

# Current Research in Egyptology 2022

Proceedings of the Twenty-Second Annual Symposium,  
Université Paul-Valéry Montpellier 3, 26-30 September 2022

Edited by

A. Bouhafs, L. Chapon, M. Claude, M. Danilova,  
L. Dautais, N. Fathy, A.I. Fernández Pichel,  
M. Guigner, M. Pinon, M. Valerio

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Cahiers « Egypte Nilotique et Méditerranéenne »  
Montpellier 2023

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# Current Research in Egyptology 2022



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## Introduction

The Egyptology team of the Université Paul-Valéry Montpellier 3 - CNRS was honoured by the decision of the participants of the CRE 2021 Rhodes to assign the hosting of the 2022 congress to Montpellier. The twenty-second Current Research in Egyptology conference was held on 26th–30th September 2022 and featured around 250 attendees in presence and online. Among them, young scholars in Egyptology from different institutions worldwide presented ninety-three papers and twenty-four posters. CRE 2022 Montpellier marked the first time that the event was held in France – a fitting opportunity to celebrate the bicentenary of Champollion’s eventful discovery.

September 1822 indeed witnessed a milestone event that marked the birth of scientific Egyptology: the young Jean-François Champollion from Figeac outlined the principles of Egyptian hieroglyphic writing in his famous *Lettre à M. Dacier*. 2022 also marked the centenary of another important milestone in Egyptology: the discovery of the tomb of Tutankhamun in November 1922. For these reasons, we have decided to celebrate the history of Egyptology and associated research by dedicating specific sessions to these topics and making them a focal point of the congress.

The Egyptology team “Égypte Nilotique et Méditerranéenne” (ENiM), part of the UMR 5140 Archéologie des Sociétés Méditerranéennes of the Université Paul-Valéry Montpellier 3 and the CNRS, also celebrated its 50th anniversary in 2022. ENiM has contributed to developing and promoting Egyptology at the European level. Consisting of many specialists in different fields of Egyptology, including history, epigraphy, lexicography, and archaeology, the team is involved in several excavations in Egypt, such as Saqqara, Karnak, the west bank of Thebes, and the site of Armant, but also develops various digital projects, such as the Karnak Project and the VEGA dictionary, which is available in French, Arabic, English, and German. Teaching and research programmes provide training for students from all over the world at different educational levels. It also has an extensive library of more than 35,000 volumes and various scientific archives with documentary material compiled by some of the members of this institution over decades.

For the last 15 years, the ENiM team has been publishing an online journal named ENiM - Égypte Nilotique et Méditerranéenne and two collections, CENiM - Les Cahiers Égypte Nilotique et Méditerranéenne, to which this volume also belongs, and TDENiM - Textes et documents de l’ENiM. For all the students and staff of the ENiM team, welcoming the CRE in Montpellier has been an excellent opportunity to meet young researchers in Egyptology from all over the world, creating links between different generations of scholars.

Since its first edition in Oxford in 2000, the core goal of CREs has been to bring together young researchers in Egyptology from all over the world. Each session of the CRE 2022 Montpellier saw the presence of a majority of post-graduate students and young post-doctoral researchers. The Organising Committee of CRE 2022 Montpellier would like to express its gratitude to all participants and attendees of the conference for their inspiring contributions and the positive and friendly atmosphere created during the days of the conference. We hope attendees found in the CRE the ideal framework for presenting their research in progress, whether doctoral theses or broader research projects, and that this experience will remain a pleasant memory for everyone.

CRE 2022 Montpellier would not have been possible without the support of many scientific and institutional partners. Special thanks go to Sébastien Biston-Moulin for his support and invaluable help during all stages of the conference organisation, as well as to Jérôme Gonzalez, Marie-Laure Chênebeau,

and Sandra Reboullet for their guidance with all the administrative subtleties and their unwavering support for this event. We would also like to thank the researchers representing various French institutions who kindly agreed to participate in our conference by giving a keynote lecture: Sylvie Donnat, Marc Gabolde, Jérôme Gonzalez, Sandra Lippert, Frédéric Mougenot, Bérange Redon, Isabelle Régen, Pascal Vernus as well as the thirty-one members of the symposium's scientific committee, who are recognised researchers from various French and foreign institutions.

The authorities of the Université Paul Valéry-Montpellier 3 supported each and every step of our project, providing us with the conference locations, funding, and technical facilities for the CRE. We would like to thank first and foremost its president, Anne Fraïsse, and the two vice presidents of the university's Scientific Advisory Board, Sarah Hatchuel and Nathalie Vienne-Guerrin, as well as all the staff and departments who helped to organise this event.

We are honoured to thank the region Occitanie through its president, Carole Delga, represented at this event by Fadilha Benammar Koly, president of the international relations commission of the Occitanie region, the Montpellier City Council and Montpellier Métropole, through Michaël Delafosse, Mayor and President of Montpellier Méditerranée Métropole, and his representative at the event, Clare Hart, Vice-President in charge of International Affairs and European Cooperation.

We shall also mention the LabEx ARCHIMEDE and the Hierolexique foundation through their director, Frédéric Servajean, and their project director, Sandra Reboullet, as well as the National Centre for Scientific Research (CNRS) for having contributed to the realisation of the conference. The events that took place alongside the congress were made possible by the Museum of European and Mediterranean Civilizations (MUCEM) in Marseille and the Montpellier Tourist Office.

Last but not least, we would like to thank all our colleagues and students who helped us during the whole process.

The present volume includes thirty-two articles on various topics from the history of Egyptology to archaeology and material culture, from the Predynastic to the Roman period, through history and epigraphy, as well as new technologies. All of them were reviewed by the members of the scientific committee, recognised scholars who contributed significantly to the quality of these proceedings through their constructive comments and advice. A special thanks goes to them for helping us in the peer review process of both the abstracts and the subsequent papers.

We are grateful to all the contributors for sending their papers and keeping with the tight schedule that led to the swift publication of these proceedings, as well as to Mike Schurer and Gerald Brisch from Archaeopress for their efficiency.

As we present the volume a year after CRE 2022 Montpellier took place, we would like to extend our warmest congratulations and best wishes to the Basel Egyptology team and all the participants in the CRE 2023 edition: may you have a successful and enriching congress!

The Editors



*Group photo taken on September 27th 2022 in the Cour des Marronniers, Saint Charles, Université Paul Valéry-Montpellier 3.  
(© S. Cayez).*

# Preliminary Report on the Project ‘Arsinoe 3D’: Archival and Digital Reconstructions of the Italian Excavations at Arsinoë

Ilaria Cariddi, Alessio Corsi

## Abstract

The archaeological remains of the Roman phase of Arsinoë (present-day Medinet el-Fayyum/El-Fayyum), threatened by urban expansion, were investigated during a single emergency campaign in 1964-65 by the Istituto Papirologico ‘G. Vitelli’ (University of Florence), and subsequently covered by modern buildings. The project ‘Arsinoe 3D’, led by the papyrologists and archaeologists of the Istituto Vitelli (Scientific director: Prof F. Maltomini) and by the DAdA-LAB team of the Department of Civil Engineering and Architecture of the University of Pavia (Scientific director: Prof. Arch. S. Parrinello), aims to achieve a virtual reconstruction of the site, based upon film negatives, excavation journals, and the unpublished findings and data preserved in Florence. Through cutting-edge photogrammetry, 3D-modelling technologies, and digital storytelling, it has been possible to recreate the environment as it was in 1965, thus allowing us to visit a site that no longer exists.

At the same time, numerous findings of that field campaign have been studied, catalogued, 3D-scanned, and virtually reinstated in their original archaeological context. The project ‘Arsinoe 3D’ will be offered as a virtual and physical exhibition, due to be launched in 2023. The present contribution serves as a preliminary illustration of the archaeological and archival research, the methodologies of the past excavation, and the modern reconstruction, for a project designed to qualify as a case study of contexts and sites endangered or no longer accessible.

## Keywords

Arsinoe, Crocodilopolis, Krokodilopolis, Graeco-Roman Egypt, Fayyum, Digital reconstruction, 3D reconstruction, archives

## Arsinoë: historical outline of the site and its excavations (I. Cariddi)

‘Arsinoe 3D’ is a multidisciplinary project aimed at shedding new light on the capital of the Fayyum region, Shedet (*Šdt/Šty*), known in the Ptolemaic period as Krokodilopolis (Κροκοδίλων πόλις), and later, as Ptolemais Euergetis (Πτολεμαῖς Εὐεργέτις, from 116 BC), and Arsinoitōn Polis/Arsinoë (Ἀρσινόϊτων πόλις/Ἀρσινόη, from the 4th century AD; Casarico 1987a: 133-135; 1987b; see also TM Geo 327). Probably dating back to the Predynastic period, the city was re-founded by Amenemhat I as a strategic centre for the control of the Lake Moeris waters, and it developed along the banks of the Bahr Yussuf canal. After the second project of land reclamation and agricultural extension at the beginning of the Ptolemaic period (Davoli 2012: 154), it became the capital of the Fayyum region, its largest and most important centre.

However, the present knowledge of the settlement is extremely fragmentary: almost entirely incorporated within the modern suburbs of Medinet el-Fayyum, Arsinoë is frequently referred to as ‘the lost city’. Its location at the very centre of the agricultural area, intensively inhabited, exploited for crops, and

subject to flooding, was its fortune in antiquity, its ruin for long-time conservation. The complete loss of the capital of the Fayyum is acutely lamented by archaeologists, historians, and papyrologists alike.

Yet, unlike most of the other hinterland settlements in the Fayyum, vanished due to constant dampness and agricultural use (Davoli 2012: 155), until the 1850s, the remnants of Arsinoë were still well visible in more than ten high mounds. The first European visitors and excavators, Jomard (1821: 446-447), Belzoni (1835: 361-362), Rifaud (1829: 4-19), Lepsius (1970: 30), Vassalli (1867: 59-69), could recognise, amongst the prominent *kiman*, vast remains of architecture and statues dated to the Middle Kingdom, Ramses II and the Ptolemaic era, residential quarters, and Roman baths.

In particular, Jomard, one of the *savants* who accompanied Bonaparte's expedition to Egypt, provides valuable information on the extension of the remains of Arsinoë – at the beginning of the 19th century, the surface occupied by the ruins measured about 4 × 3 km, a not inconsiderable area (Jomard 1821). The first 'excavations' of the site were those of J.J. Rifaud, in 1823-1824, who distinguished four levels of occupation recorded in a simplified, yet indicative, section plan. The explorer conducted a survey of the 51 m-tall hill of 'Koum-Medinet-el-Farès', probably corresponding to the 'Kom Fares' later mapped by G. Schweinfurth, where abundant fragments of Pharaonic and Greco-Roman stone elements surfaced. Under the *kom* he located mudbrick structures, interpreted as residential, a subterranean conduct leading to a vast water basin and three cisterns, all on a north-south axis, and the monumental vestiges of a thermal complex (Rifaud 1829: 4-19).

During the late 19th century, as ancient sites were reinhabited in the process of modernisation and intensification of agricultural production promoted by Muhammad Ali Pasha, several Fayyum sites, including Arsinoë, were used as quarries for building materials, and spoiled by *sebbakhin*; their activities unearthed sizeable quantities of archaeological remains, and particularly papyri, later sold to the largest collections in Europe and Egypt (Breccia 1936: 297-298; Davoli 1998: 150). The site was thus progressively ruined, both by diggers and the development of cultivation, and by the modern capital of the Fayyum.

The most important landmark in the documentation of Arsinoë came about in 1886, when the German botanist, ethnologist and explorer Schweinfurth (1887: pl. 2) led a detailed survey, producing what remains the only extensive planimetry of the area. At that time, the ruins occupied roughly 2.4 × 2.2 km, in eight tall *kiman*, mainly located to the north of the modern city. In 'Kom el-Chariana', he unearthed a residential quarter and the ruins of a great public building, from which most of the previously discovered papyri were said to derive. The excavation of the prominent 'Kom Fares' brought to light wall sections and papyri; nearby lay the remains of what the excavator interpreted as the temple of Hadrian or Jupiter Capitolinus. In 'Kom el-Addama', Schweinfurth dug some trial trenches in a 5th/6th century AD necropolis, the grave goods and rich textiles of which are presently in the Berlin Museum. The most extended ruins were those of the *temenos* of the main temple of Sobek/Suchos, in the area known as 'Deir el-Dab', and Schweinfurth (1887: 75-77) recorded there several red granite architectural fragments with cartouches of Amenemhat I and III, and Ramses II.

In 1888, W.M.F. Petrie investigated what survived of the temple of Sobek, renown in antiquity as the principal centre for the cult of the god in the Fayyum region, presently located in the northern district of Medinet el-Fayyum (area 1 of Davoli and Ahmed 2006: 81, 85-86, 90-91). Even though the sanctuary was, by then, almost covered by cultivation, Petrie was able to describe its stratigraphy in four main phases: a (re?)foundation in the 12th dynasty, probably under Amenemhat I or, more probably, III and, subsequently, the Ramesside, Saitic, and Ptolemaic layers. The temple, whose *temenos* measured c. 300 m in length and 250 m in width, was abandoned around the 3rd century AD, and by the 4th century, its entrance was occupied by private houses (Petrie 1889: 59). The great temple was dedicated to 'Sbk Šdty', 'Sobek of Shedet', and other *sunnaoi theoi*, probably including Thoeris, Thot and Amenemhat III/

Pramarres (Habachi 1955). A number of literary and papyrological sources suggest the existence of several cultic facilities of this temple, notably including a library, and a lake or basin housing the live reptilian hypostasis of Sobek. However, the excavations and the dispersed architectural finds have not yielded sufficient information to identify any of these structures (Casarico 1987a: 137-139; 1995: 72; Rossetti 2020: 88-93).

The aforementioned papyrological sources also record additional sanctuaries in Hellenistic and Roman Arsinoë, such as a temple for Ptolemy (identified with area 2 of Davoli and Ahmed 2006: 85-86, 90-91), one for the triad Isis-Osiris-Harpocrates, two for Soknebtynis ('Sobek-lord-of-Tebtynis') and Soknopaios ('Sobek-lord-of-Pay', especially worshipped at Dime), a Boubasteion, a synagogue, a Sebasteion, and several others (Casarico 1995: 72-75; Rossetti 2020: 93-95), all poorly or not documented archaeologically.

Scattered finds were made continuously as the modernisation of the city went forward (for a list see Davoli and Abd El-Aad 2001; Davoli and Ahmed 2006: 85-86). Above all, 14 colossal fragments of red granite columns with cartouches of Amenemhat III were brought to light c. 700 m south of the *temenos* of the Sobek temple, in the area known as the 'Kiman Fares' (also transcribed 'Kiman Faris'), from the name of the central mound, the 'Kom Fares'. Habachi (1937) theorised that they had to belong to another, previously unknown, large Middle Kingdom temple or cultic facility.

In 1964, the Chief Inspector of El-Fayyum compiled a report on the area of the Kiman Fares, documenting its endangered state, at this point reduced to less than half the area Schweinfurth mapped. The areas recorded and partially excavated on that occasion included the Sobek temple north of the Kiman Fares, the nearby remains of two red granite statues of Ramses II, the supposed Amenemhat III temple in the south, the Ptolemaic temple in the east, and two large Roman baths north and south of the Kiman (Davoli and Ahmed 2006: 85).

At that time, the long-term scientific collaboration between Egypt and the Istituto Papirologico 'G. Vitelli', University of Florence (henceforth: IPV), was resuming after the halt forced by the war (Manfredi, Menci and Pesi 2007: 625; Pintaudi 2009: 83-84). The IPV was thus granted the excavation permit for the Kiman Fares (centred in sector marked as 'Kom el-Arabi' in Schweinfurth 1887), the district that included the monumental ruins south of the Sobek temple, and the area believed to have produced a quantity of the famous bulk of papyri. No other foreign mission had previously worked on the site, and the aim was therefore twofold: investigating the architectural remains, in particular the presumed 'other' Middle Kingdom temple, and, if possible, searching for papyri. However, it also was devised as an emergency excavation, since, as the Government forewarned, the building expansion was rapidly progressing.

V. Bartoletti, then Director of the IPV, entrusted the excavation to S. Bosticco and M. Manfredi, professors of Egyptology and Papyrology respectively, at the University of Florence. Arriving on site on 3 December 1964, and having started the excavation two days later, they first mapped the identifiable stone structures. In particular, Manfredi detected a section of masonry in limestone blocks, located north of the concession area, with a fragmentary monumental Ptolemaic inscription in Greek which attested that it was part of a theatre (Rathbone and Pintaudi 2020). The original plan of some thermal buildings in baked mudbricks, largely plundered, could be distinguished in negative, and a cemented stone pavement of Roman age, at the same level as the other thermal installations throughout the city, was unearthed under a 2 m-thick layer of debris. The excavation activity, focused in the central-east sector over an area of c. 12,500 m<sup>2</sup>, was conducted by Bosticco, Manfredi, and the mission members C. Barocas and F. Forte, leading the labour force of 50 workers from Quft. In addition, S. Donadoni (University La Sapienza of Rome) and E. Bresciani (University of Pisa) provided consultancy and collaboration (Bosticco 1997: 285-

286). The team carried out only one, brief campaign, from 5 December 1964 to 24 February 1965, after which the site disappeared completely.

In fact, after Bosticco's excavation and some final investigations by the *Service des Antiquités*, in 1966 the entire site was listed by the Inspectorate as free from antiquities, and buildable (Davoli and Ahmed 2006: 85). The district was fully urbanised, and, in 1970, only five areas with substantial architectural remains were preserved (Davoli and Ahmed 2006: 85-86, 90). Today, these sections have mostly disappeared under modern buildings (Davoli 2015: 93). More scattered finds continued to be unearthed and identified over the years. In particular, a fragment pertaining to a copy of the 'Marriage Stela' of Ramses II, probably from the temple of Sobek, provided new and significant evidence of the eminent role played by the city of Shedet in the Ramesside era (Davoli and Ahmed 2006: 83-85, 87). The last monumental and statuary vestiges were transferred in 2015 to the Open-air Museum of the Kiman Fares, in the archaeological area of ancient Karanis (today Kom Aushim, c. 35 km north of Medinet el-Fayyum), as part of the 'URU Fayum project' (University of California Los Angeles, Rijksuniversiteit Groningen, and the University of Auckland). The museum was funded by the Egyptian Ministry of Tourism and Antiquities and the American Embassy in Cairo as a contribution to the local redevelopment of tourism.

Therefore, the 1964-65 campaign led by the IPV proved the last opportunity for a systematic archaeological investigation of a fairly large sector of Arsinoë. Later in 1965, Bosticco and his team intended to resume their work on the site, exploring the areas planned for the following seasons, including the remains of residential quarters in the area mapped as 'Kom er-Rustn' in Schweinfurth 1887, however this was not possible given the advanced state of the urban expansion (Pintaudi 2009: 84, 88-89). Thus, the documentation was left at a preliminary stage, and the only extant publication consists of two concise reports (Manfredi 1965; Bosticco 1997).



Figure 1. Egyptian workmen moving the fragments of the red granite columns (photo by C. Barocas, © 1964-65 Istituto Papirologico 'G. Vitelli', Florence).

As a result, the evidence of the Arsinoite metropolis in the Graeco-Roman era has, until now, relied almost exclusively on the papyrological sources; the published archaeological documentation has been deemed insufficient for any sort of reconstruction (Casarico 1995: 69; Davoli and Ahmed 2006: 87).

### **The results of the 1964-65 Italian excavations and the 'Arsinoë 3D' project (I. Cariddi)**

The Italian campaign determined that there was no trace of a Middle Kingdom temple in the archaeological layers beneath the red granite columns. Probably deriving from the neighbouring temple of Sobek, these had been gathered there and broken, presumably to be reused. The columns and nearby blocks were photographed, recorded, and drawn; they also revealed cartouches of Ramses IV, in addition to the already recorded ones of Amenemhat III, Ramses II and VI (Bosticco 1997: 286, and unpublished documentation [see *infra*]). It has been hypothesised that they were originally part of a colonnade erected by Amenemhat III in the temple of Sobek, later restored by Ramses II and Ramses VI (Davoli and Abd el-Aal 2001: 208).

The most important discovery was that the area preserved a section of the Roman aqueduct of the city, regarded as a peculiarity of the site. The mission excavated sizeable remains of pipes and canals, at the point where the principal line of the aqueduct that wound through the city from north to south connected with an east-west branch, as well as deep cisterns scattered throughout the site. These possibly belonged to the same complex of conduits described by Jomard (1821). Perhaps the most noteworthy of the hydraulic installations was located to the south of the excavation sector, comprising of a double series of canals, at three different levels, which supplied a large elliptical cistern, 3.75 m deep (Leclant 1966: 139-140; Manfredi 1965: 94), which produced no significant findings (Bosticco 1997: 286). A stone-lined well in the central sector, however, contained whole amphorae, ollas and cups, which confirmed the Roman dating of the construction (Bosticco 1997: 286). Some Pharaonic architectural fragments were found re-employed in the Roman aqueduct, validating the hypothesis of reuse for the Middle Kingdom and Ramesside monuments. In the south-west and north sectors of the excavation, two different complexes of several rooms were brought to light, both dated to the Ptolemaic age on the basis of the coins and pottery.

### ***The findings and groundwork of the project (A. Corsi)***

No new papyri were recovered at Arsinoë, but archaeological finds were abundant, mostly still unpublished. Some 1500 pieces were granted to Italy in the *partage* with the *Service des Antiquités*. Provisionally deposited for over thirty years in the storerooms of the National Archaeological Museum in Florence, in 2001 these were transferred to the IPV, and today they are one of the two cores of its archaeological collection (Manfredi, Menci and Pesi 2007: 625-626, 629-633). Some 450 votive terracotta statuettes, and eight limestone fragments, currently under study, were recovered during the mission, dating from the end of the Ptolemaic age to the early Roman period (Menci and Pesi 2012: 5-16, and unpublished documentation [see *infra*]). While a substantial part of the collection is on display, much remains still within the deposits of the IPV.

The corpus of the terracotta statuettes of the IPV includes all typologies of figurines common in Hellenistic and Roman Egypt, illustrating the devotion of the inhabitants to local, Greek, and syncretic deities (Barrett 2011: 421-424). Egyptian divinities are mainly recognised by their crowns and headdresses, while Greek gods and goddesses of analogous prerogatives are often assimilated to them with different attributes (Menci and Pesi 2012: 14). The problem related to the destination and use of such statuettes is still open. As for several other areas of the Fayyum, most of the statuettes were found, unfortunately, separated from their original contexts; however those retrieved *in situ* seem to confirm the prevalent private and domestic use attested elsewhere in the region (Dunand 1979: 9; Nachtergaeel 1985: 224).



Divinities of fertility and fecundity prevail, testifying to a characteristic faith popular to the masses (Dunand 1979: 107-117). Isis, related to agricultural fertility and procreation (Dunand 1979: 60-67), is the most predominant among the figurines of goddesses; she is also assimilated to Demeter in statuettes bearing attributes of both divinities and, as Isis-Hathor, also to Aphrodite, as protector of women.

Harpocrates ('Horus-the-Child'), on the other hand, is the predominant god among the statuettes portraying male gods, and, once again, he acts as guardian of the household and animals, propitiating fertility and abundance (Dunand 1979: 74-86). He is often depicted characteristically with his right finger pointing to his mouth, wearing a wreath of flowers (on top of which he normally wears a *pschent* and/or lotus blossoms), sometimes holding loaves and pots, or a *cornucopia*; occasionally he is represented with a shaved head and the typical childhood braid, closer to his Pharaonic iconography.

The collection of terracotta statuettes of the IPV also features a rare figurine of Mithras, whose cult seems otherwise documented only in Memphis and Hermopolis Magna (Harris 1996).

Bes, on the other hand, is fairly well attested among the autochthonous divinities, either as figurines in the round, or applied to torch holders or miniature altars.

The archaeological mission also recovered c. 800 pieces of pottery, mainly kitchenware, oil lamps and *unguentaria*, which testify once again to the residential use of the area. These were mainly produced in series, while some objects were imported. This part of the collection is still unpublished.

Lastly, an important core of the Arsinoite IPV collection consists of amphorae and amphorae handles with marks and inscriptions (in Greek and Latin) that give supplemental evidence of the intense commercial exchanges between the Fayyum and the other maritime centres of the Mediterranean Basin, especially Rhodes, Phoenicia, and Puglia (Manfredi and Rizzo forthcoming).

In recent years, several efforts have been dedicated to the collection and digitalisation of the unpublished documentation of the 1964-65 campaign still held at the IPV, something long wished for by the scientific community. This has allowed for a wealth of new studies that have expanded the results published by Bosticco and Manfredi. As part of the 2017 PRIN project '*Greek and Latin Literary Papyri from Graeco-Roman and Late Antique Fayum (4th century BC - 7th century AD): Texts, Contexts, Readers*', the IPV envisaged a collaboration with the DAda-LAB team from the Department of Civil Engineering and Architecture of the University of Pavia (henceforth: DAda-LAB), for an experimental project to try and recreate some of the original, physical context of the renown Arsinoite papyri. The IPV researches have thus supplied the architects and engineers with the original, and especially the newly catalogued documentation, extensive to some degree, but also incomplete, and difficult to publish, or to 'let it speak for itself' as it was.

A multi-disciplinary team was established to create a tool for the critical interpretation of such diversified sources – 'to make explicit the interconnection of the existing, fragmented historical data, giving an image to the relationships between the findings, and revealing the lost landscape' (Parrinello, Dell'Amico and Galasso 2022: 897). Despite the difficulty of dealing with a context no longer visible, but also precisely because of this feature, the working group devised several strategies to digitise this vanishing heritage, and to provide different means, for both general and specialised audiences, to explore the dynamic context of an excavation, and its many timelines – the Hellenistic and Roman lives of Arsinoë, the 20th century archaeological investigations, and the current research.

### Unpublished documentation (A. Corsi)

Numerous items of unpublished documentation from the excavation, still kept in the archives of the IPV, have been thoroughly reviewed and digitalised. These consist of:

- original film negatives
- contact prints of film rolls
- printed pictures
- handwritten excavation log journals (diaries, worker lists, finds lists, architectural and planimetric sketches), and a final report on the excavation for the *Services des Antiquités*
- general plans drawn by Forte

The photographic documentation consists of medium and small format negative films (see paragraph 'The reconstruction'), and 35 prints, of which no negatives are stored in the archives. Contact prints of the small format film rolls were also recovered, easing the cataloguing process of the pictures.

Once the photographic documentation had been organised, probably the most important step of this preliminary stage of the reconstruction was to locate and consequently geo-reference the 1964-65 excavation. The only extant excavation plans and the general plan, in fact, lacked precise geographical references, and the whole district is presently covered by modern buildings. Confronting and juxtaposing historical maps, the general excavation plan, and satellite images, we have thus been able to locate the investigated site with a good degree of approximation: it has finally been identified in an area now occupied by the premises of the Fayyum University (29°19'13.0" N, 30°50'07.0" E, Figure 2).

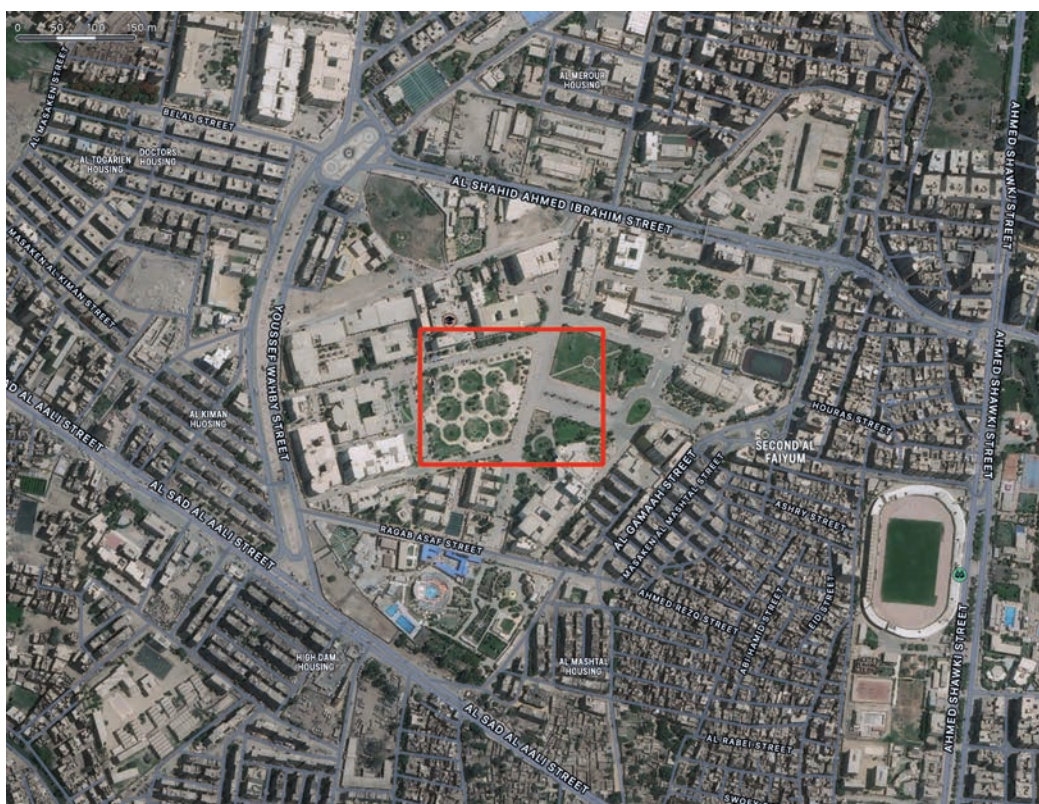


Figure 2. Satellite image of the area of the Fayyum University, with the approximate location of the sector excavated by the Istituto Papirologico 'G. Vitelli' in season 1964-65 highlighted in red (Apple Maps satellite photo with graphic elaboration by A. Corsi).

## **The reconstruction: findings, pictures, methodology (A. Corsi)**

This attempt at a digital reconstruction of a lost archaeological site can be seen as a case study, with all the peculiar traits of a ‘test’, i.e. the timespan of that excavation was short, the excavated surface was limited, and the available documentation was scarce and left at a preliminary stage. Moreover, we do not have the possibility to verify the data on the actual location. These characteristics have posed a challenge, but gave us the opportunity to put this methodology ‘under stress’ with a virtual reconstruction of what is perpetually lost, thus permitting a recontextualising of the findings and the whole excavation.

In cooperation with DAdA-LAB, we decided to focus on two study paths: (1) 3D models of select findings, that will represent the core of the virtual exhibition ‘Arsinoe 3D’, aimed at building a narrative of the history and daily life of the site for the wider public, and (2) also a digital reconstruction of the excavation site as it was at the end of the Italian archaeological campaign in 1965. The findings were chosen, prioritising those found *in situ*, that had specific findspots recorded, other than relevant pieces from the piles of pottery fragments close to the buildings of sector D and from the layers of debris.

To create a 3D model of the artifacts, two different techniques were employed:

Some objects were 3D scanned using two handheld 3D laser scanners (for smaller or larger artefacts): the scanner is rotated around the object and the model is automatically created.

For other objects, photogrammetry techniques were preferred. They were photographed from different sides, and all datasets were finally merged to complete the 3D model of the whole artefact. Both techniques allow the recording of the textures of the artefacts directly during the ‘capturing’ phase (for technical details see Parrinello, Dell’Amico and Galasso 2022: 895-896).

### ***The 3D reconstruction of the archaeological site***

The most challenging part was the attempt at a digital reconstruction of the excavation area of the Italian campaign.

The original negative films were scanned, as well as the contact prints, the latter having eventually proven very useful as some of the original frames were damaged. The majority of the 1964-65 photos was taken with a small format camera, but medium format was also used, probably equipped with a 75 mm lens. The notes left by the mission members recorded only the film used and shutter speed and aperture; no notes were left about the type of camera and/or its lens. Studying the original pictures, it has been hypothesised that both a 50 mm and a wide-angle lens were used. At least two small format cameras were brought to the excavation: one used by Manfredi, who shot seven rolls for the entire campaign, and another by Barocas, who took the 35 pictures. Of the latter we only have 11 × 7.5 cm prints.

Given the scarcity of the available pictures, as film was expensive at that time, the initial idea of using photogrammetry techniques to recreate the 3D model of the excavation was soon discarded, since many pictures of the same object or area from different angles and views are needed for the photogrammetry software programs to produce a 3D model (for an in-depth study of techniques of modelling environmental systems from pictures, see Parrinello and Picchio 2014).

The first step was to connect the available pictures to the general excavation plan, identifying the archaeological remains in the pictures with their drawing on the plan. This task has been especially demanding, not only as the list of pictures taken was not exhaustive, but also since the photographic

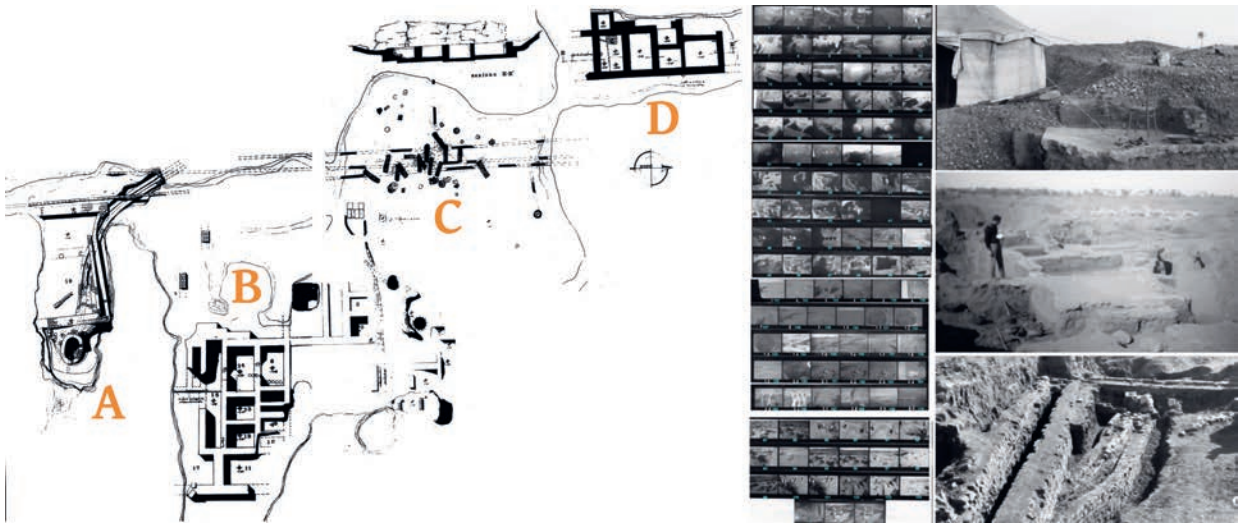


Figure 3. Original general plan of the excavation, with the four sectors, supplemented with examples of the photographic documentation, catalogued according to said sectors (© 1964-65 Istituto Papirologico 'G. Vitelli', Florence, and DAdA-LAB).

campaign did not always include the basic references needed to isolate and orient the photographed subjects within the general site arrangement. Moreover, as multiple shots were taken at different stages of the excavation, without associated notes, the same setting and surroundings appear very different from picture to picture, making the recognition of each structure a lengthy and problematic process. Four excavation sectors were finally identified and the pertinent pictures catalogued in synoptic frameworks according to these subdivisions (Figure 3).

Every landmark, wall, well, shaft, hole, and pile of debris that we could recognise has been identified, both in the general plan and on the pictures, and then colour-coded to help sort the multitude of data. This preliminary cataloguing step proved to be extremely helpful, especially in terms of understanding the several excavation phases of the same structures, and constituted the necessary premise to attempt a reconstruction of the environment in 3D.

Another essential task, and factor of complexity, was to identify the exact spot the pictures were shot from, detailing every stage of the excavation and every reference point to fully understand the morphology of the environment and thus virtually 'place' the camera in it.

Basically, two different modelling techniques were employed jointly, to compensate for the uncertainties resulting from the partial knowledge of the site, in order to optimise the reliability of the virtual reconstruction process.

#### (1) Lines of perspective

It was extremely important to identify the focal length of the lenses used to take each photo so as to have reliable lines of perspective on which the whole 3D model could be grounded. This step was essential, as longer focal lengths tend to flatten the perspective while shorter ones exaggerate it, giving the impression that objects are much further away than they actually are.

The structures were then directly 3D-built over the pictures, matching the perspective lines of the 3D model to those of the reference photo.

This technique was used especially for sector A, since that area was one the most photographed and had clearly visible lines of perspective.

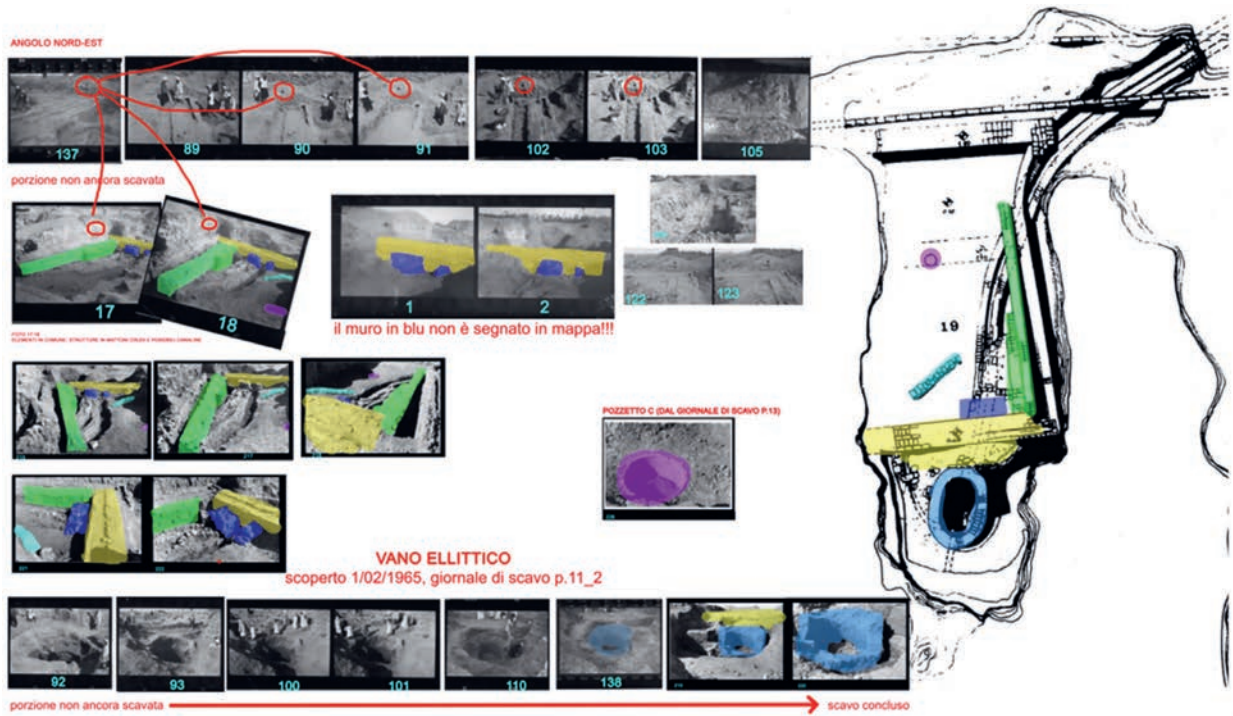


Figure 4. Synoptic maps of general plan and photos with colour-coded structures (© DAda-LAB).

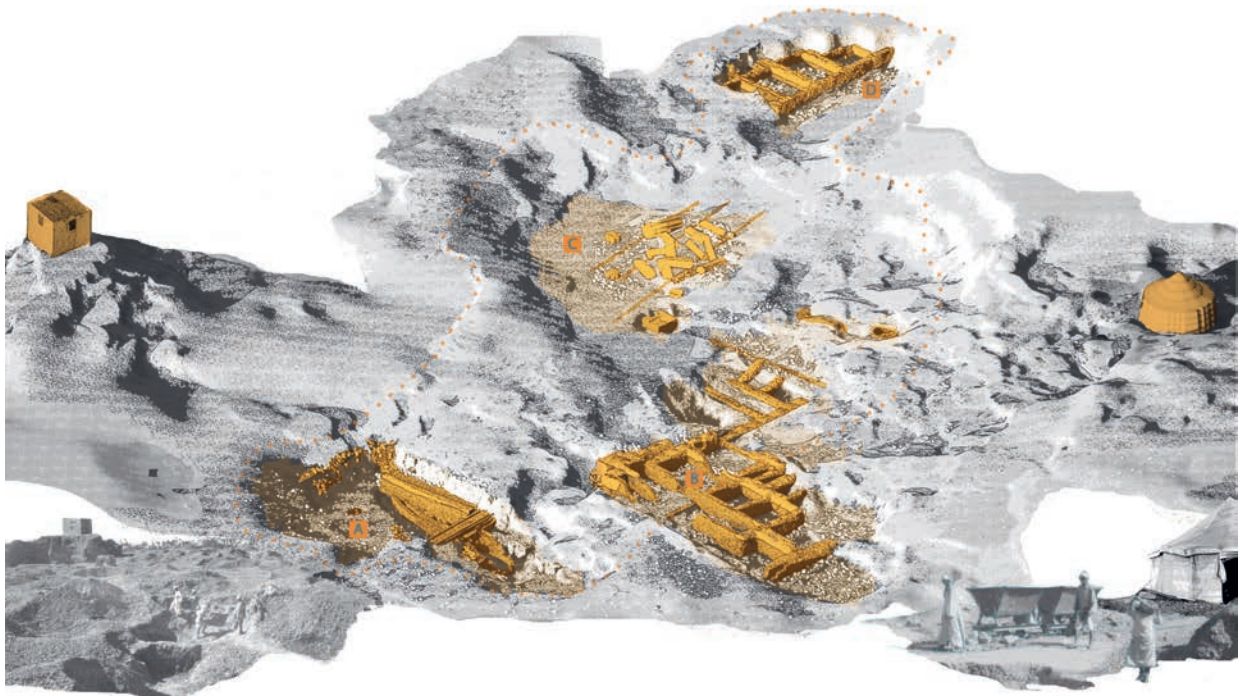


Figure 5. General 3D plan of the sectors, with principal structures highlighted in yellow (© DAda-LAB).

*(2) Extrusion technique*

The central part of the excavation, sectors B, C and D, however, could not be reconstructed using the same technique as the photographic documentation was not complete enough. That area was then traced above the plan and extruded to create the 3D model of the walls.

A digital environment was then designed using the pictures as references for the height of the structures and of the mounds as well as the notes on the excavation journal that listed the highest elevations of the structures. This operation was difficult as the archaeological remains were within an open environment that had to be created from scratch; also, the models of both the setting and the structures had to be constantly adjusted to have the same perspective as in the reference pictures.

The last phase was to apply the corrected textures to the models: the materials were identified according to the information in the excavation journal. The textures were extracted from modern pictures taken in the same area (especially for the colours of sand and mudbricks).

The final step was the decimation of the polygons to achieve a more user-friendly smoothness during the navigation inside the model. Eventually, the whole environment was set to dusk to add a layer of 'affective historicity' (as defined in Winnerling 2014), thereby conveying a sense of something past and irretrievable (Figure 6).

In this digital setting, according to the archaeological data provided by the excavation journals, the findings (with their own 'object cards') were then placed in the same spots where they were found.

***The exhibition 'Arsinoë 3D'***

The exhibition will then be declined in two different concepts:

A 'physical' exhibition in which the visitors will be guided through a path with explanatory panels and objects (some of which never before displayed) illustrating the site, the excavation, the inhabitants of Roman Arsinoë, and their economic, religious and daily lives, paired with selected papyri from the Greek and Egyptian collections of the IPV. 3D printed models of objects will be available to be touched.

A 'virtual exhibition' on a dedicated website, where the data from its 'physical' counterpart are combined with ample additional content, organised and interconnected in a narrative structure with a neural



Figure 6. A provisional frame from the 3D reconstruction of the excavation, implemented with Unreal Engine (© DAda-LAB).

network approach, at several reading levels. They will both include a 3D immersive experience with two platforms of choice:

Using a 3D visor provided during the event, the visitors can immerse themselves in the digital reconstruction of the site and literally walk in it and explore it, appreciating its size, context, and tridimensionality that no plan could ever transmit. In their exploration of the site, visitors will encounter the findings in their original findspots and have access to all the objects' details.

More traditionally, the visitor can navigate the digital environment remotely, using a computer or a tablet, in a kind of blendable, 'serious game' approach that provides the opportunity for a catered experience for different categories of audience: scholars of Egyptology, Papyrology and Antiquities, or laypersons, young adults and children, who will be able to explore the layered historical timeframes of the city, the sectors and the protagonists of the excavation, browsing through specialist or more general information.

### ***Final remarks***

We would like to reiterate that this reconstruction and these techniques were not an end in themselves: through modern technology, old and partial documentation that one could hardly interpret can still provide plenty of data and, therefore, is no longer mute. Reconstructing Arsinoë as it was when the Italian mission left it in February 1965 helps the scholar to study and contextualise the site, much more than from the incomplete photographic documentation alone. In the words of the DAda-LAB experts, 'this practice does not replace the emotional experience of the visit, but it can amplify its communicative potential [...] Bringing an archaeological site back to life, giving meaning to the signs of history, becomes the main objective of Virtual Archaeology, whose purpose lies precisely in [...] making easier the access to information contents, and in the correlation between two main aspects, the communication of the finds and the archaeological research' (Parrinello, Dell'Amico and Galasso 2022: 893). The model acts as a 'container' that can now be further enriched with different datasets, such as scattered finds from museums, or information provided by papyri and previous studies of the site.

These techniques reveal an enormous potential, proving to be extremely successful even in contexts with limited data and diachrony, not to mention when they are used for much more documented sites. Thus, they can serve as a different, auxiliary support in data interpretation, as well as providing new ways for the general public to visit sites, either extant or lost in time, such as the Italian excavations at Arsinoë.

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