, 2017, pp. 589–592, doi: 10.1109/MetroAeroSpace.2017.7999536. It was recently underlined that the distances extrapolated from this GIS project are subject to a maximum error in the order of 2–4% and can thus be considered very reliable, as demonstrated in Andrea Meleri, *Il Sito di Tebtynis in Egitto: Analisi GIS di cartografie e foto degli scavi degli anni Trenta* (Bachelor Diss., University of Padova, 2017).

30 Irena Lazar, "An Oil Lamp Depicting a Roman Glass Furnace," *Journal of Dalmatian Archaeology and History*, 2006, 99/1:228–234.

31 Richard Fazzini, "Report on the Brooklyn Museum's 2008 Season of Fieldwork at the Precinct of the Goddess Mut at South Karnak," Preliminary report. Available at: https://d1lfxha3ugu3d4.cloudfront.net/features/docs/Preliminary_Report_2008.pdf (accessed 3 Sept. 2018).

32 *Deipneteria* are dining halls used for ritual banquets that were usually placed along the processional way or within the enclosure of the temples in Graeco-Roman Egypt.

33 IVSLA, Anti's archive, Egypt, folder 7, dossier 1, n. 1: "The transformation into δειπνετήριον is clearly later. […] at the foot of the southern wall, charcoals, and ashes. The wall is also blackened."

FIGURE 4 Mold inv. S. 19268: note the field inventory code on the backside. Left: front view, right: back view
ME, TEBTYNIS COLLECTION

The presence of ashes and charcoals, and the soot on the wall seem again a clue of the functional transformation that turned the building from a manufacturing laboratory into a ceremonial banquet hall.

5.2 *Inlays and Tools: Consistency and Documentation*

Anti described the artifacts discovered in the workshop in two lists, one written in Egypt at the end of the 1931 campaign for the *partage* and the other prepared in view of a first exhibition planned after their arrival in Italy. The majority of the finds were given inventory numbers directly in the field; their codes are also recorded in black or red ink on the objects themselves or on the boxes which contained them (see e.g. Fig. 4). For example, mold inv. S. 19268 (actual number in the Museo Egizio collections), bears the code T31 340, where T stands for Tebtynis, 31 indicates the year of the discovery and 340 is the field inventory number, which finds direct reference in the artifact listings and in the annotated photographs preserved in the archive (Fig. 5).

> Materiali di un laboratorio di smalti. / Vennero tutti raccolti all'interno del peribolo sotto il pavimento rialzato di un locale che in epoca romana era stato trasformato in *deipneterion*, cioè in sala per banchetti rituali dei sacerdoti. Che si tratti di un vero e proprio laboratorio è provato dalla presenza di attrezzi, forme, materia grezza e dal fatto che in un piccolo ambiente vicino esisteva un fornello fornito di lunghissima canna e quindi ad alto tiraggio. Esso documenta che entro il santuario accanto agli edifici di culto vivevano oltre i sacerdoti quanti erano utili o interessati alla vita del santuario, operai e artisti di ogni genere. / nn. d'inv. 340–349. Forme in terra refrattaria o in calcare per elementi a smalto figurati (gambe, corna, corona, geroglifici, etc.) / nn. d'inv. Crogiuoli piatti in terra refrattaria per

FIGURE 5
Annotated photograph of the tools discovered within the glass workshop. Up left, note mold inv. S. 19268 of fig. 7
IVSLA, ANTI'S ARCHIVE, EGYPT, FOLDER 8, DOSSIER 2, N. 2

la fusione della pasta vitrea. / n. d'inv. 352 Frammento di modello in gesso rappresentante il disco solare alato. Serviva per preparare gli elementi a smalto necessari a decorare analogo motivo in legno. / n. d'inv. 362. Frammento di modello in gesso in forma di cornice a gola, d'uso uguale al precedente. / nn. 355 e 356. Spatola e pestello in bronzo per la macinatura e la mesticazione delle polveri. / nn. 358 e 359. Due pesi in basalto / nn. [sic.] Elementi a smalto figurati da servire per l'intarsio di mobili. / nn. [sic.] Elementi a smalto decorati da servire per l'intarsio di mobili / nn. [sic.] Campionario della materia prima (vetro filato di vari colori), usata per la preparazione degli smalti a mosaico. / n. 363. Tavoletta in legno intarsiata a smalto, esempio dei lavori che si eseguivano nel laboratorio. M. 0,21 × 0,125. In alto il disco solare alato (cfr. il modello n. 352) e sotto una striscia di stelle bianche in campo azzurro (cfr. il n. [sic.] tra gli elementi decorativi). / Sotto il Faraone seguito dalla Regina, adora Harpocrates e la dea Hathor. / n. d'inv. 425. Thoeris […].[34]

34 IVSLA, Anti's archive, Egypt, folder n. 6, dossier n. III, n. 4: "Materials from an enamel workshop. / They were all gathered inside the peribolos, under the raised floor of a room that in Roman times had been transformed into a *deipneterion*, that is, the ritual banquet hall

Anti highlights the close relationship between priests and workers, living together within the enclosure of the temple. This picture matches the data provided by the ancient alchemical sources. During the early 1st century AD, Pseudo-Democritus is said to have been initiated into the mysteries of alchemy by a group of Egyptian priests in Memphis. Similarly, Zosimus (3rd–4th century AD) underlines the role of ancient Egyptian priests in the transmission of the secret knowledge related to specific medical practices and to the craft of producing alchemical tinctures.[35] In this sense, the data from Tebtynis further evoke the role of ancient alchemy in the empirical and chemical knowledge associated with the coloring and opacification of glass in the Graeco-Roman period.

The listings and annotated photographs were employed to simplify the identification of the pieces and, yet, Bagnani's words underline the difficulties in recognizing the boxes and the objects after their arrival in Italy.

> 10/06/32 / 6 via Pompeo Magno/ Caro Professore, / Grazie della sua lettera e dell'assegno che ho ricevuto oggi come pure in questi giorni ho

for the priests. That it is a real workshop is proven by the presence of tools, molds, raw materials and by the fact that in a small room nearby there was a kiln provided with a long chimney and thus with high draught. It documents that the sanctuary, just beside the sacred buildings, accommodated beyond the priests all those people who were useful or interested in the life of the sanctuary, workers, and artists of all kinds. / nn. inv. 340–349. Refractory or limestone molds for figured enamel elements (legs, horns, crowns, hieroglyphs, etc.) / nn. inv. [sic] Flat crucibles in refractory fireclay for the fusion of the glass paste. / n. inv. 352. Fragment of a gypsum-based plaster model representing the winged solar disc. It was used to prepare the enamel elements needed to decorate a similar motif in wood. / n. inv. 362. Fragment of gypsum-based plaster model in the shape of an Egyptian gorge, of the same use as the previous one. / nn. 355 and 356. Bronze spatula and pestle for grinding and mixing the powders. / nn. 358 and 359. Two basalt weights / nn. [sic] Figured enamel elements to be used for the inlay of furniture. / nn. [sic] Decorated enamel elements to be used for the inlay of furniture / nn. [sic] Sample of raw materials (glass of various colors), used for the preparation of the mosaic enamels. / n. 363. Wooden tablet inlaid with enamels, an example of the work carried out in the workshop. M. 0.21 × 0.125. At the top the winged disk (see model n. 352) and below a strip of white stars on a blue background (see n. [sic] among the decorative elements). Below the Pharaoh, followed by the Queen, worships Harpocrates and the goddess Hathor. / n. inv. 425. Thoeris […]."

35 Marco Beretta, "Between Nature and Technology: Glass in Ancient Chemical philosophy," in *When Glass Matters* (cit. note 2), pp. 1–30; Martelli, "Greek Alchemists at Work" (cit. note 4); Id., *The Alchemy of Glass* (cit. note 4); Matteo Martelli, "Alchemy, Medicine and Religion: Zosimus of Panopolis and the Egyptian Priests," *Religion in the Roman Empire*, 2017, *3*/2:202–220.

> ricevuto l'Engelbach e le fotografie, compresa quella di Petesuchos. / So, di capitelli, ne sono riuscito a trovare solo 6 ma ci riguarderò. Il guaio è che tra spedizionieri, dogane, musei e altri impicci quelle benedette casse hanno tanti numeri che sembrano delle tavole Pitagoriche! E di conseguenza non si possono identificare sulla sua lista. In ogni modo quando esporrò gli oggetti del laboratorio farò una revisione di tutto quanto. Avverto che le casse sono in condizioni abbastanza pietose: si sfasciano da sé [...].[36]

Despite the problems encountered by Bagnani, this method is an essential tool which can be used nowadays on the objects preserved at the ME to identify the materials discovered during Anti's campaigns and to better contextualize them (see e.g. tab. 1 for the production tools).

As emerged from the examining of the depots of the ME, the figured glass inlays were numbered individually, while most of the fragments and the simple bars were cataloged with the code T31 396, probably because they were too numerous and less significant than the other pieces.

> Gli smalti indicati sotto il numero 396 sono contenuti in 14 scatolette e, all'ingrosso, già divisi per tipi e per colori. Amerei che i vetri colorati fossero esposti colore per colore, in cassettine di vetro per far capire che si tratta proprio della 'tavolozza' di questi smaltatori.[37]

Judging from the extract, the inlays were selected in order to offer a general overview of the typology and the chromatic variability of the glasses employed in the workshop. This is particularly important as it highlights that the sampling strategy on the field had a technological perspective, offering a reliable

36 IVSLA, Anti's archive, Egypt, folder 9, n. 53: "10/06/32 / 6, Pompeo Magno street/ Dear professor, / Thank you for your letter and check that I received today; in these days I also received the Engelbach and the photographs, including that of Petesuchos. / I know of the capitals, I managed to find only 6 of them, but I will try again. The trouble is that among freight forwarders, customs, museums, and other messes, those blessed boxes have so many numbers that they look like Pythagorean tables! As a result, one cannot identify anything on your list. Anyway, when I will display the objects of the workshop I will review everything. Be warned that the boxes are in pretty pitiable conditions: they are falling apart by themselves [...]."

37 MSA, Anti's Archive, Egypt, section 1 Administration, folder 1, n. 5 (ex folder 1, s.n.): "The enamels indicated under number 396 are contained in 14 small boxes and, mostly, already divided according to their typology and color. I would love that the colored glasses could be exhibited color per color, in small glass showcases to clarify that this is the actual 'palette' of the enamel workers."

dataset for further qualitative and quantitative analysis. As already demonstrated in his works in Venice[38] and Padua, Anti shows a modern museological sensibility when planning the exhibition of the Tebtynis materials for the *Mostra d'Arte Antica* held in Rome:[39] his interest is not limited to art objects, but aims to present various mundane activities and production processes, such as the "palette" of the local glassworkers.

During his first season, Gilbert Bagnani wrote weekly letters in English to his mother, Florence Dewar Bagnani and his wife, Stewart Bagnani, to update them about the progress of the dig.[40] From 1932 onwards, Stewart accompanied her husband as an active member of the archaeological mission.

In 1931, Bagnani spent much of his time away from the dig, getting supplies, keeping contacts with the local authorities, visiting sites, museums, and meeting other archaeologists. This is the reason why he was not present on the day of the discovery of the inlay workshop.

> The funny part is that all the workmen say that I am the lucky one. They knew I had come back on Saturday to remain till the end of the season and they say that when I came back then the papyri began to come. They forget that the pastes came when I was away, but then they do not realize their value. They think that we are out only for papyri, and anything else seems worthless to their eyes.[41]

It is interesting to compare the perception of the workers with the one of the scholar. Bagnani is deeply aware that the discovery of the "pastes" can be considered as much important as that of the papyri, yet the local workers – who had been used to deal with papyrologists, such as Evaristo Breccia (or Rubensohn, Grenfell and Hunt before him) – could not understand their relevance. In fact, Bagnani writes words of aesthetic praise and technical admiration for the glass inlays.

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38 Carlo Anti, *Il Regio Museo Archeologico nel Palazzo Reale di Venezia* (Roma: Libreria dello Stato, 1930).

39 *Mostra d'Arte Antica Organizzata dal Ministero dell'Educazione Nazionale e dall'Associazione Internazionale per gli Studi Mediterranei* (Roma: Istituto Poligrafico dello Stato, 1932).

40 Florence's letters are preserved in the archives of the Art Gallery of Ontario (AGO) in Toronto, while Stewart's drawings and correspondence are now at Trent University, Peterborough, Ontario.

41 Trent University, Bagnani's Archive (currently in re-ordering), Wednesday, March 11, 1931, letter to Stewart Bagnani.

> The stuff is perfectly lovely. All Ptolemaic glass pastes for inlays, the men red the women a heavenly blue, and the [clothes] all the most wonderful colours. Some of the prettiest stuff I have seen for long time. Of course the worst of it is that most of it is going to be nabbed by the Museum which is not rich in pieces of that kind.[42]

The most significant data related to the inlay workshop can be found in a letter to his wife of early March 1931, where Gilbert lists the artifacts found in building 17. Not only does he give an account of the tools and inlaid objects unearthed there, but he also proposes some preliminary hypotheses about the function of the structure and the materials, which at first he attributes to the dump of a workshop.

> We then went back to the camp and Anti took [Director-General Pierre] Lacau[43] down to see the stuff in the storeroom. In one of the houses he had found a picture with its frame, unfortunately not in a good state of preservation, but always [sic] a piece of the greatest importance. Then in his tent he showed part of a really big find. Evidently the pilgrims of that day instead of getting oleographs and such like things, bought at the temple little sacred pictures done on stuccoed wooden tablets with the figures inlayed [sic] in coloured glass pastes. We have one of these pictures fairly complete and a number of fragments of pastes of the others, some perfectly lovely. The place where we found them must have been the dump of the shop that manufactures them since we have found a number of the fire-clay molds, chisels, stones for the drills, lumps of pitch and molten glass, and a whole lot of other things.[44]

During a state visit in Egypt, the Italian royal family visited the Tebtynis excavations on March 6, 1933. For the occasion, the display of the Cairo Museum was

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42 AGO, Bagnani's Archive (currently in re-ordering), Wednesday, March 4, 1931, letter to Florence Bagnani.

43 Pierre Lacau (November 25, 1873 – March 26, 1963) was a French Egyptologist and philologist. From 1914 to 1936 he served as general director of the *Service des antiquités de l'Égypte*, currently merged into the Ministry of State for Antiquities. In this role, he was in charge of overseeing the archaeological excavations and ensuring the conservation, protection and regulation of all Egyptian antiquities. For more details, see Jaques Vandier, "Notice sur la vie et les travaux de M. Pierre Lacau, membre de l' Académie," *Comptes rendus des séances de l'Académie des Inscriptions et Belles-Lettres*, 1970, *114*/3:520–535.

44 Trent Universiy, Bagnani's Archive (currently in re-ordering), Wednesday, March 4, 1931, letter to Stewart Bagnani.

altered to host one of the glass inlay heads discovered by Anti in the Soknebtynis sanctuary, which had been brought there as part of the *partage* agreement.

> On Monday [20] I was at the Museum at 8 & went round with Lacau & Engelbach[45] fixing up all the details of the programme [for the upcoming royal tour that week]. They had got their little glass paste head that we found & put it in a place of honour on a black background, very attractive, very decent thing to do.[46]

Stewart Bagnani painted a watercolor of this same head and a few other inlays from the temple after joining her husband in Egypt for the 1932 campaign (Fig. 6). Some of the drawings still bear very faint penciled numbers which refer to their inventory code in the *Journal d'Entré*,[47] thus suggesting that the watercolors were painted when the objects were already stored in the Cairo Museum.

The choice of the artifacts represented in Stewart's watercolors seems to respond to a precise scientific aim, rather than a personal taste. In fact, her subjects were characterized by a wide variety of colors, which constituted an integral part of their symbolic and iconographic value and that could not be captured by black & white photography. Moreover, they were all intended to remain in Egypt for political/legal reasons and thus colored drawings were the best documentation tool available at the time.

6 Tools for the Craftsmen

The tools and equipment employed by ancient glassworkers which were recovered in the archaeological, iconographic or textual record and correctly identi-

45 Reginald Engelbach (July 9, 1888 – February 26, 1946) was an English Egyptologist and engineer. He assisted Flinders Petrie in various excavations and, as Chief Keeper at the Cairo Museum, he created the first register of the antiquities preserved there, as reported in Warren Royal Dawson, Eric Parrington Uphill, *Who Was Who in Egyptology*, 3rd rev. ed., edited by Morris Bierbrier (London: Egypt Exploration Society, 1995).

46 AGO, Bagnani's Archive (currently in re-ordering), Friday, February 24, 1933, letter to Florence Bagnani.

47 The *Journal d'Entré* is one of the three different types of handwritten register books of the Egyptian Museum in Cairo. It was recently digitalized thanks to a combined project of the Supreme Council of Antiquity and the American Research Center in Egypt. For further details see Janice Kamrin, "The Egyptian Museum Database, Digitizing, and Registrar Training Projects: Update 2012," *Bulletin of the Egyptological Seminar*, 2015, *19*:413–440.

FIGURE 6 Stewart Bagnani's watercolors of a set of glass inlays now preserved at the Cairo Museum: a) female head and torso, inv. JE 55943; b) white crown inv. JE 55946 and ram horns inv. JE 55950; c) from top to bottom: decorative frame with three lunettes inv. JE 55956, ram horns inv. JE 55950, ram horns 55949, ram horns with no inventory number (possibly a preliminary version of JE 55950); d) decorative frame with three lunettes and no inventory number (most probably the final version of JE 55956)
BAGNANI'S ARCHIVE, TRENT UNIVERSITY

fied are, unfortunately, relatively few. Stern published a comprehensive study on the glassblower tools used from Roman to modern times, focusing on the type and evolution of jacks and shears.[48] At present, there are no systematic data available on the instruments associated with Ptolemaic inlay production, except for mold examples.

As for Tebtynis, some of the tools discovered by the Italian Archaeological Mission in 1931 within the workshop are registered in a historical picture reproduced in figure 5. Most of those artifacts have now been identified within the Turin collections thanks to the field inventories and notes preserved in Anti's archives, as mentioned in the previous sections.

Excluding the vitreous materials, so far it has been possible to recognize in the Turin collections the following objects unearthed in the workshop (tab. 1):

TABLE 1 Table listing non-vitreous artifacts discovered in the workshop of Tebtynis and identified in the Turin collection to date. The table shows the modern picture of the objects (column 1) associated with its historical counterpart (column 2), the field inventory code given by Anti (column 3) and Turin's inventory number. Moreover, the pieces are briefly described according to their material composition, as emerged by OM observations (column 4), and typology (column 5)

Image	Historical image	Anti's field inventory	Museum inventory	Material (macroscopic observations)	Typology
	not available	n.d.	S. 19201	organic	lump of adhesive, fragmented in joinable peces
		T31 340	S. 19268	fireclay	mold with white residues on the inside. Possibly traces of a powdered detaching agent or glass residues
		T31 343	S. 19275	stone	mold in form of corkscrew ram horns part of Hemhem crown, fragmentary

48 Marianne Stern, "The Ancient Glassblower's Tools," in *Hyalos, Vitrum, Glass: History, Technology and Conservation of Glass and Vitreous Materials in the Hellenic World*, edited by George Kordas (Athens: Glasnet, 2002), pp. 159–165.

TABLE 1 Table listing non-vitreous artifacts (*cont.*)

Image	Historical image	Anti's field inventory	Museum inventory	Material (macroscopic observations)	Typology
		T31 345	S. 19277	fireclay	double-sided mold, fragmentary
		T31 347	S. 19309	fireclay	model/ architectural element never exposed to fire or to high temperatures, with traces of red painting on the upper side and red, ochre-like, traces on the inside. Fragmentary
		T31 348	S. 19278	organogenic limestone	model/ architectural element never exposed to fire or to high temperatures: it bears red, ochre-like, traces on the inside. Fragmentary
		T31 350	S. 19269	fireclay	tray or mold, possibly used for assembling mosaic canes
		T31 351	S. 19921	fireclay	tray or mold, possibly used for assembling mosaic canes, fragmented in two joinable pieces
		T31 352	S. 19220	gypsum-based plaster	fragment of winged solar disk
		T31 353	S. 18716	calcareous alabaster	tablet with traces of grinding
		T31 355	S. 19473	bronze	chinsel

TABLE 1 Table listing non-vitreous artifacts (*cont.*)

Image	Historical image	Anti's field inventory	Museum inventory	Material (macroscopic observations)	Typology
		T31 358	S. 19272	stone	weight, broken (709 g)
		T31 360	S. 19276	stone	model/ architectural element/ tool never exposed to fire or to high temperatures. Fragmentary
		T31 362	S. 18566	gypsum-based plaster	Egyptian gorge-shaped model or architectural element, fragmentary
		T31 359	S. 18914	stone	weight (46 g)

– *Various Molds and Trays*
To date, not all the molds listed and photographed by Anti were effectively identified in the Turin collections. It is possible that at least some of the missing pieces were sent to the Cairo Museum following the *partage*, such as the mold with ram horns T31 342 identified in the *Journal d'Entré* as JE 55958. However, other artifacts (such as T31 344 and 346, among others) could still be lying in the Turin depots, after their reference to Tebtynis got lost or forgotten.[49]
Among the numerous fragments which were described as molds in the digital catalog of the Museum, some cannot be associated with pyro-technological processes involving high temperatures and should more probably be interpreted as models or decorative elements. For example, S. 19309 still bears traces of red painting on the upper side and red, ochre-like, traces on

49 Giulia Deotto is currently working on a project for the identification of the Tebtynis materials in the depots of Turin. Her work will possibly help to retrace the missing artifacts in the near future.

the inside (tab. 1). The same applies to S. 19278 and, possibly, to S. 19276 even if this last piece has no color residues.

As for the effective molds suitable for firing, only S. 19268 has inner residues which possibly refer to glass or traces of a detaching agent (Fig. 4). All other pieces show no specific marker associatedwith inlay production. A number of similar, coeval objects was discovered in Gumaiyima,[50] Tanis,[51] Karnak,[52] and Dionysias,[53] while others coming from private and public collections have unknown provenance. Grose also published a positive, master mold in limestone with two profile faces coming from the Cairo antiquity market and now in the Ishiguro collection in Tokyo.[54]

On the contrary, for inv. S. 19269 and S. 19921 (Fig. 7–8a), it was not possible to trace any significant comparison with published molds related to glass-working. According to our interpretation, these tools were employed as trays for assembling stratified or mosaic glass canes from pre-fabricated bars. In particular, after being used for staking up the bars cold, they must have been introduced in the kiln for sintering the various glass elements. This would explain the traces of burning (and the rare charcoal residues) which characterize their bottom surface, as well as the upper part and the edges.

– *A Tablet in Calcareous Alabaster with Traces of Grinding*
  Considering the soft stone used (Fig. 8b), it is hard to interpret the kind of material which was powdered. However, glass can be certainly ruled out for its hardness on the Mohs scale. Possible candidates may be certain pigments or other soft materials.
– *Two Domed Weights in Hard Stone*
  Between the two, only the smaller is complete and returned a weight of approximately 46 grams. The comparison to the Egyptian and Hellenistic weight systems led us to conclude that our piece is compatible with the

50 Flinders Petrie, Francis Llewellyn Griffith, *Tanis II* (London: Trübner & Co, 1888); John Cooney, *Catalogue of Egyptian Antiquities in the British Museum, IV: Glass* (London: British Museum Publishing, 1976).

51 Veronique Arveiller-Dulong, Marie-Dominique Nenna, *Verres antiques du Musée du Louvre III: parures, instruments et éléments d'incrustation* (Paris: Editions Musée du Louvre/Somogy, 2001).

52 Fazzini, "Report on the Brooklyn Museum's 2008 Season" (cit. note 31).

53 Jacques Schwartz, Henri Wild, *Qasr-Qarun/Dionysias 1* (The Cairo: IFAO, 1950); Jacques Schwartz, *Qasr-Qarun/Dionysias 2* (The Cairo: IFAO, 1969).

54 David Frederick Grose, *Early Ancient Glass: Core-formed, Rod-formed and Cast Vessels and Objects from the Late Bronze Age to the Early Roman Empire, 1600 BC to AD 50* (New York: Hudson Hills Press, 1989).

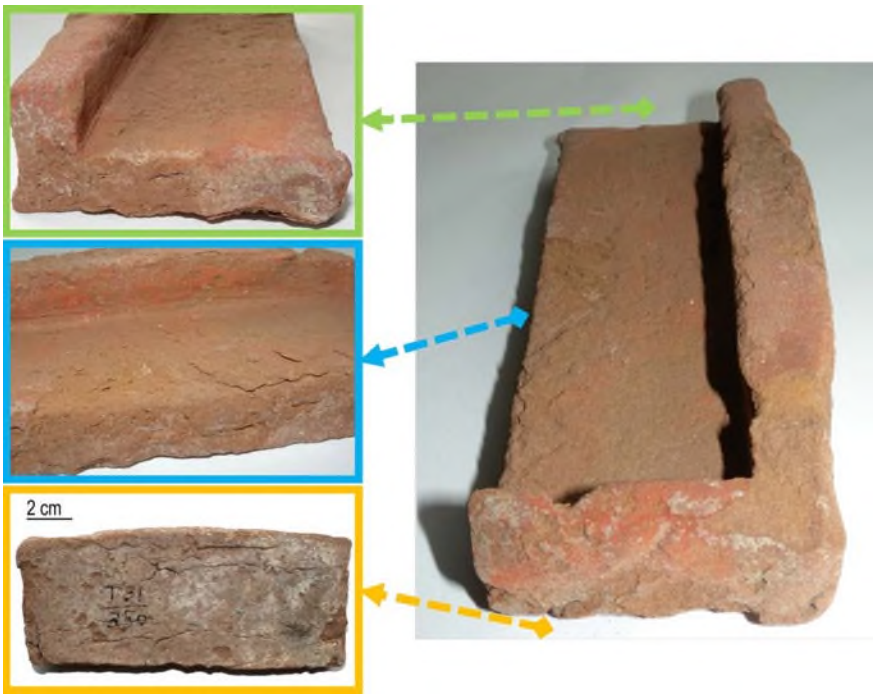

FIGURE 7 Tray in fireclay inv. S. 19269. Details of the firing marks (left, from top to bottom): side view, front view, bottom view
ME, TEBTYNIS COLLECTION

weight of five *qedets*, or a half *deben* (a *deben* being ca. 91–95 grams during the Late Period). The typological classification further strengthens its Egyptian origin[55] supporting the hypothesis of an indigenous tradition for inlay manufacture (Fig. 8c).

– *Two Gypsum-Based Plaster Fragments*
Inv. S. 18566 is in the shape of the Egyptian gorge (Fig. 8e), while S. 19220 represents the wings of a solar disk (tab. 1). Considering their composition, which is not suitable for firing, and the concave shape of the gorge-shaped fragment, none of them can be interpreted as a mold, as previously suggested.[56] Our hypothesis is that we are dealing with stucco mod-

55 Flinders Petrie, *Ancient Weights and Measures: Illustrated by the Egyptian Collection in University College, London* (London: Department of Egyptology, University College, 1926).

56 Marie-Dominique Nenna, "Le mobilier religieux en bois incrusté de verre des temples égyptiens: nouvelles données (VIIIe av. J.-C.–Ier siècle apr. J.-C.)," in *Annales du 19e Congrès de l'Association International pour l'Histoire du Verre*, edited by Irena Lazar (Piran: AIHV, 2015), pp. 30–38.

FIGURE 8
Selection of the tools recovered in the collection of the Museo Egizio: a) tray in fireclay, possibly related to the assembling of mosaic canes (inv. S. 19921); b) alabaster table with traces of grinding (S. 18716); c) big, domed stone weight (S. 19272); d) stone mold in form of corkscrew ram horns, part of Hemhem crown (S. 19275); e) Gorge-shaped gypsum-based plaster fragment, possibly referring to a stucco model for wooden furniture or an architectural decoration (S. 18566); f) small chisel for woodworking (S. 19473)
ALL ARTIFACTS ME, TEBTYNIS COLLECTION

els for wooden furniture, as originally proposed by Anti, or with architectural decorations. It should be stressed that the glass inlays within S. 19220 do not appear to be present in the 1931 picture, so they are probably a later insertion. This is further strengthened by the fact that Nenna published a picture of the same object where the inlays are placed in different spots.

There are no comparable pieces from Ptolemaic times, except for a hollow relief recently recovered in Dionysias. The object came to light during the excavations of the University of Siena (Italy) and was only published in a pre-

liminary paper without further specifications.[57] Historical excavations in the same site, also report the presence of "toutes sortes d'ornements en plâtre modelé" ("every kind of ornament in modeled plaster") in one of the houses near the public baths.[58] It is, indeed, interesting to note that Dionysias is – perhaps not coincidentally – one of the few Egyptian sites with possible traces of a secondary glass workshop for inlay production.[59] Plaster models with god figures were also discovered in Gumaiyima,[60] another glass-working center, but there are no published images currently available, so it is not possible to evaluate a possible correlation with the Tebtynis examples.

– *A Lump of Organic Binder*

No historical picture shows the lump of brown, solid and amorphous material marked as inv. S. 19201 (tab. 1). However, this is most probably one of the objects Bagnani is referring to when talking about the "lumps of pitch" discovered in the workshop. The point is also strengthened by the fact that a huge number of spare inlays and all inlaid objects still preserve a layer of a similar substance, used as a glue.

Similar traces were also found adhering to *sectilia* panels, architectural decorations, wooden furniture or inlay fragments in various Graeco-Roman sites in Egypt.[61] Archaeometric investigations on the Tebtynis samples are planned for the near future; however, some preliminary speculation on their composition is possible on the basis of the analyses performed on a set of eleven specimens discovered in Antinoopolis, a Late Antique glass-working center in Middle Egypt.[62] Essentially, all samples revealed the presence of organic material, frequently mixed with a high proportion of calcite, probably added to grant better working consistency and dryness to the final adhesives. Gas-chromatographic data, allowed to identify the main organic sources as pine pitch and beeswax, with eventual traces of brassica oil.[63]

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57 Emanuele Papi, Gabriella Carpentiero, Luca Passalacqua, Leonardo Bigi, "Dionysias: città dei segreti," *Archeo*, April 2016, *374*:34–47.

58 Schwartz, Wild, *Qasr-Qarun/Dionysias 1* (cit. note 53).

59 For an updated overview on Graeco-Roman inlay workshops in Egypt see Cinzia Bettineschi, Ivana Angelini, Gianmario Molin, "Contestualizzazione degli intarsi in vetro da Tebtynis nel quadro dell'Egitto Greco-Romano," in *Anti Archeologia Archivi* (cit. note 7), pp. 515–540.

60 Petrie, Griffith, *Tanis II* (cit. note 50).

61 See for example: Petrie, Griffith, *Tanis II* (cit. note 50); Donald Harden, *Roman Glass from Karanis* (Ann Arbor: University of Michigan Press, 1936).

62 Flora Silvano, Erika Ribechini "Adesivi e collanti nell'Egitto tardo romano," *Egitto e Vicino Oriente*, 2014, *37*:123–192.

63 Erika Ribechini, Sibilla Orsini, Flora Silvano, Maria Perla Colombini, "Py-GC/MS, GC/MS and FTIR Investigations on Late Roman-Egyptian Adhesives from Opus Sectile: New Insights into Ancient Recipes and Technologies," *Analytica Chimica Acta*, 2009, *638*:79–87.

Of course, these results cannot be directly applied to the case of Tebtynis; nevertheless, observations in stereoscopic microscopy (OM) highly suggest a generic characterization as organic compound.

– *A Bronze Chisel*
The discovery of a chisel for woodworking (Fig. 8f, inv. S. 19473) further confirms the idea, already presented in other occasions, that the workshop of Tebtynis should not be considered in terms of a simple glass-working structure, although glass was indeed worked there.[64] In fact, the area hosted an artisanal activity devoted to the production of sacred furniture, which was gilded and inlaid with colored glasses. The complex inlaid figurative motifs represented on the *naoi*, as well as the statues and the small boxes found in the site, were probably carved in this same workshop by using small chisels like the one discovered by Anti, which was well suitable for obtaining the tiny indents that hosted the glass inlays.

In addition to the artifacts listed in table 1, the archival documents and the historical pictures point to the discovery of at least another metal rod, stones for the drills, a big mortar and a pestle. These elements appear well suited for a glass-working/inlay production area; yet, the impossibility to conduct direct observations on the pieces prevents us from going into the details of their role in the production processes. Hopefully, the through study of the Tebtynis collection at the Museo Egizio of Turin will soon offer the chance to identify and study these missing objects.

7 The Chronology of the Workshop

According to Anti, structure 17 had three main phases: the foundation of the building is pre-Ptolemaic, but no clear function is known for this first phase; during Ptolemaic times, room 17 D and 17 E (and partially 17 B) were involved in the "*laboratorio di smalti*" (enamel workshop). Finally, in Roman times (before the first half of the 1st century AD), the building was restored and 17 B was transformed into a banquet hall for religious ceremonies (*deipneterion*). According to the stratigraphic evidence, the activity of the workshop seems, thus, dated to a wide time-span, ranging at least from the Middle Ptolemaic phase until the early Roman era.

64 Cinzia Bettineschi, Giulia Deotto, Ian Begg, Ivana Angelini, Gianmario Molin, Paola Zanovello, "Crafts in the Temple: The Ptolemaic Inlay Workshop in Soknebtynis Sanctuary," in *Quaderni del Museo del Papiro. Proceedings of the XVI Convegno di Egittologia e Papirologia*, edited by Anna Di Natale, Corrado Basile (Siracusa: Museo del Papiro Corrado Basile, 2018), pp. 349–368.

Moreover, in his unpublished paper presented at the 18th International Congress of Orientalists,[65] Anti mentions the existence of:

> frammenti di mobili intarsiati a smalto, ora nel commercio antiquario del Cairo, ma trovati alcuni anni fa tra le rovine del santuario [di Tebtynis], portano la cartuccia di Tolomeo Evergete.[66]

Nenna has repeatedly suggested that the glass workshop in Tebtynis is a temporary installation connected to the building of the temple at the very beginning of the Ptolemaic period[67] on the basis of the stylistic analysis of the figured inlays.

The existence of glass inlays with the name of Ptolemy III (246–221 BC) provides an important chronological indication, given that the great temple of Sobek was built under the reign of Ptolemy I (305–282 BC).[68] If Nenna is correct in associating the workshop with the production of sacred furniture during the foundation phase of the temple, there is a narrow chronological range, between 305 and 221 BC, when the structure was certainly in use.

However, considering the stratigraphic data and Anti's interpretation, it seems that the manufacturing area is obliterated by a Roman *deipneterion* only as late as the end of the 1st century BC–early 1st century AD. Therefore, it would be logical to infer that the artifacts discovered by the Italian mission do also date to the last period of activity of the workshop.

The archaeological study points to two different directions, which cannot be better clarified without further radiocarbon investigations:[69]

1) the Tebtynis glass workshop is a temporary installation, active for less than one century, and Anti failed to recognize the functional conversion which must have taken place somewhere between the Middle/Late Ptolemaic phase;
2) the workshop is a long-lasting productive structure within the economy of the temple, and the artifacts discovered there, although dating to the

65 Also mentioned in Rondot, *Tebtynis II* (cit. note 6).

66 MSA, Anti's Archive, Cyrene, folder dedicated to Egypt, currently in re-ordering: "Fragments of furniture inlaid with enamel, now in the Cairo antiquities market, but found some years ago in the ruins of the [Tebtynis] sanctuary, bear the cartouche of Ptolemy Euergetes."

67 Nenna, Picon, Vichy, "Ateliers primaires et secondaires en Égypte" (cit. note 19); Nenna, "Le mobilier religieux en bois incrusté de verre" (cit. note 56).

68 Rondot, *Tebtynis II* (cit. note 6); Deotto, *L'Università di Padova in Egitto* (cit. note 7).

69 Given the importance of obtaining an absolute dating on these materials, we hope to be able to perform the analysis in the near future.

early Roman period, cannot be easily distinguished from their early Ptolemaic counterparts only on the basis of the stylistic appearance.

8 Conclusions

Because of its excellent preservation, the workshop of Tebtynis constitutes a crucial spot in the history of glassmaking. However, despite the numerous bibliographic mentions, very little was actually known with respect to the location and spatial organization of the structure or the type and quality of the materials discovered before the beginning of this research. The combined analysis of the archival data in Veneto and Canada and the material record at the Museo Egizio of Turin contributed to shed new light on the M.A.I. excavations at the site and reopened a series of questions which were taken for granted by recent literature on Egyptian glass-making in Graeco-Roman times, especially with reference to the chronology of the workshop and the time-span of the inlay production in the temple.

This work allowed us to recover and interpret the images and the planimetry of the kiln, which was still preserved in elevation in 1931: this structure constitutes a fundamental piece of evidence for the pyro-technological structures in Graeco-Roman Egypt, as those published to date are preserved only in foundations.[70] Moreover, we were able to contextualize the tools within a well-defined manufacturing area and to interpret their specific function in the production processes. Again, these data are of great importance as artifacts of this kind tend to be defined broadly in the collection catalogs without any reference to the specific manufacture involved.

Reviewing the data of historical digs not only contributes to highlighting fundamental details about the stratigraphic sequence, the provenance of the artifacts and the bias in the collection process, but it is especially useful as it

70 Just to cite a few recent works on the topic, see: Liesel Gentelli, Abdelrahman Medhat, "A Multi-Analytical Approach for the Archaeometric Identification of a Roman Period Glass Furnace in the Central Nile Delta," *Journal of Archaeological Science: Reports*, 2017, *11*:330–337; Marie-Dominique Nenna, "Primary Glass Workshops in Graeco-Roman Egypt: Preliminary Report on the Excavations of the Site of Beni Salama, Wadi Natrun (2003, 2005–2009)," in *Glass of the Roman World*, edited by Justine Bayley, Ian Freestone, Caroline Jackson (Oxford: Oxbow Books, 2015), pp. 1–22; Flora Silvano, "Glass Production in Antinoopolis, Egypt," in *Annales du 19e Congrès de l'Association International pour l'Histoire du Verre*, edited by Irena Lazar (Piran: AIHV, 2015), pp. 244–249; Fazzini, *Report on the Brooklyn Museum's 2008 Season* (cit. note 31).

offers a better understanding of the actual remains in the field, thus supporting the ongoing and future archaeological activities.

Moreover, the archival and material evidence related to the Tebtynis workshop clearly shows that we are dealing with a closed context, sealed by the functional transformation of the area. This means that the artifacts recovered can be considered essentially coeval, thus, forming a reference assemblage for typological, technological and archaeometric analyses. The research presented in this paper is a further step of a multi-methodological project promoted by the University of Padova to recover the heritage of Carlo Anti preserved in its collections and in those of the networked institutions. The glass inlays in Turin, now reassigned to their original context, will undergo an in-depth analytical investigation, which is intended to provide new details on the raw materials and the production processes employed by the ancient Egyptian glassmakers of Tebtynis. The archaeometric analyses will offer a further hint for a comprehensive understanding of the history of science considered from the perspective of glass studies. In fact, the proposed analytical approach will help to determine the eventual standardization of the recipes and the glass forming techniques employed within the workshop, in comparison with other coeval structures and with what is known from the literary sources. This is particularly significant in the case of Tebtynis, because the inlay workshop is located within the sacred space of the *temenos*, not far from the well-known temple library comprising manuals of priestly knowledge, astronomical texts, ritual hymns, religious poetry, magic spells, and teaching material.[71] In this sense, the study of the Tebtynis inlay workshop may constitute a tentative direction for reducing the perceived dichotomy between the scholarly knowledge of the philosophers who studied and described the properties of glass and the empirical practice of the ancient artisans. Working within the enclosure of the sanctuary increased the chance of daily interactions among the glassworkers and the priests, who were in charge to record and transmit relevant knowledge.

While the status the Roman *banausoi* ranked among the lowest social classes,[72] very little is known on the role of Ptolemaic glassworkers active

71 On the topic, see the following papers and the cited bibliography: Kim Ryholt, "On the Contents and Nature of the Tebtunis Temple Library. A Status Report," in *Tebtynis and Soknopaiou Nesos: Leben im römerzeitlichen Fajum*, edited by Sandra Lippert, Maren Schentuleit (Wiesbaden: Harrassowitz Verlag, 2005), pp. 141–170; Ian Begg, Paola Zanovello, Alessandra Menegazzi, Carlo Urbani, Giulia Deotto, "Location of the Deposit of Papyri from the Temple Library at Tebtunis Identified," *Atti Classe di Scienze Morali, Lettere ed Arti – IVSLA*, 2014–2015, *173*/3–4:397–407.

72 Marianne Stern, "The Glass *banausoi* of Sidon and Rome," in *When Glass Matters* (cit. note 2), pp. 77–120.

within the temples. However, the glass inlays produced in Egypt between the 5th century BC and the 1st century AD can be regarded as some of the most aesthetically pleasing and technically challenging products of their time.[73] The complexity of the miniaturization process, associated with the delicate furnace conditions necessary for obtaining specific chromatic hues, highlights the fundamental contribution of these craftsmen to the fields of chemistry, optics and natural studies, within an evolutionary trajectory leading to modern science as we know it.

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73 Nenna, "Le mobilier religieux en bois incrusté de verre" (cit. note 56); Bettineschi, Angelini, Molin, *Contestualizzazione degli intarsi in vetro da Tebtynis* (cit. note 59).