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Wooden funerary sculpture in ancient Egypt: a study of the assemblage from the tomb of Minhotep in Asyut

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WOODEN FUNERARY SCULPTURE IN ANCIENT EGYPT: A STUDY OF THE ASSEMBLAGE FROM THE TOMB OF MINHOTEP IN ASYUT

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Abstract

This doctoral research examines the construction techniques, materials and production dynamics of a group of wooden funerary sculptures from the Tomb of Minhotep at Asyut, dated to the late 11th–early 12th Dynasty (1939–1875 BCE) and now housed in the Museo Egizio, Turin. Grounded in the methodological framework of cultural heritage conservation, the study addresses the long-standing imbalance in Egyptological scholarship, where stylistic analysis has often prevailed over systematic investigation of technical practices.

The research focuses on a coherent assemblage of twelve sculptures, including offering-bearers and boat models, seven of which were subjected to detailed archaeometric analysis. Through the integration of visual examination, conservation records, imaging techniques and targeted scientific analyses, the study reconstructs operative choices in wood selection, carving, assembly and pictorial finishing, with the aim of situating the artefacts within a plausible local production context.

The results demonstrate substantial formal and material consistency. Fig wood predominates as the structural material, while calcium-based ground layers and a restricted palette of ochres, carbon black and, in one case, Egyptian blue define a controlled chromatic repertoire. Recurrent solutions suggest consolidated workshop practices, and different craftsmen involved.

By combining technical examination, archival documentation and scientific data, the research also reassesses the post-excavation history of the assemblage, highlighting misplacements and reassemblies that have affected its current configuration. The study contributes to the technical history of Middle Kingdom wooden sculpture and proposes an integrated methodological model applicable to other museum-held assemblages.

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1. Introduction

This research is grounded in the perspective of cultural heritage conservation, understood not only as a practice aimed at the preservation of artefacts, but also as a specific approach to the study of ancient material culture. The investigation of materials and manufacturing techniques lies at the core of the conservator's training and working methods, and represents a fundamental condition both for responsible conservation practice and for the historical interpretation of objects. When applied to ancient Egyptian wooden funerary sculpture, this perspective brings to light a number of persistent methodological issues, including ambiguities in technical terminology and the uneven reliability of published data on materials and techniques. The existing literature is still largely dominated by stylistic and typological approaches, while constructional and technological aspects remain comparatively less explored. Although such an imbalance is partly due to the nature of the evidence itself, the growing availability of non-invasive and non-destructive scientific methods now offers concrete opportunities to address these gaps. Within this framework, the present research is guided by a set of closely related questions concerning the modes of production of wooden funerary sculptures, the relationship between commission and manufacture, the organisation of labour within workshops, and the degree of standardisation or variability in technical practices.

The project took shape through direct involvement in the study and conservation of a group of wooden funerary sculptures from the Tomb of Minhotep¹, now preserved in the Museo Egizio of Turin. An initial comparative investigation carried out on two offering bearer figures from the same archaeological context made it possible to test an integrated methodological approach combining visual examination, conservation data and scientific analyses, aimed at reconstructing materials and construction techniques. The results of this preliminary phase confirmed the feasibility and relevance of extending the study to the wider assemblage and provided the basis for a more systematic research project. This line of investigation was subsequently formalised within the framework of the National PhD in Heritage Science, with the support of the University of Turin as host institution and constitutes the core of the present doctoral research.

The final project, which forms the subject of this thesis, focuses on the technical and archaeometric study of the wooden funerary sculptures unearthed at Asyut, in the Tomb of Minhotep, currently housed at the Museo Egizio in Turin and generally dated, on stylistic and contextual grounds, between the late 11th and early 12th Dynasty (1939–1875 BCE). The primary objective of the project is to attempt to place these artefacts within their appropriate production context (in terms of materials used, technologies, and manufacturing techniques), by integrating stylistic assessment with scientifically verified technical data. The aim of this approach is to emphasise the technical details that may be associated with specialised workshops involved in the production of various artefact types, or with specific stages in their manufacture. The present research objective provides

¹ Throughout the present thesis, references to the tombs of Asyut primarily follow the traditional nomenclature established in earlier scholarship and, where applicable, the designations adopted by the German-Egyptian mission of the Asyut Project, in order to ensure consistency with previous literature and facilitate comparison with ongoing research.

a framework within which to address some of the questions that were previously posed. A comprehensive study of all aspects of Ancient Egyptian wooden funerary sculpture would have been far too broad and complex for a single group of scholars, and particularly for a doctoral research project. By focusing instead on a select number of sculptures, with provenance and historical period being consistent, a system was designed that allowed direct comparison between the various artefacts. This facilitated the identification of both similarities and differences in terms of materials used and execution techniques. The subsequent attempt was then made to interpret the reasons behind these observations by establishing meaningful connections. If applied to multiple groups of objects from different places and historical phases, this approach has the potential to facilitate a deeper comprehension of the overall technical history of wooden funerary sculpture. Furthermore, it could assist in addressing some of the existing gaps in the extant technical literature.

The multidisciplinary character of this research required constant interaction with scholars from different scientific and humanistic disciplines and continuous reflection on analytical and communicative strategies. This dialogue proved essential for the definition of a shared methodological framework suited to the investigation of wooden funerary sculpture from both a technical and historical perspective.

In light of the considerations outlined above, the assemblage unearthed in the Tomb of Minhotep is particularly well-suited to this type of investigation. It represents a reasonably substantial corpus, comprising twelve wooden sculptures, including: three offering bearer figures (no. inv. S.8794-6), four boat models (S.8790-3), one baking model (S.8789), two sculptures depicting Minhotep (S.8787-8), one sculpture of a male figure called Wepwawetemhat (S.8786), and one female figure (missing). The tomb was unearthed during the 1908 fieldwork season of the Italian Archaeological Mission, led by Ernesto Schiaparelli, who was concurrently serving as Director of the Museo Egizio. In addition to the sculptures, the tomb returned a variety of other artefacts, including coffins and human remains, pottery, walking sticks, bows, and numerous arrows (Kahl et al. 2019, 286-291). In accordance with the excavation agreements in place at the time, Schiaparelli was authorised to transfer part of the finds to the Museo Egizio (Moiso 2022, 74-76). This was the case for the funerary assemblage, which was thus transported to Turin.

Of the twelve wooden sculptures forming the assemblage, only a selected group was subjected to in-depth scientific investigation. Specifically, detailed archaeometric analyses were carried out on three offering bearer figures and four boat models, chosen on the basis of their state of preservation, representativeness and analytical feasibility. For the purposes of this study, and in order to ensure clarity and consistency throughout the text, these objects are hereafter identified as Offering Bearers A (no. inv. S.8795), B (S.8796) and C (S.8794), and Boat Models 0 (S. 8790), 1 (S. 8791), 2 (S. 8792) and 3 (S. 8793)². The remaining sculptures were examined through direct visual observation but were not included in the programme of instrumental investigations.

² In this essay, references to the right and left of objects will be made as follows. In the description of three-dimensional works, “right” and “left” refer to the sides of the object itself.

Measurements, where indicated, are to be read in the following order: height × width × depth.

The coherence of the objects, in terms of both geographical provenance, chronology, and also from the perspective of their conservation history³, makes them particularly well-suited to a study involving detailed comparative analysis. These artefacts most likely shared the same burial environment for over 3,500 years. They were subsequently transferred to Turin, where they were once again subjected to analogous environmental conditions and conservation histories, including conservation treatments which, although differing from one object to another, were consistent in terms of methodologies and materials utilised. Their biography suggests that there are no substantial variations in the ageing processes of the materials across the different sculptures. This is a significant factor when considering the execution of scientific analyses aimed at investigating manufacturing techniques and the materials employed.

However, it is also crucial to acknowledge the limitations of this research, which must be carefully considered to avoid errors in the final evaluation of its outcomes. The primary concern pertains to the statistical limitations intrinsic in the study. This study is of a modest scale, encompassing a total of twelve sculptures, of which only seven have been investigated in depth from a scientific perspective. Consequently, most of the broader postulates remain hypothetical, necessitating a more substantial corpus of research to reach more definitive conclusions. Statistical limitations must also be recognized as relevant when interpreting the results of the scientific analyses. While it is possible to acquire multiple data points in the case of non-invasive analyses, this is not the case for those requiring micro-sampling. In this study such samples were extremely limited, and their interpretation must therefore consider the very partial nature of the data. Despite meticulous collection of samples from meaningful and appropriately comparable areas across the sculptures, it cannot be overlooked that these are extremely small and localised samples, taken from specific areas of the objects. Additionally, the composition of the materials used, such as natural earth pigments, may vary significantly from one area to another.

A further limitation of this research lies in the extremely limited documentation available regarding the circumstances of the discovery and the condition of the artefacts at the time they were unearthed. The absence of both notes and photographs precludes the possibility of providing a clear description of the objects at the moment of their recovery. Consequently, it cannot be established with certainty that their current configuration corresponds to their appearance at the time of excavation. Moreover, the few notes written by Schiaparelli during the excavation of the tomb suggest that the archaeologist believed that the tomb context had been disturbed in antiquity. This information, together with the evidence that the tomb contained multiple burials, leads us to adopt further caution in our interpretations. Not only the setting where the objects were found might differ from their original one, but it is also highly probable that the assemblage does not constitute a single, unified funerary set intended for one individual. Rather, it consists of at multiple assemblages deposited within the same space.

³ The history of the artworks in terms of preservation, conservation treatments, and material modifications from the time of their creation to the present.

Another aspect emerging from this study concerns the reconstruction of past practices of restoration, reconstruction and display of archaeological objects, a field that remains only partially explored within Egyptological research. Systematic documentation of excavations and conservation interventions is a relatively recent practice: in archaeology it became widespread only from the 1960s (Lucas 2001, 6-9), while in Italy the formalisation of conservation documentation developed fully only after 1975, following earlier legislative provisions such as the “Legge Bottai” of 1939 (Fiore Marocchetti et al. 2008, 14). As already mentioned above, without detailed records of the original condition of the objects and of subsequent interventions, the reconstruction of their appearance at the time of unearthing is rather problematic. This issue is particularly critical for composite artefacts such as models, whose elements may have been displaced, replaced or reassembled over time. As will be discussed below, examples of both clear inconsistency and apparent coherence between components were encountered. The assessment is further complicated by the ancient practice of reusing spare wood for less prestigious elements. Distinguishing between ancient reuse and modern intervention therefore represents a major interpretative challenge, and highlights the importance of critically evaluating conservation histories to avoid distortions in the historical and Egyptological interpretation of the objects.

A secondary objective of this research concerns the possible reconstruction of the original configuration and display of the sculptures. Owing to the absence of detailed documentation at the time of excavation and to the numerous relocations, reassemblies and conservation interventions that have affected the objects over time, their present appearance cannot be assumed to correspond to their original state. For this reason, the study also addresses the identification of potential displaced or misassembled elements within the assemblage. Any reconstruction hypothesis is therefore formulated with particular caution and is based on the critical integration of archive photography documentation, typological conventions, and the material and technical evidence derived from direct observation and scientific analyses, with the aim of proposing a plausible interpretative framework rather than definitive restitutions.

Finally, it must recognise that this study is a focused investigation, exclusively concerned with the construction techniques of wooden sculpture. However, a funerary assemblage, as is the case in this instance, is intrinsically complex and composed of a wide variety of objects, some created for everyday life use and then left in the tomb, others specifically intended for funerary purposes. Future research on the subject would greatly benefit from a widening of the study to encompass the other objects of the same assemblage, and from joining forces with specialists from other disciplines, in order to produce a comprehensive evaluation of all materials and exploring the burial in its entirety.

The present study, although focused on a limited group of artefacts, seeks to contribute to the understanding of the technical history of ancient Egyptian wooden funerary sculpture through a multidisciplinary and methodologically integrated approach. By combining archaeometric data with historical and technical analysis, the research aims to provide a coherent interpretative framework while remaining open to future reassessments and to the integration of new evidence.

2. Artistic and Technological Trends in Wooden Funerary Sculpture between the Old and the Middle Kingdom

2.1. State of the art

2.1.1. Previous studies and approaches to the subject

Scholars have long examined Egyptian sculpture, tracing the development of styles, canons, and iconographic conventions, however they rarely address the implications of the various media involved, or deepen the topic of the artistic techniques. Therefore, although the study of wooden sculpture in ancient Egypt remains an open field this does not imply an absence of research addressing the subject. In particular, there exist studies that explore the nature of wooden sculpture from perspectives other than construction techniques. Moreover, recent research focuses on the artistic techniques themselves but concentrates specifically on particular object typologies, periods and/or production areas. Finally, there are investigations dealing with other research topics but adopting an approach analogous to the one proposed in this essay.

For what concern the several studies that addressed the topic of sculpture from a general point of view, when differences in materials are acknowledged, they are usually limited to brief descriptive remarks and, in most cases, the discussion remains overwhelmingly centred on stone sculpture. This focus is understandable, given the numerical prevalence and better preservation of stone artefacts, but it has contributed to a persistent imbalance in the literature. These studies, although frequently cited and providing a cursory description of the main technical and expressive differences inherent to various materials, have rarely been analysed the subject in depth.

Among the earliest and most frequently cited works stands Jacques Vandier's *Manuel d'archéologie égyptienne*, specifically the third volume: *Les grandes époques. La statuaire* (Vandier 1958). This comprehensive study reconstructs the evolution of Egyptian sculpture through its major historical phases, correlating stylistic and symbolic developments with broader political, religious, and cultural contexts. Manuals of a more synthetic or popular nature, such as Gay Robins' *Egyptian Statues*, similarly approach sculpture within a general survey of Egyptian art, again without deepen into the technical specificities of different materials (Robins 2001). Further studies concentrate on particular iconographies, such as royal or divine statuary, or focuses on specific periods or museum collections (e.g. Barbotin 2007, 2024; Hartwig 2014; Laboury 1998; Smith 1978; Wilkinson 2003). While these studies are valuable for their stylistic insights, they offer limited perspectives for investigations centred on materials and techniques. Yet these aspects are crucial, particularly for wooden sculpture. For example, the choice of timber *ex ante* determines not only the expression of specific formal possibilities but also provides indicators relevant to the social status of the owner, patterns of material availability, archaeological and environmental history, and trade networks.

A parallel line of research examines wooden objects through typological lenses. Extensive studies have been carried out on wooden coffins (Grajetzki 2022), furniture and boxes (Killen 1994; Leospo 2001), and funerary models (Merriman 2011; Reisner 1913; Tooley 1989, 1995), which allow for a more focused understanding of the stylistic and typological development of these artefacts. Even in these cases, however, attention to technical aspects remains limited, with a strong predominance of typological and stylistic focus. Scientific analyses are often absent, and artistic techniques tend to remain in the background. Noteworthy exceptions include studies on carpentry techniques, particularly the examination of joints used in wooden furniture and boxes (Gale et al. 2000, 358-366; Killen 1994, 14-16; Leospo 2001). While these analyses are of clear interest to conservators, they often rely on objects originating from broad and complex archaeological contexts, which can restrict their interpretive potential unless they are integrated into wider frameworks that allow for a precise contextualisation.

Within this broader category, several studies specifically concerned with wooden sculpture deserve attention. More systematic is Julia Harvey's doctoral thesis, which conducted a typological study aimed at establishing a system of chronological attribution of the wooden sculptures of the Old Kingdom (Harvey 2001). This system led to the creation of a chronological "feature list" which provides a useful visual reference of attributes and other stylistic elements to be considered for comparison between the sculptures. Although the study is primarily typological, her work remains a fundamental reference for future chronological classification. Furthermore, the inclusion of an exhaustive catalogue of the artefacts examined in the study in the final section of the thesis proved quite useful as a consistent point of reference. In this regard, catalogues have been invaluable for providing an overall overview of the number of extant objects, their provenance, their current geographical distribution, and, most importantly, for facilitating typological and stylistic comparison (Breasted 1948; Chassinat et al. 1911; Glanville et al. 1972; Merriman 2011; Saleh et al. 1987; Winlock 1955).

Similar in its approach, though dedicated to funerary models, is Tooley's research. Covering materials from the Old Kingdom through the reign of Senwosret II, it reconstructs production, function, and cultural significance, with particular emphasis on the Middle Kingdom (Tooley 1989, 1995, 2005). The study offers a detailed overview of the geographic and chronological distribution of models and analyses several recurring types: granaries, offering bearers, boats, and others. Once again, scientific analyses are absent, though observations on construction methods are more substantial than in many previous works. Moreover, due to its broad scope and meticulous research, this study has been fundamental not only for tracing the typological evolution of some of the artefacts under investigation, but also for providing materials useful for stylistic and iconographic comparison.

A decisive shift toward a more thoroughly technical and material approach is represented by Gersande Eschenbrenner-Diemer's research on wooden funerary models (Eschenbrenner-Diemer 2010, 2013, 2017, 2018, 2021). These investigations illustrate a more modern, methodologically integrated approach, one that underscores the benefits of combining typological analysis with technical and material study. In these studies, optical microscopy is employed for wood identification; FTIR and Raman spectroscopy are used

to analyse pigments and binders; and radiocarbon dating and dendrochronology are applied for chronological assessment. These methods shed light on manufacturing processes, material provenance, and restoration phases. Although in her most extensive study the use of analytical investigations has been inconsistent (Eschenbrenner-Diemer 2017), since, due to the very large number of objects examined, only a few underwent an extensive diagnostic campaign, the approach of this study aligns more closely with that adopted for the research carried out in the present project. Furthermore, this study allows for more precise observations on regional trends, an issue already raised but never fully resolved in earlier scholarship, in which it is very complex to navigate. It is precisely in this aspect that the significance of this research lies, as it addresses the topic in a systematic and organised manner.

The first scholar to address Egyptian materials and techniques in a systematic and explicitly technical manner was Alfred Lucas, whose pioneering volume *Ancient Egyptian Materials and Industries* (A. Lucas e Harris 1926) laid the foundations for the scientific study of ancient Egyptian technology. The most extensive manual devoted specifically to the study of techniques and materials is the volume edited by Paul T. Nicholson and Ian Shaw, *Ancient Egyptian Materials and Technology* (Nicholson et al. 2000). Considered by conservators as a reference study, it offers a detailed examination of the raw materials and technical practices employed in ancient Egypt across a wide range of fields. Its coverage spans stone, wood, metals, glass, pigments, and textiles, with contributions from specialists drawing upon both archaeological evidence and scientific analyses. The multidisciplinary framework, integrating archaeology, chemistry, and art history, has made the book a fundamental point of reference for understanding the production, use, and symbolic dimensions of Egyptian artefacts. Due to its breadth, the volume cannot be considered exhaustive, partly because the scale of its scope inevitably limits the depth with which individual materials or processes can be treated. Moreover, it is now nearly twenty-five years old, and many of the studies on which it relied, while pioneering at the time, reflect the analytical possibilities and methodological assumptions of their period. Several areas would benefit today from substantial expansion and revision in light of recent advances in archaeometric techniques and updated contextual interpretations. Notably, research on pigments, binders, and painting techniques is considerably more advanced than that on carving techniques.

This aspect reflects a broader trend that can generally be observed in the consultation of the technical literature. Regarding pigments, and painting techniques, research has become increasingly detailed and often multidisciplinary (e.g. Davies 2001; Pagès-Camagna and Colinart 2003). Nonetheless, even in this field, attention to material preferences across different supports is not always consistent. Trends that may distinguish, for example, the use of particular pigments on wood versus wall surfaces are not systematically explored, whereas distinctions based on economic geographic, or ritual considerations are more commonly attested. By contrast, as previously noted, studies specifically addressing carving techniques remain comparatively underdeveloped, leaving a significant gap in our understanding of the technical choices that shaped the production of wooden sculpture.

Finally, several recent research initiatives align closely with the methodological direction pursued in the present study, particularly in their integration of stylistic, technical, and scientific analyses. Chief among them is the *Medjehu Project, Wood in Ancient Egypt*⁴, an interdisciplinary programme coordinated by Eschenbrenner-Diemer (2023). Bringing together Egyptologists, archaeometrists, archaeobotanists, philologists, and conservators, the project investigates wood in Egyptian material culture from multiple perspectives: sources of supply, working techniques, everyday wooden objects, and funerary production. Of particular relevance here are the studies centred on construction techniques and the reconstruction of the production chain. Although most of the studies in this project focus on periods and regions rather distant from those examined here, their results are particularly valuable, as they are grounded in the same methodological premise as this research. Since there is a considerable scarcity of finds and information concerning the artistic techniques of the craftsman producing wooden artefacts, in this case, specifically funerary wooden sculptures, it may be useful to adopt an inverse approach, one that infers the *chaîne opératoire* from the finished object.

Another valuable comparative framework is provided by the *Vatican Coffin Project*⁵, a multidisciplinary investigation of the Egyptian wooden coffins in the Vatican Museums (Amenta 2014). The project aims to reconstruct manufacturing processes and identify both ancient and modern restoration interventions through the combined expertise of Egyptologists, conservators, archaeobotanists, and chemists. Special attention is given to wood identification, pigments, binders, and decorative techniques, underscoring the potential of integrated diagnostic approaches for understanding ancient craftsmanship.

2.1.2. Key critical aspects

The relative marginalisation of historiographical interest in the study of the artistic techniques of wooden sculpture could be a condition rooted in long-standing historiographical attitudes. A complex interplay of material, cultural, and historiographical factors contributed to its persistent classification of the wood as a medium of lesser prestige when compared with stone and metal. Central to this perception was the inherent fragility of wood: its susceptibility to thermohydrometric variations, fire, biological degradation, which may result in structural instability. These features reinforced the belief that wood lacked the durability and nobility traditionally associated with monumental sculpture. Belief that was further reinforced by western sixteenth-century treatise literature, which exalted classical models and artists working with more noble materials. In this context, the widespread use of wood in devotional contexts, frequently tied to local patronage, further aligned it with artisanal practices rather than with the elite artistic culture. These cultural and historiographical biases have had enduring effects, shaping not only the broader discipline of art history but also Egyptology, where the technical and craft-related aspects of wooden sculpture have long remained at the margins of research. Only in recent years has this medium begun to

⁴ <https://www.medjehuproject.com/projects>

⁵ <https://www.museivaticani.va/content/museivaticani/it/collezioni/musei/museo-gregoriano-egizio/museo-gregoriano-egizio/progetti-scientifici/vatican-coffin-project.html>

receive more sustained consideration, supported by the rise of interdisciplinary approaches and an increased sensitivity to a wider range of artistic and cultural expressions.

A further obstacle to a comprehensive understanding of these artefacts corpus lies in their interpretation. Many studies that address the subject of wooden models tend to prioritise the reconstruction of the activities depicted rather than the examination of the techniques employed in crafting the models themselves. This approach, although highly valuable for historical reconstruction, leaves significant gaps in our knowledge of wooden sculpture as a material and technological phenomenon (Widmaier 2017, 70-79). Among others, two studies in which this type of approach can be observed are the Herbert E. Winlock's study of the statuettes and funerary models from the tomb of Meketre (Winlock 1955), or the Ann Merriman's doctoral thesis on Egyptian watercraft models (Merriman 2011).

A different, and more recent, approach to the study of Egyptian statuary and funerary images has instead developed through relational and ontological perspectives. In particular, studies by Baines (1985, 2009, 263-280; 298-337) and, more recently, Nyord (2017, 2020), have emphasised that Egyptian images should not necessarily be understood as passive representations or purely symbolic substitutes, but as entities capable of materially participating in the activation, presence, and efficacy of the represented subject within ritual and funerary contexts. Such approaches have drawn renewed attention to the interconnection between materiality, embodiment, image-making practices, and ritual function. While the present research is not primarily concerned with the theoretical ontology of images, these perspectives nonetheless reinforce the importance of investigating the material and technical dimensions of wooden funerary sculpture, since manufacturing choices, material selection, and construction strategies formed an integral part of the object's broader cultural and funerary significance.

Within this framework, researching on the subject of the artistic techniques of the wooden sculptures inevitably involves encountering a wide constellation of recent studies devoted to individual pieces or small groups, developed through varied approaches and often supported by targeted scientific analyses (Abdrabou et al. 2018; De Marco 2021; Manfreda et al. 2021; Seyr and Medhat 2021). The broad geographical and chronological dispersion of the archaeological material, together with the vast number of publications scattered across various journals and monographs, makes it exceedingly difficult to construct a truly comprehensive overview, whether general or specific to a particular region or period. In the future, the field would clearly benefit from a large-scale, systematic review capable of integrating this fragmented body of evidence and offering a consolidated synthesis of current knowledge.

In addition to the historiographical and bibliographical challenges, the material itself presents several methodological difficulties. The study of servant statues and models requires a genuinely multi-layered approach. Each sculpture requires the integration of historical, religious, typological, stylistic and technical considerations. Moreover, it must be contextualised within a broader corpus of analogous artefacts, within the funerary assemblage of which it forms part, and within the specific tomb, region, and period to which it belongs. As well, it should be considered that the archaeological record is inherently selective. For instance, wood survives particularly well in the arid conditions of

Upper Egypt, whereas material from the Delta is significantly underrepresented. Furthermore, the predominance of certain typologies, such as boat models and female offering bearers is partly due to their production in multiples, but it also reflects preservation biases. Indeed, the large quantity of fragments complicates attempts to establish reliable distributions, as some categories, like offering bearers, boats, and granaries, are more readily identifiable and consist of fewer assembled components, making them more likely to survive intact and thus overrepresented in the corpus (Tooley 1989, 28-31).

It is evident that conducting a fully comprehensive study is not a readily viable option. Therefore, each study tends to focus on a specific aspect at the expense of others and of an overall perspective. One of the issues still widely debated concerns the identification of regional trends, subject that has been approached using different methods by the scholars. Typological approaches, such as that adopted by Tooley, may offer preliminary indications, but their results remain uncertain in the absence of sufficiently comprehensive datasets. The selective nature of the archaeological record and the incomplete publication history of many assemblages, including those excavated by Schiaparelli, further complicate such analyses. This is evident in the later reassessment by Eschenbrenner-Diemer (Eschenbrenner-Diemer 2021, 131), who, with a stylistic study, demonstrated that models previously attributed to Asyut should instead be assigned to Meir, underscoring the extent to which gaps in documentation can distort the perceived distribution of model types.

Together, these historiographical, methodological, and material difficulties reveal the gaps in our current understanding and point to the need for comprehensive studies that treats wooden sculptures not only as funerary materials, or representations of daily life but as crafted objects.

Finally, a brief clarification concerning terminology is necessary, since the designation of ancient Egyptian wooden funerary artefacts remains an open and actively debated issue within current scholarship, while terminological consistency is also essential for the clarity and readability of the present thesis. Indeed, the terminology traditionally employed for ancient Egyptian wooden funerary artefacts is far from neutral or universally agreed upon. Categories such as “model”, “miniature”, “figure”, “statuette”, or “sculpture” are often used inconsistently within Egyptological literature, despite carrying important formal, functional, and interpretative implications. The issue is particularly relevant for Middle Kingdom wooden funerary assemblages, which occupy an ambiguous position between representation, ritual substitution, and material agency.

A major contribution to this debate has been offered by Camilla Di Biase-Dyson, who explicitly questioned the appropriateness of the term “model” for Egyptian funerary wooden artefacts (Di Biase-Dyson 2023, 414–416). Drawing on approaches from material culture studies, semiotics, and cognitive theory, she observed that the modern concept of a “model” generally implies some precise assumptions, whereas Egyptian funerary examples frequently lack consistent scale, selectively simplify or alter forms, and primarily operate within funerary and symbolic frameworks. Building on broader theoretical distinctions between “models” and “miniatures”, she further argued that these artefacts cannot be understood merely as reduced reproductions of reality, but rather as

communicative and conceptual devices embedded within funerary thought and ritual practice. In particular, she emphasized that these objects are not only “of something” but also “for something”, thus highlighting their active conceptual and funerary role.

Other scholars have stressed the internal heterogeneity of the category itself. Zöller-Engelhardt, for example, defined funerary wooden models as a “diverse and complex category of grave goods” and emphasized the necessity of distinguishing between different object types and functions within the broader label of “funerary wooden models” (Zöller-Engelhardt 2023, 621–622). She also observed that such artefacts cannot simply be reduced to representations of “everyday life”, since many examples relate instead to ritual, provisioning, or symbolic activities. Her discussion further foregrounded the problematic overlap between categories such as anthropomorphic model figures, offering bearers, estate figurines, serving statues, and autonomous wooden statuettes, demonstrating how the boundaries between these designations remain fluid and partly dependent on modern scholarly conventions.

More recently, Eschenbrenner-Diemer has further expanded this discussion by reconsidering funerary wooden models not simply as representations of activities or objects, but as material devices actively involved in shaping funerary thought and afterlife conceptions (Eschenbrenner-Diemer 2024). Her contribution moves beyond rigid typological distinctions, emphasizing instead the cognitive, symbolic, and relational dimensions of these artefacts, as well as the interpretative implications embedded in the terminology itself. Within this perspective, categories such as “model”, “representation”, “substitute”, or “object” are no longer understood as self-evident definitions, but as modern analytical constructs whose meanings depend on broader theoretical and funerary frameworks.

In light of this broad and multifaceted scholarly debate, the terminology adopted in the present thesis should be understood as primarily pragmatic and operational. The term “funerary model” is used to designate composite three-dimensional funerary representations integrating multiple elements and/or figures within a coherent scenic or functional context. “Figure” refers more specifically to the anthropomorphic components. The term “statuette” is instead employed for autonomous three-dimensional sculptures of relatively modest dimensions, while “serving statues” is reserved for the specific category of autonomous offering-bearing figures discussed by Di Biase-Dyson and related scholarship. Finally, the term “sculpture” is used in a broader and more general sense to indicate three-dimensional carved works independently from their typological classification.

2.2. The wooden funerary sculptures between the Old and the Middle Kingdom

2.2.1. Historical overview

A considerable number of statues from ancient Egypt have survived to the present day, offering crucial insights into the civilization’s artistic and religious practices. Stone, wood,

and metal were the primary materials used for their production (Robins 2001, 9), although faience and ivory were also occasionally employed (Schulz 1999, 95). Scholars generally agree that these objects were not merely artistic creations, but they were infused with symbolic and magical-religious significance, that transcended their aesthetic appearance. Typically created for specific functions, they were often intended for temple or funerary contexts, reflecting the interlinked nature of art, ritual, and belief.

As it is the central focus of this dissertation, wooden funerary sculpture should be understood within this broader framework of function and symbolism. Both the sculptures themselves and the associated funerary practice evolved over time, shaped by the historical, theological and socio-economic circumstances of their production. Accordingly, situating the wooden sculptures under examination within their historical framework is essential to enable a comprehensive interpretation of the context in which they were produced, particularly at the late 11th-early 12th Dynasty.

Eschenbrenner-Diemer identifies four distinct chronological phases in the development of wooden models, which provide a useful framework for understanding their evolution: Phase I spans the 6th to 8th Dynasties; Phase II covers the 9th to 10th Dynasties, including the First Intermediate Period; Phase III encompasses the early 12 Dynasty, up to the reign of Senwosret I; and Phase IV corresponds to the second half of the 12 Dynasty (Eschenbrenner-Diemer 2017, 133-134).

Evidence of private patronage in funerary statuary emerges as early as the 3rd Dynasty, with statues found in the tombs of princes and high officials in the necropolis of Memphis. These private tombs were often located near royal funerary complexes, a proximity that likely served both functional and symbolic purposes. It has been suggested that individuals whose tombs were situated near those of the pharaoh could benefit from the services of priests overseeing the royal cult and share in the votive offerings made to the king (Schulz 1999, 80-81). From the end of the 5th Dynasty onwards, such private tombs increased significantly, reflecting the expansion of the Egyptian administrative apparatus. Officials began constructing their own tombs and funerary assemblages, particularly in Giza, where royal authorization was no longer strictly required (Freed 2006, 155).

During this period, the Pyramid Texts emerged as a prominent category of sacred writings, inscribed on the inner walls of royal pyramids from the end of the 5th Dynasty through the 6th Dynasty. These texts, primarily formulae intended to assist the pharaoh's ascension to the afterlife, likely originated from an earlier oral tradition (Bresciani 2007, 1-3). With the decline of the Memphite dynasty, the Pyramid Texts gradually disappeared, giving way to the Coffin Texts, which preserves elements of these earlier writings (Donadoni 1970, 178). The Coffin Texts, so named for their appearance on coffins from the First Intermediate Period through the Middle Kingdom, reflect the growing independence of the nobility from central authority and the resulting "democratisation" of the afterlife, which was no longer the exclusive prerogative of the pharaoh (Bresciani 2007, 59-60). However, this view is being outdated by recent research, that increasingly moved beyond the traditional 'democratization of the afterlife' model, arguing instead that the emergence of the Coffin Texts reflects shifting patterns of textual display and the growing ritual agency of provincial elites, rather than a sudden expansion of access to afterlife knowledge (Hays 2011, 115-130; M. Smith 2017, 166-270).

In any event, with the end of the Old Kingdom, the central authority disintegrated, marking the opening of a period of instability in Egypt known as the First Intermediate Period. This period was characterised by internal conflict, exemplified by the fight between two opposing factions, the resolution of which marked the beginning of the Middle Kingdom.

During this phase of political instability, the traditional role of the king as absolute theocrat underwent significant changes. The emergence of rival rulers and the increasing influence of powerful provincial families, called nomarchs as administrator of the nomes, shifted the nucleus of authority away from the central state. This decentralisation is also evident in funerary practices: the rise of the nomarchs coincided with the establishment of provincial necropolises within their districts, characterised by rich grave goods and elaborate decorative programmes. Among the most notable of these sites are Beni Hasan, Deir el-Bersha, Qau el-Kebir, Asyut, Meir, Deir Rifa, and Qubbet el-Hawa (Schulz 1999, 119). These developments provide essential context for understanding the wooden funerary sculptures of the early 12th Dynasty, highlighting how shifts in political power and social structures influenced both the production and the function of these objects.

2.2.2. Typologies of wooden funerary statuary

Funerary sculpture appears in burial assemblages from the Old Kingdom through the end of the Middle Kingdom and can be broadly divided into two principal categories: statues representing the deceased, either individually or in family groups, which may also be defined as *ka*-statues; and serving statues, which depict individuals engaged in specific activities connected to the provisioning of the deceased in the afterlife (Eschenbrenner-Diemer 2017, 134-135). The range of actions portrayed by serving statues is notably diverse and becomes increasingly varied and complex over time, a development that will be examined in the following sections. It is worth noting that the presence of models in funerary contexts is attested as far back as the Predynastic period and the early Old Kingdom, although they were infrequent and typically crafted from pottery rather than wood or stone (Breasted 1948, 2; Tooley 1995, 16-18). These earliest models predominantly depict individuals engaged in offerings, brewing, and vessels, providing the first glimpses of a funerary material culture concerned with the afterlife sustenance of the deceased (Tooley 1989, 1-5).

Old Kingdom sculpture primarily presents idealised images of the deceased, sometimes accompanied by family members. Group compositions representing husband and wife, occasionally with children, are quite common. However, this type of family representation was not rigid, as sculptural groups comprising two or three individuals in various combinations of gender and familial relationship are also attested (Schulz 1999, 96-100).

From the end of the 4th Dynasty onward, representations of attendants performing everyday tasks become increasingly common (Roth 2002, 103). These figures typically undertake activities related to food processing, although representations of manufacturing activities and domestic life are also attested. The most prevalent representations are those depicting female millers. A foundational and still influential study of these objects was carried out by Breasted Jr., who in 1948 catalogued them under the designation “servant

statues”⁶ emphasising their dual role as depictions of household workers and as magical representations intended to perform essential tasks for the deceased (Breasted 1948, 1-3). Alongside these figures, architectural models, and boats models begin to appear. While most tomb assemblages include only two or three figures, notable exceptions exist, such as the exceptionally rich corpus from the tomb of Nikauinpu at Giza, which contained twenty-six statues.

Generally, these figures were made of limestone, or less frequently of wood, except for the boat models for the creation of which the use of wood was preferred. In both cases, limestone and wood were painted and sometimes inscribed. A further exception is represented by the granary models, which were generally made either of pottery or wood. During the reign of Pepi II, the growing demand for such objects led to a progressive reduction in size and, significantly, a shift from stone to wood, including a transitional phase of composite stone-wood models (Tooley 1989, 6). This shift not only reflects economic considerations but also facilitated greater compositional freedom and flexibility that will evolve in depicting multi-figure scenes, an advantage particularly relevant for more dynamic and complex representations.

With the end of the 6th Dynasty, serving figures began to spread beyond the confines of the Memphite territories, becoming common throughout Egypt. Their relationship to painted wall scenes is significant, supporting the hypothesis that both served the same funerary function. Indeed, in earlier phases, these sculptures appear primarily in tombs already decorated with comparable representations, and only later do they occur in undecorated tombs (Barker 2022, 178; Tooley 1995, 12). Boat models emerged as one of the most widespread categories, often occurring in pairs or multiples. Offering bearers also became increasingly common, particularly at Saqqara, produced either as single figures or in processional groups mounted on shared bases, and usually occurring in pairs within the tombs. Meanwhile, scenes of food preparation remained a persistent type across regions and periods. A key innovation of this phase is the emergence of paired or combined scenes, such as milling with brewing, or milling with baking. Wood became the preferred material for these more complex compositions due to the greater compositional flexibility it offered, and the material’s workability allowed local workshops to experiment with different forms and arrangements, a factor which contributed to the geographic spread of these models.

During the First Intermediate Period, the use of wood became ubiquitous, and models increased in both number and typologies. Large composite scenes featuring multiple figures engaged in coordinated activities became standard. The most common types include boat models, offering bearers, with a marked increase in the number of male porters, and integrated scenes of milling, brewing, baking, and occasionally butchering. Thematically, emphasis on staple-food production becomes particularly marked, and hybrid models combining several phases of food preparation appear with increasing frequency. This period also demonstrates a notable expansion of the repertoire of depicted activities, including more specialised tasks and more complex narrative combinations,

⁶ A term used here exclusively when referring to his writings, as it was preferred to adopt Roth's definition of “serving statues”. q.v. chapter 1.2.5

reflecting both social and economic developments at the provincial level (Barker 2022, 178-186; Tooley 1989, 6-62).

Furthermore, granary models, which had fallen into disuse during the 5th Dynasty, experienced a revival in popularity, manifesting in a new form known as square granaries. This renewed emphasis on the image of the granary may be linked to the historical context of political instability and the weakening of central authority (Barker 2023, 23; Tooley 1989, 29).

With the reunification of Egypt and the establishment of the Middle Kingdom, models reached their greatest distribution, complexity, and social significance, becoming a distinctive feature of provincial elite funerary assemblages. In this period models serve to reflect both the individual wealth of their owners, and the collective prosperity of the nome.

A typical Middle Kingdom assemblage might include a pair of offering bearers, a granary, two boat models, and one or more combined scenes of staple-food production (Tooley 1989, 30). Agricultural scenes and oxen models also become more frequent. Tombs often contain unique models, such as specialised scenes or architectural structures not attested elsewhere, reflecting a clear preference for variety and individuality. The artistic and technical apex of the tradition could be exemplified by the models from the tomb of Meketre, distinguished not only by their exceptional craftsmanship but also by the presence of several rare or unique scenes (Winlock 1955). These assemblages provide insights into the social standing, wealth, and cultural priorities of their owners, as well as the technical skill and innovation of the workshops producing them.

The reign of Senwosret II marks the beginning of a decline in the provincial elites, accompanied by a concomitant decline in the use of models. The materials used for their production began to diversify, with stone and faience emerging alongside wood. As the prevalence of the model genre diminished, ushabti figures began to assume prominence within funerary assemblages, thereby assuming some of the functions previously fulfilled by models. Nonetheless, in certain rare tombs, the use of specific types of models persisted until the Late Period (Tooley 1989, 63-68).

2.2.3. Changes in the tomb typologies and spatial positioning of wooden sculptures within the burial environment

The spatial arrangement of sculptures within tombs played a central role in their symbolic and functional significance. In most instances, sculptures were not intended for public viewing, being accessible only to those officiating the funerary cult, or totally hidden. This arrangement underscores their strictly ritual function.

During the Old Kingdom, significant changes occurred in the placement of sculptures within mastabas. From the 3rd Dynasty onwards, tombs often included a chamber adjacent to the funerary chapel, specifically designed to house the statue of the deceased and the serving statues. This chamber, known as the *serdab*, was positioned behind a false door through which the deceased symbolically received offerings. Multiple *serdabs* could be present within a single tomb. The funerary chapel itself continued to serve as the space

for ritual practices and offerings. Notable exceptions exist, such as the tomb of Prince Kawab, dating to the reign of Khufu, where statues were displayed directly within the chapel, accessible rather than hidden. By the reign of Menkaure, the use of the *serdab* had become widespread, reaching a peak at the end of the 5th Dynasty, when statues of the deceased were also placed within subterranean burial chambers. The *serdab* is exclusively attested in mastabas and does not appear in rock-cut tombs, which were initially prevalent in Upper Egypt but became widespread throughout the country by the end of the Old Kingdom (Bárta 1998, 70-71; Schulz 1999, 95-96).

During the First Intermediate Period, rock-cut tombs became increasingly common. Excavated directly into the bedrock, these tombs could be monumental in scale and typically featured one or two superstructure rooms above the shafts leading to the burial chamber (Donadoni Roveri 1990, 47; Schulz 1999, 119-122). The development of rock-cut tombs was accompanied by changes in funerary assemblages. Rectangular wooden coffins were the most common type, often painted with *udjat* eyes on the left side to allow the deceased, positioned with the head facing north and turned left, to symbolically observe the rising sun and the east, emblematic of rebirth. By the end of the First Intermediate Period, anthropoid coffins came into use, primarily as inner coffins or mummy-boards within outer rectangular coffins. When multiple coffins were employed, the inner anthropoid coffin was oriented on its left side, mirroring the orientation of the mummy it contained (Grajetzki 2022, 46).

Tombs included a wide range of objects to ensure the deceased's sustenance in the afterlife. Everyday items such as clothing, cosmetics, jewellery, weapons, furniture, games, and tools were included, though scholars continue to debate whether they had been used during the deceased's lifetime or produced specifically for burial, with wear patterns examined to determine prior use (Ikram 2014, 179). Consumables such as food, drink, and floral offerings were also present, along with amulets, many placed within the mummy's wrappings (Donadoni Roveri 1990, 49-50). Certain items were explicitly created for funerary purposes, fulfilling magical or ritual functions. Among these were statues of the deceased, acting as surrogates for the physical body, which could embody the deceased's *ka* through the ritual of "opening of the eyes and mouth." Similarly, serving statues were intended to perform essential tasks for the deceased, ensuring the continuity of offerings and rituals in the absence of living attendants.

At the beginning of the Middle Kingdom, wooden models emerged. Analogous to wall paintings and coffin decorations, these models likely aimed to perpetuate the deceased's wealth and social status, thereby ensuring their well-being in the afterlife (Barker 2022, 1; 2023, 10; Grajetzki 2022, 33; Tooley 1989, XVI). Their placement within tombs also evolved: no longer confined to the *serdab*, models were increasingly situated within the burial substructure, either directly in the burial chamber. In some cases, they were found also in side niches, particularly in Middle and Upper Egypt where tombs tended to be smaller and more modestly decorated (Barker 2023, 15-16; Tooley 1989, 16). Within rock-cut tombs, models were placed as close as possible to the deceased, commonly on the coffin lid and on the eastern floor, adjacent to the side of the coffin where the *udjat* eyes were painted, and near the false door. Such placements were likely deliberate, intended to guarantee that the deceased could "access" the sustenance provided by the models. While this

arrangement appears to have been preferred, numerous exceptions are documented, reflecting adjustments for practical or ritual reasons. Alternative placements were sometimes dictated by religious considerations, such as positioning food and libation offerings near the *udjat* eyes. Practical constraints also played a role: the burial chamber could be too low to allow placement on the coffin lid, or tall elements of the assemblage, such as offering bearers, may have required placement on the floor. In such cases, practical necessity took precedence over symbolic or ritual concerns (Tooley 1989, 76-80).

The evolution of tomb architecture directly influenced the positioning of funerary objects, fostering a closer relationship between the deceased and the items intended to serve them in the afterlife. Scholars have identified two complementary explanations for the shift in placement. The first concerns religious factors: at the end of the 5th Dynasty, the growing association of the deceased with Osiris, initially documented in Pyramid Texts and later in Coffin Texts. As a chthonic deity, the result was an increase of the symbolic importance of the subterranean areas of tombs, particularly the burial chamber. This religious emphasis likely prompted the relocation of statues of the tomb owner, serving statues, and wooden models from the superstructure to the substructure (Grajetzki 2022, 30; Hays 2011, 120-123; Roth 2002, 118; Smith 2017, 190-191).

The second explanation pertains to socio-historical factors. The instability of the First Intermediate Period, including wars, economic changes, climatic fluctuations, and the weakening of royal authority, accompanied by the rising power of local governors. Such instability generated social insecurity and diminished confidence in the living to perform funerary rituals and offerings effectively. Consequently, the enhanced proximity of serving statues and the statue of the deceased to the burial chamber may have served to guarantee access to sustenance, compensating for any shortcomings in human provision. Moreover, depending on circumstances, these objects were positioned either within the burial chamber, ensuring direct access for the deceased, or in adjacent niches, reflecting concerns about tomb security. Indeed, during the same period, heightened attention to safeguarding tombs from theft meant that objects placed outside the chapel but within or near the burial chamber were better protected. These variations underscore the considerable symbolic and practical importance attributed to wooden sculptures, serving statues, and models within the funerary context (Barker 2023, 21-23; Breasted 1948, 3).

2.2.4. Centres of production

Architectural developments from the late Old Kingdom to the early Middle Kingdom were mirrored by significant shifts in artistic production. The study of wooden funerary models reveals a landscape that evolved from strong centralisation to a markedly regionalised and polycentric system.

During the earliest phase, craftsmanship was predominantly concentrated in the Memphite region. Techniques and stylistic canons closely reflected those employed in contemporary private statuary, and the striking consistency observed in early models, both in techniques and iconography, suggests that Memphis operated as the principal hub. Objects produced there, executed by highly skilled craftsmen possibly linked to an “official school”, appear to have circulated not only within the capital but also to

provincial elites, likely facilitated by their political and administrative bonds to the royal court. Although peripheral workshops existed, particularly at southern sites such as Elephantine and Qubbet el-Hawa, their production, that later scholarship termed “provincial” art, remained modest in scale and distinctly local in character, often replicating Memphite prototypes with simplified workmanship (Eschenbrenner-Diemer 2017, 139-148; 2021, 123-125).

As central authority weakened with the end of Old Kingdom, the rigid Memphite canon gradually became less prescriptive. The growing power of the nomarchs encouraged the flourishing of provincial artistic traditions, which reinterpreted established norms and experimented with new forms. This development was also accompanied by a broader adoption of wood, a material probably more commonly used in provincial regions than at court, as local artisans were therefore likely more familiar with its properties. Moreover, wood afforded greater compositional freedom than stone, enabling the assembly of multiple components and allowing more dynamic forms, features particularly evident in artefacts of this period (Donadoni 1989, 136-137).

These tendencies became even more pronounced during the First Intermediate Period. Political fragmentation fostered the rise of alternative artistic centres, especially in Upper Egypt. Sites such as Naga ed-Deir, Gebelein, and the increasingly prominent Theban region cultivated identifiable workshop traditions. Although Memphite production persisted and its models continued to circulate, it no longer dominated the market. Instead, regional ateliers asserted themselves, blending inherited Memphite conventions with locally favoured forms. Their organisation varied significantly: some operated as stable and cohesive groups of craftsmen sharing consistent models, while others were more episodic, leaving behind only a small number of recognisable pieces⁷. Despite this diversification, exchange between regions did not stop. Closely related models appear across distant cemeteries, implying continued movement of craftsmen, prototypes, or finished goods. Nevertheless, the broader trajectory was one of increasing decentralisation and stylistic variability (Eschenbrenner-Diemer 2017, 139-148; 2021, 123-125).

With the political reunification of Egypt under the 11th and early 12th Dynasties, these regional traditions did not disappear, but instead they reached full maturity. Thebes, empowered by its consolidated political authority, emerged as a major artistic centre and played a leading role in revitalising wooden model production. It revived canons inherited from the Old Kingdom, emphasising proportion and formal clarity, without fully recall the refinement of Memphite art. Moreover, influences from the Theban local style were maintained, preserving the expressive qualities characteristic of First Intermediate Period sculpture. The resulting aesthetic is significantly more realistic and dynamic than that of earlier times (Saleh et al. 1987, 21-22). At the same time, Middle Egyptian sites such as Meir, Asyut, and Deir el-Bersha developed highly distinctive workshop signatures. Their models display consistent approaches to carving, assembly, pigment application, wood selection, and the treatment of human and animal figures, features that allow individual “work-crews” to be identified. The technical refinement achieved in some provincial productions, particularly at Meir and Asyut, challenges

⁷ See section 2.3.1.

earlier assumptions that artistic excellence was concentrated primarily at Memphis. Although Memphite workshops continued to operate, sometimes directly, sometimes through artisans trained in their traditions, the balance had by then shifted: regional centres had become firmly established hubs of expertise with their own repertoires, capable of influencing one another and, at times, integrating Memphite traits into their local idioms. These provincial ateliers reshaped the Memphite models, adapting techniques and iconographies to local materials, preferences, and ritual priorities. Taken as a whole, this trajectory reveals a transformation from a system dominated by a central workshop tradition to a plural and interconnected network of regional centres. The circulation of objects and craftsmen created a complex web of artistic relationships in which centre and periphery were defined not only by hierarchy but also by mutual exchange (Eschenbrenner-Diemer 2017, 139-148; 2021, 123-125).

The complexity of this artistic landscape has long been recognised in scholarship. One of the earlier attempts to classify regional styles is found in Vandier's analysis of thirty-six sculptures, both royal and private, from the reign of Senwosret I (12th Dynasty), in which he identified four artistic "schools": the Delta, Memphite, Fayum, and Southern schools (Vandier 1958, 170-171). The subsequent Lorand's reassessment of Vandier's work proposed a broader interpretation of the stylistic criteria. His critique focuses on two elements absent from Vandier's analysis: the mobility of craftsmen within the country, and the longevity of Senwosret I's reign, which spanned roughly three generations of artists who may have developed stylistic differences chronologically rather than geographically. While not denying the existence of distinct simultaneous workshop traditions, Lorand emphasises the need to consider the multiple factors shaping artistic production over the king's forty-five-year rule, countering the idea that the observed diversity depended solely on geography (Lorand 2012, 49-52).

Building on these historiographical considerations, more recent typological and stylistic studies have proposed clearer frameworks for understanding the development of wooden model production. Eschenbrenner-Diemer identifies four main phases, how to contextualize the rise and fall of the different production centres. Phase I (late 6th–8th Dynasty) marks the origins of the tradition, centred in the Memphite region and characterised by small, stylistically uniform models distributed to provincial tombs. Phase II (First Intermediate Period) corresponds to a period of broad diversification: while Memphis remained active, new Upper Egyptian centres, such as Naga ed-Deir, Gebelein, Antinoopolis, and early Thebes, developed their own practices and gradually departed from Memphite prototypes. Phase III (early 12th Dynasty) represents the mature stage, with provincial sites such as Meir, Asyut, and Deir el-Bersha producing technically refined artefacts, often employing imported woods and elaborating more complex subjects. Phase IV (late 12th Dynasty) marks the decline and eventual cessation of the tradition. Production became increasingly standardised and geographically restricted, and by the reign of Sesostri III wooden models disappeared from elite burials (Eschenbrenner-Diemer 2017, 133-134).

2.2.5. The debate on the identity of the represented subjects

Serving statues and models were intended to sustain the deceased in the afterlife and are mainly perceived as representations of anonymous individuals performing practical tasks, but the issue could be more complex than expected.

As previously observed, the placement of these sculptures within tombs evolved over time. Initially located in the *serdab*, they were gradually moved closer to the burial chamber. The *serdab*, like the burial chamber, was a small, often inaccessible room containing a simulacrum of the owner's body and offerings and may therefore be interpreted as an auxiliary burial space (Roth 2002, 107).

Most serving statues lack inscriptions, their purpose being clear from context and association with the deceased. Where inscriptions do occur, they generally record the figure's functional role, such as "the miller", rather than individual identity (Breasted 1948, 4; Fiore Marocchetti et al. 2008, 16-17; Schulz 1999, 130-131). However, this was not invariably the case: some Old Kingdom sculptures bear inscriptions identifying specific individuals, including tomb owners, their heirs, *ka*-priests, or estate officials (*djet*), suggesting that they sometimes could depict real participants in funerary rituals (Tooley 1995, 19-22). A few Middle Kingdom examples, such as the two female offering-bearer figures from the Tomb of the Two Brothers at Rifeh, bear names and indicate lineage and familial roles, suggesting they represented particularly valued servants (Tooley 1989, 84-85). In such cases, the statues could serve as eternal substitutes for these individuals, ensuring the continuation of their duties in the afterlife. Overall, however, the majority of Middle Kingdom sculptures are impersonal, emphasizing the collective role rather than individuality.

One hypothesis proposed to explain the origin of serving statues, suggest that they could be an evolution of archaic practices dating back to the early dynasties, of burying servants within royal tombs, in order to serve their masters for eternity. According to this view, the statues would have served to replace these individuals (Roth 2002, 117; Spencer 1984, 68; Tooley 1995, 19-22).

Alternative hypotheses propose that these sculptures simultaneously represented servants and family members, or even the deceased themselves, providing a conceptual bridge to the development of shabtis (Schneider 1977, 22-24). Another possibility considered is that the form of the shabti derives from the mummiform representations of the deceased found on certain types of boat model (Tooley 1989, 84-85).

Roth notes that changes in placement and materials over time reflect an evolution in function: initially, statues provided for the deceased's needs and represented specific individuals, but over time, their role shifted towards generic servile functions (Roth 2002, 116).

The presence of models has been identified in burials attributed to individuals belonging to the highest offices of the state. It is significant that these are particularly associated with the king and his family, or with courtiers and local administrators such as nomarchs. In contrast, they are rarely found in the burials of individuals who held purely religious positions, especially when compared with those who occupied administrative roles (Tooley 1995, 19). This tradition, therefore, would have originated from a system of mutual

benefit, in which the specific servant representation ensures sustenance for the deceased, and at the same time could benefit from the offerings intended for his master. Inscriptions emphasizing personal identity were gradually replaced by functional designations, prompting Roth to advocate the term "serving statues" as a neutral descriptor (Roth 2002, 118).

Unlike portraits, which depict the deceased in relatively static poses and emphasise individual identity, serving statues focus on action and role. These figures are often captured in *medias res*, with movement frozen at a moment of activity. Their function typically requires a series of accessories, intended as objects essential for performing the depicted task, rather than merely symbolic attributes. In complex scenes involving multiple figures, these accessories and the surrounding context enable interaction and a clear understanding of the represented actions. Serving statues often lack distinctive facial or personal features, particularly in larger ensembles. This generic character increases as the scene's complexity grows and aligns with the iconographic conventions of wall decorations, underscoring the shift from individual representation to functional and symbolic performance within funerary contexts (Tooley 1989, 84-85).

2.2.6. Selection of supports: artistic, technical and economic considerations

Understanding the criteria underlying material selection in funerary sculpture is essential for a comprehensive study of these artefacts. Most wooden models were placed in hidden or inaccessible locations within tombs, indicating that they were not intended for direct visual appreciation but served a functional and symbolic role related to the afterlife. These sculptures acted as durable representations designed to ensure the deceased's continued social status and the perpetuation of offerings, making the selection of materials, colours, and stylistic registers deliberate rather than purely aesthetic. A substantial corpus of technical literature has already been written on the symbolism of colours, and although this topic will not be explored in depth here, despite its fundamental importance it will be revisited where necessary during the analysis of the artefacts under examination.

The choice of material has been approached from both symbolic and technical perspectives. Harvey suggests that wood may carry symbolic meaning, distinguishing it from stone, which, due to its durability, was more suitable for *ka*-statues intended to receive offerings (Harvey 2001, 9-11; Wood 1977, 14-17). Building upon this reasoning, Harvey observes that sculptures might serve as a physical substitute for the body in both its active and passive aspects. Wooden sculptures often depict figures in dynamic, striding poses, while stone statues more commonly portray the deceased standing or seated, reflecting a more passive, stable state. Wood, being organic and derived from living matter, was particularly suited to represent vitality and motion, symbolising life in the afterlife. Consequently, despite some scholar hypnotised wooden statues not being intended to house the *ka*, they frequently bear inscriptions naming the individual, indicating a symbolic connection to the deceased. The rarity of seated wooden statues in the Old Kingdom further underscores this functional distinction, as seated poses typically signify a passive state of attained prestige perpetuated in stone sculptures. Therefore, the association between passive/seated/stone and active/striding/wooden sculptures within

the tomb would serve to represent different states of human existence in the afterlife (Harvey 2001, 11; Wildung 1990, 57-80).

Technical considerations also influenced material selection. Wood provides greater compositional freedom than stone, enabling the creation of figures in dynamic poses and the use of negative space, whereas stone imposes constraints due to weight and the need to preserve load-bearing integrity. Donadoni highlights that, under Egypt's climatic conditions, wood exhibits sufficient durability for funerary use, especially when compared to softer stones, while terracotta is less suitable due to fragility. Despite these technical constraints, the iconography of the sculptures remained consistent across different media, with formal adjustments made to accommodate the specific properties of each material (Donadoni 1989, 98).

Concrete examples illustrate these principles. The limestone statue of Sepa from the 3rd Dynasty (inv. no. N 37-38, Louvre) and the wooden statue of Minhotep from the later 11th-early 12th Dynasty (inv. no. S.8787-8788, Museo Egizio) share the same iconographic program: a standing figure with the left leg advanced, the left arm extended holding a staff, and the right hand grasping a sceptre. In the limestone statue, movements are restrained and flattened to maintain the block's structural stability, with the left arm folded across the chest and the legs taking a cautious step, with no material removed between the legs. The wooden statue, by contrast, offer artists greater freedom of expression in three dimensions, by using negative space. It allows for an elongated step, an extended arm, and a perpendicular placement of the sceptre, demonstrating the expressive potential afforded by the material (Donadoni 1989, 98-102). These examples reveal how material selection directly impacts the execution of the same model, balancing iconographic consistency with technical possibilities.

Economic and pragmatic factors also played a role. This issues not only affected the number and the quality of sculptures, but probably also the choice of the materials. Tooley notes that, in addition to wood, models from the Old and Middle Kingdoms were occasionally produced in stone, faience, clay, and terracotta, choices often reflecting material availability and cost. For instance, pottery models appear in sites lacking wooden examples, suggesting that economic convenience influenced material selection without necessarily affecting iconographic norms (Tooley 1989, 5).

In conclusion, the preference of the wood as support for funerary sculptures was shaped by a combination of symbolic, technical, and economic factors. Wood was particularly suited for dynamic representations, stone for passive, enduring forms, and alternative materials such as clay or faience were employed when pragmatics dictated. These choices reflect the sculptors' engagement with ritual function, technical possibility, and resource availability, ensuring that the models fulfilled their role in the tomb while adhering to established artistic and symbolic conventions.

2.3. An examination of the relationship between artisans, patrons, and the problem of the workshop's definition

Within the corpus of wooden funerary models of the First Intermediate Period and early Middle Kingdom, the relationship between patrons and handicrafts worker can be reconstructed indirectly through the formal and technical choices embedded in the objects themselves. Di Biase-Dyson conceptualises the artisan as the primary “sender” in a communicative process, whose activity was motivated by the funerary function of the models, conceived fundamentally as provisions for the deceased and as distillations of what was perceived as essential in the represented activities and architectural settings. This essentialism is not the result of mechanical execution but derives from a sequence of deliberate aesthetic and technical decisions, including thematic and structural simplification, the selective isolation of functional elements, and the reduction of complex processes to visually salient stages. At the same time, the craftsman's field of action was shaped by concrete constraints of material, scale, space, time, and budget, as well as by the preferences of the future owner, whose expectations contributed to defining what could be built and how it could be represented. In this framework, the patron operates as a secondary agent in the communicative chain: although not directly involved in the act of making, the tomb owner reactivates the object as a vehicle of symbolic communication addressed to both human and supernatural receivers. Technical decisions traditionally interpreted as purely conventional, such as the carving of human figures from a single block of wood with separately attached arms, must instead be understood as pragmatic solutions balancing efficiency of production with semiotic clarity and functional intelligibility. The relationship between commissioner and artisan therefore emerges not as a simple hierarchical transmission of iconographic programmes, but as a mediated interaction in which funerary expectations, cultural codes, and artisanal expertise converge to produce objects that are simultaneously technically economical, ritually effective, and cognitively legible (Di Biase-Dyson 2023, 415-418, 423-424).

2.3.1. Workshop's definition and its organisation

Understanding how workshops operated is essential for contextualising the production of wooden sculptures during the Middle Kingdom. This raises several fundamental questions: how was sculptural labour organised? Were artisans specialised in a single medium, or did they work across different materials? And how were the various phases of production coordinated, particularly those involving painters and other specialised craftsmen? Since no physical workshop site has survived, addressing these issues remains extremely challenging (Eschenbrenner-Diemer 2017, 133).

In her study of Middle Kingdom stelae, Freed reflects on the difficulty of defining a workshop and on the feasibility of identifying distinct production groups. She characterises a “stela workshop” as a set of “three or more stelae sharing distinctive aspects of composition or style which collectively set them apart from others” (Freed 1996, 298). Building on this, Connor examines stone sculpture from the Late Middle Kingdom and the Second Intermediate Period and distinguishes between court workshops,

responsible for royal commissions, and local workshops producing objects for the middle and lower-ranking elite. The latter are generally identifiable by the quality of their workmanship. Yet the reality was almost certainly more complex. Stylistic analyses are only partially reliable, as stylistic canons could be replicated by multiple sculptors, and court artists may not have remained stationary in the capital but may have travelled according to need. Connor ultimately proposes a functional definition of a workshop as a “group of craftsman/artists producing work in a common and coherent style” (Connor 2018, 28).

For the purposes of this thesis, a more nuanced definition is required, one closer to that proposed by Eschenbrenner-Diemer and originally formulated by Quirke. In her study of Middle Kingdom wooden models, she highlights the intrinsic difficulty of defining workshops: the impossibility of identifying precise production sites, the uncertain permanence of a given “work crew” in a specific region, the persistence of distinctive stylistic and technical features, and the variety of materials used. Accordingly, the term “workshop” should be reserved for contexts in which evidence attests to the existence of a stationary production centre, even if its exact location remains unknown. In cases where homogeneous funerary assemblages originate from multiple tombs, the term “work crew production” is more appropriate, whereas isolated outputs are best described as “production episodes” (Eschenbrenner-Diemer 2021, 120; Quirke, Stephen 2009, 119-121).

The issue of workshop location is closely linked to the problem of definition. For stone sculpture, Connor suggests that certain workshops may have developed near construction sites or quarry areas (Connor 2018, 21-24). For wooden objects the situation probably was more complex, particularly regarding the purchasing of raw materials. The study of the Meir models by Eschenbrenner-Diemer is remarkably illuminating in this respect. In several artefacts she identified cedar-wood planks that had been reused, as indicated by the presence of non-functional dowels. This observation led to the hypothesis that model workshops may have operated in association with coffin workshops, which supplied unusable planks discarded during coffin manufacture, “indicating that in some localities, wooden model production stands alongside bigger objects, for example, boxes, coffins or statues, the study of which complements that of wooden models” (Eschenbrenner-Diemer 2021, 137). It is also plausible that multiple workshops collaborated or that larger production systems brought together craftsmen with different specialisations, as often occurred in major building projects. In the case of wooden sculpture, carpenters and woodcarvers required the support of painters responsible for the surface decoration and of metalworkers who produced and maintained essential tools (Arbuckle MacLeod 2018, 124-125).

Beyond geographical considerations, a series of iconographic sources offer valuable insights into the appearance and organisation of woodworking workshops. In the mastaba of Ti at Saqqara (5th Dynasty), an extensive wall relief depicts carpenters engaged in different phases of production, seated or squatting on the ground or on mats as they saw, smooth, and assemble wooden components. A similar organisation is evident in the mastaba of Mereruka (6th Dynasty), where groups of artisans are arranged in parallel rows as they saw planks or shape parts of furniture. Even more detailed evidence comes from the Middle Kingdom wooden models from the tomb of Meketre (late 11th dynasty,

early 12th Dynasty), including a model representing a carpentry workshop. The artisans sit on low stools or directly on the ground, as in Old Kingdom reliefs, but the three-dimensional format provides precise information about the arrangement of tools. Nearby are piles of beams and planks, sometimes already roughly shaped, stacked on raised supports to protect the material (Winlock 1955, 33–38). A recurring theme in these representations is the sequential depiction of the working process. In the mastaba of Ti, for instance, one carpenter saws a beam, another refines it, a third smooths it, and a fourth assembles the components using joinery. In the Meketre workshop, workers cut planks, drill with bow-drills, or sharpen tools at a small furnace. These sequences suggest not only a functional division of labour, but also a hierarchy of skill: some craftsmen perform simpler or repetitive tasks, while others, likely the more experienced, are responsible for delicate operations such as final assembly or carving. The repeated depiction of stacks of raw or semi-worked wood, both in Saqqara reliefs and in the Meketre models, indicates the presence of dedicated storage areas within the workshop. Given the value of wood, planks were stored on elevated supports to reduce humidity. These iconographic details reflect a working environment organised to maximise efficiency and preserve precious raw materials. Notably, the workshop is never represented as a fully enclosed space but rather as a semi-open working area, likely a courtyard or shaded outdoor zone, whose flexible layout could be adapted to different stages of production (Winlock 1955, 33). Taken together, the evidence from the tombs of Ti and Mereruka and the models from Meketre presents a coherent image of a structured and collaborative workshop, in which spaces, tasks, and tools were arranged according to stable functional principles. Despite the chronological distance between the Old and Middle Kingdoms, these sources reveal remarkable continuity in technical practices and workshop organisation, underscoring the durability of Egyptian woodworking traditions.

2.3.2. Serial production practices

The potential for serial production of wooden statuettes has increasingly attracted scholarly attention, particularly in response to the growing funerary demand during the late Old Kingdom and Middle Kingdom. Before analysing this phenomenon, it is important to clarify how “serial production” is operationally defined in the literature. Two main definitions generally emerge: one emphasising standardisation, identified as the replication of widely used models, and the other referring to true production “to stock”. Although closely interrelated, these definitions highlight different aspects of production processes. For the purposes of the present study, which focuses on artistic techniques, the discussion will concentrate primarily on production “to stock.”

This phenomenon is closely linked to several interconnected factors. The increasing request for funerary sculptures, the recurring use of certain models, such as offering-bearers or boat model, and the progressive standardisation of funerary rituals enabled specialised workshops to anticipate clients’ needs and produce certain items in advance, thereby maximising efficiency. Regional stylistic clusters, such as those identified in Middle Egypt (e.g., Asyut, Meir, Bersha), further support the existence of workshop traditions in which specific iconographic programmes and proportion systems were

consistently reproduced across multiple commissions (Eschenbrenner-Diemer 2017, 155-161).

This trend of progressive loss of physiognomic detail, visible in serving figure, in favour of an increasing systematization, has been explained by Donadoni with the narrative intent of models. By comparing them to the Italian tradition of Neapolitan nativity scenes tradition, in which the single figures are interchangeable, Donadoni argue that they only gain significance when placed within their compositional context and in the narrative of their specific activity (Donadoni 1989, 113–14). This conceptual anonymity of the figures, as noted by Donadoni, coupled with the observation that the body of most model figures was carved from a single block, with head, torso, and legs in one piece, with separately attached arms. This evidence led Winlock to propose that the central bodies of the figures produced for complex models were made in series. Individualisation was then achieved by assembling the arms and applying painted decoration: “A squatting man could be made into a carpenter, a sailor, or a cook according to the arms given him, and a standing man could be a herdsman, a harpooner, or a worker in a granary” (Winlock 1955, 74).

The practice of producing separate elements, such as arms, or bases, later assembled into a complete figure indicates a workflow optimised for serial repetition, analogous to what has been demonstrated for contemporary wooden coffins. Scholars have explored this phenomenon more extensively in the context of coffins manufacture, which offers useful parallels for understanding the production of wooden statuettes. Arbuckle MacLeod observes that until the end of the Old Kingdom, a great technical variability prevailed: carpenters employed different joinery methods without a shared standardised tradition and confirmed by comparative analysis. By contrast, in the Middle Kingdom, a technical stabilisation is apparent. The number of joinery methods was reduced and standardised, and the use of stucco to smooth surfaces prior to painted decoration became almost systematic. A marked shift occurred towards greater uniformity in format, proportions, and structure. Similar trends are visible in painted decoration, with recognisable provincial styles. At Asyut, for instance, several standard decorative typologies have been catalogued, suggesting the practice of serial productions (Arbuckle MacLeod 2023, 13-20; Eschenbrenner-Diemer 2017, 157-158).

This organisational pattern aligns with broader evidence of division of labour in Egyptian workshops, where carpenters, sculptors, and painters operated in sequence. Consequently, such standardisation does not imply mechanical production or a reduction in craftsmanship quality. Rather, it reflects an efficient response to the increased ritual demand for elaborate wooden figures and models, requiring sustained output of relatively homogeneous objects. Rondano, in her study of coffins production from the New Kingdom to the Late Period, highlights that the quality of the finished product depended less on whether the workshop employed standardised or customised methods and more on the economic capacity of the patron (Rondano 2021, 113–18). In this perspective, serial production emerges as a pragmatic solution embedded in a highly skilled artisanal system, capable of balancing individual workmanship with standardised prototypes.

Connor similarly observes, in the context of stone sculpture, that during the Late Middle Kingdom, most sculptures, except for those with specific forms, poses, or attributes, exhibit a high degree of impersonality, in which the subject is identified only through

attributes or inscriptions. This suggests that some pieces were not commissioned individually but purchased ready-made and personalised afterwards with inscriptions (Connor 2018, 25–27).

Careful analysis of serial production, whether in individual elements or complete models, is therefore crucial for reconstructing workshop organisation, tracing the circulation of models, and understanding the stabilisation of funerary rituals and broader economic dynamics.

2.3.3. Defining the role of the artist

Ancient Egyptian art has preserved only a limited number of artists' names. This is attributable to the fact that, artists' status and economic value were predominantly determined by their mastery of specific artisanal skills. Consequently, they were generally regarded as a form of salary labour. It is also important to consider that artistic works possessed a significance that transcended their artistic value, being necessary objects for religious purposes. Moreover, the organisation of labour placed greater emphasis on the workshop as a collective entity rather than on the individual. These were generally collective productions in which the work was divided among specialised craftsmen and adhered to strict canons, thereby allowing little space for individual expression (Miniaci et al. 2018, 7-8).

In sculpture, therefore, the focus is never on the individual who creates the artefact, but rather on the subject represented. The technical skill of the craftsman is reflected in two primary practical imperatives. On the one hand, the artisan was required to fulfil the ritual requirements of the patron with precision and efficacy. On the other, he needed to ensure structural integrity through careful, methodical decisions concerning materials, joinery, and overall composition. Such choices were often pragmatic, but they did not compromise the artistic outcome. Rather, they exemplify a distinctive application of creativity and technical competence (Donadoni 1989, 127,129).

This pragmatic yet highly skilled approach is further corroborated by the limited written sources available. The most renowned example comes from *The Instructions of Dua-Khet* (or *Satire of the Trades*), where a father encourages his son to pursue the scribal profession, presenting it as superior to manual trades. The passage on the carpenter depicts an artisan working with hand tools, labouring intensively even late into the night. Frequently copied in educational contexts, this text provides valuable insight into the literary and ideological perception of manual professions in ancient Egyptian society (C. J. Arbuckle MacLeod 2018, 125–28).

Another compelling example is the self-praise of Irtysen, a sculptor active at the beginning of the Middle Kingdom. His stela (inv. no. N 168/C14, Louvre), discovered at Abydos, lists his titles as “Director of Craftsmen, Scribe, and Sculptor.” Two passages are particularly instructive. The first reads: “I know the going of a male figure, the coming/stride of a female figure, and the stance of many birds, the bend of the one who strikes a single blow, how the eye looks at its two sisters, and the making fearful of the face of the bound enemies, the lifting of the arm of the one who harpoons the hippopotamus, and the stride of the one who runs.” The second states: “There is none revealing it to anyone except me

alone with my firstborn bodily son, for the god has ordered that he act as one to whom it has been revealed. I have seen his activity in acting as Director of Works in every precious material ranging from silver and gold, to ivory and ebony.” (Donadoni 1989, 119-120; Hartwig 2014, 192; Stauder 2018, 247-249).

Beyond demonstrating Irtyzen’s technical mastery, these passages provide two significant insights into the craft. First, they suggest the hereditary transmission of knowledge, a well-attested feature of Egyptian artisanal culture. Second, they challenge the assumption that sculptors worked exclusively in a single medium, indicating instead that a single artisan could operate proficiently across different materials.

For what concern the specialisation of craftsmen, two main hypotheses have been proposed, which need not be mutually exclusive. Textual evidence indicates that some artisans possessed polyvalent skills, working with a variety of materials. Conversely, certain artefacts’ high technical refinement suggests the existence of specialists dedicated to a single medium (Robins 2001, 9). The current evidence supports the coexistence of both types of craftsmen. Highly specialised artisans likely operated alongside those with broader, more adaptable skills. This scenario appears most plausible, given that rigid professional divisions were rarely observed historically, and social organisation tended toward flexibility and diversity. In this context, Miniaci’s suggestion is particularly persuasive: the coexistence of highly specialised court artists with “rural and itinerant craftsmen/women”, individuals who may have alternated between agricultural labour and craft production according to seasonal rhythms and economic opportunities, is a likely model of Middle Kingdom artisanal organisation (Miniaci et al. 2018, 7-8).

2.4. Artistic techniques of wooden sculptures

2.4.1. Choice of timber

In Ancient Egypt, the use of wood was widespread despite its relative scarcity within the local environment. Native Egyptian timbers were generally of modest dimensions and often of poor mechanical quality. Nevertheless, they were extensively exploited for a wide range of applications. The main native species employed in sculpture included *Ficus sycomorus*, various species of *Acacia*, different species of *Tamarix*, *Zizyphus spina-christi*, and date palm (*Phoenix dactylifera*) (Gale et al. 2000, 335–352). In addition, alongside with the use of conventional wood, small sculptures and tools made from fossil or silicified wood, readily available in Egyptian territory, have also been documented (Leospo 2001, 19-20; Lucas et al. 1926, 455-456).

Despite the technical difficulties associated with working these materials, Egyptian craftsmen developed highly sophisticated methods for their exploitation. This technical capability is further reflected in the early introduction of measures aimed at protecting arboreal resources, intended to prevent deforestation caused by intensive exploitation. From the very beginning of the historical period, royal decrees regulated tree felling, and only the vizier was authorised to issue provisions concerning the cutting of trees (Leospo 2001, 17).

Alongside the exploitation of native species, evidence for the importation of timber from abroad is attested as early as the 1st Dynasty, owing to the structural limitations of local woods (Killen 1994, 7). By the 4th Dynasty, this phenomenon becomes increasingly substantial. The most significant written documentation of this trade derives from the inventories of major Egyptian sanctuaries, such as the Harris Papyrus, from which the overall scale of timber imports has been reconstructed (Leospo 2001, 18). Coniferous woods, primarily pine and cedar (*Cedrus libani*), as well as common ash (*Fraxinus excelsior*), were imported mainly from the Syro-Palestinian area and Lebanon. From Africa came *Dalbergia melanoxylon*. From the Caucasus region originated silver birch (*Betulaceae*) and common box (*Buxus sempervirens*), while from Asia Minor and the Mediterranean area originated *Quercus cerris*, cypress (*Cupressus sempervirens*), *Juniperus excelsa*, and common yew (*Taxus baccata*) (Gale et al. 2000, 335–352).

Until relatively recently times, scientific analyses aimed at identifying wood species in Egyptian artefacts were extremely limited, primarily due to the risks and constraints associated with sampling (Fiore Marocchetti et al. 2008, 10). These limitations concerned both the quantity of material required and the fragility of the artefacts, as well as factors that could compromise the reliability of the diagnostics, such as restricted accessibility to certain structural components (for example, dowels) or advanced states of degradation⁸.

Despite the growing number of scientific investigations devoted to the identification of wood species in ancient Egyptian artefacts, the quantity of analytically examined material remains extremely limited in relation to the vast corpus of surviving wooden objects. Consequently, the current reconstruction of the range and distribution of timbers employed by Egyptian craftsmen remains fragmentary and strongly dependent on small, often site- or collection-specific datasets. This situation underlines the need for further systematic analytical campaigns and for the development of broader, interoperable databases that would allow meaningful comparative assessments across different periods, regions, and object categories (Asensi Amorós 2003, 77-78; De Marco 2021, 54; Harvey 2001, 11-12).

At the same time, an additional and fundamental epistemological limitation must be acknowledged: even when modern analytical methods succeed in identifying a specific botanical taxon, this does not necessarily coincide with the categories of knowledge available to ancient Egyptian craftsmen. It is unknown to what extent the Egyptians recognised and differentiated wood species according to criteria comparable to modern botanical taxonomy, or how their systems of classification were structured from a cognitive or practical perspective. Consequently, any attempt to interpret the symbolic value, functional significance, or intended use of specific woods must take into account not only the partial nature of the analytical record, but also the intrinsic uncertainty surrounding the ways in which these materials were perceived, distinguished, and conceptually framed within ancient Egyptian culture. The interpretative framework adopted in the following discussion must therefore be read in light of this epistemological constraint (El Sherbiny 2015, 72–73; Eschenbrenner Diemer 2025; Urzì 2022, 243–44).

⁸ The issues concerning the scientific identification of wood species will be addressed in detail in Appendix F

The selection of raw materials for the production of wooden sculptures and models displays considerable variability. The documented range extends from prestigious objects executed in high-quality imported timbers to artefacts crafted from native woods. Of particular interest is the body of less valuable objects manufactured from recycled wood recovered from earlier artefacts, or from timber unsuitable for carving large volumes. Such evidence provides important insights into patterns of material economy, reuse, and workshop practices. From a material perspective, Harvey's study clearly indicates a marked preference for indigenous timbers over imported woods in the production of Old Kingdom private wooden statuary. Although only a very limited number of statues has undergone scientific wood identification, the available analyses indicate that sycamore fig (*Ficus sycomorus*) and acacia (probably *Acacia nilotica*) were the most frequently employed species, while tamarisk appears only sporadically. Imported woods such as ebony and cedar are attested in only a few cases and, in several instances, their identification remains unconfirmed. This evidence points to a deliberate reliance on locally available resources, likely reflecting both practical and economic considerations in the procurement of raw materials. For these reasons, Harvey's work represents a fundamental reference for the study of typology, chronology, and material choices in Old Kingdom wooden sculpture (Harvey 2001, 283-385).

Taken together, the evidence from Old Kingdom private statuary (Harvey 2001, 283-385), from the coffins analysed by Davies (1995, 146-148), and from the funerary models examined by Eschenbrenner-Diemer (2017) clearly indicates that the selection of wood was differentiated according to function, social status, and economic context. Imported timbers, particularly cedar, were preferentially reserved for high-prestige objects or for specific symbolic and structural components, while indigenous species predominated in the production of ordinary statuary, coffins, and models. This pattern reflects a material economy in which technological choices, availability of resources, and workshop practices were closely intertwined with social hierarchy and regional supply systems, as further supported by the Middle Kingdom evidence discussed by Deglin (2012).

Within this broader framework of material selection and timber economy, the evidence from Asyut provides a particularly instructive case study for assessing how these general patterns were implemented at the level of a major provincial production centre.

Sixteen coffins from Asyut were analysed as part of a broader corpus of thirty-six coffins from Middle Egyptian and Theban sites preserved in the British Museum, examined to assess the relative use of native and imported timbers in funerary contexts (V. W. Davies 1995, 148-49). While cedar clearly emerges elsewhere as the dominant imported wood, the Asyut assemblage represents a striking anomaly. Of the sixteen specimens, eleven are made of *Ficus sycomorus*, three of *Tamarix* sp., and one of *Ziziphus* sp., whereas only a single coffin (EA 46644) is carved from imported *Cedrus* sp. The occasional use of mixed species is confined to secondary structural elements such as dowels, tenons, and pegs, typically produced in sidder or tamarisk. With large majority of the assemblage manufactured from indigenous timbers, Asyut represents a particularly pronounced case of reliance on local resources within the broader pattern emerging from the British Museum analyses. Davies explicitly warns that these results derive from a limited and unevenly distributed sample and must therefore be interpreted with due caution.

Nevertheless, the contrast with contemporary centres such as Bersheh, where most coffins are made of cedar, remains pronounced and cannot be explained solely on the basis of differences in social status, since the Asyut coffins also belonged to members of the provincial elite. Davies therefore suggests that specific regional economic or logistical factors may have affected the availability of imported timber at Asyut.

The selection of wood for coffin construction reflects not only the availability of natural resources, but also technological knowledge, workshop organisation, and social hierarchy. Indigenous Egyptian timbers, particularly *Ficus sycomorus*, acacia, tamarisk, and *Zizyphus spina-christi*, formed the structural core of most coffins throughout Egyptian history. These species were locally available, but rarely grew long and straight enough to provide extensive planks, a condition that strongly influenced construction strategies and favoured composite structures assembled from multiple elements. Imported cedar, by contrast, was consistently associated with elite production due to its superior mechanical properties, straight grain, and symbolic prestige. It was typically reserved for the highest-status burials and often employed for inner coffins, eventually in association with outer coffins made of local wood. This pattern is particularly significant in the Middle Egyptian context: at Asyut, the reliance on native woods for coffin construction aligns with a broader provincial practice that balanced economic pragmatism with adherence to elite funerary standards. The general preference for local species at Asyut does not indicate technical inferiority, but rather reflects a deliberate adaptation of available materials within a shared technological tradition. The coffins from Asyut preserved in the Museo Egizio of Turin, including that of Minhotep, fully conform to this technological and economic framework: despite the high social status of their owners and the role of Asyut as a major administrative and commercial centre, they are constructed primarily from local Egyptian woods (C. Arbuckle MacLeod 2023, 17-19; 2018, 225-241).

This trend of Asyut must also be understood in direct relation to the mechanical properties of the available woods. The limited length and irregular growth of species such as sycamore, acacia, and tamarisk imposed clear technical constraints on woodworking practices, favouring the widespread adoption of composite construction systems assembled from multiple elements rather than from single large planks. Conversely, the occasional use of imported cedar, documented by Davies (1995, 148–149) in a single coffin and by Eschenbrenner-Diemer (2017, 157–158) in selected prestige components of funerary models, exploited the superior dimensional stability and straight grain of this material for structurally or symbolically significant parts. In this sense, the technological choices observed at Asyut reflect a coherent adaptation of construction strategies to the mechanical performance of the available timbers, rather than a mere limitation imposed by restricted access to imported wood.

Eschenbrenner-Diemer's work highlights that, unlike what has been observed in coffins, the production of wooden funerary models relies predominantly on indigenous wood species, with a clear preference for light and fibrous timbers such as *Ficus sycomorus*, alongside tamarisk and acacia. This general pattern is likewise confirmed at Asyut, where the manufacture of models is largely based on local resources, reflecting both material availability and established craft traditions. The use of imported coniferous woods, most notably cedar, remains highly selective and functionally restricted. In the Asyut corpus,

cedar is exceptionally rare and appears only in specific components of prestige objects, such as the shelter of the boat model of Mesehti, rather than in ordinary figurines or structural elements. More broadly, Eschenbrenner-Diemer notes significant regional differences in the management of imported woods: while in workshops such as Meir cedar is frequently reused for bases and small components, and in Memphite productions it may be reserved for the figure of the deceased, at Asyut imported wood plays a marginal role (Eschenbrenner-Diemer 2017, 155–158).

The marked reliance on indigenous species observed by Eschenbrenner-Diemer in the production of funerary models finds an indirect but significant parallel in Deglin's analysis of timber exploitation during the Middle Kingdom (Deglin 2012). Although Deglin does not propose a quantitative diachronic model, the documentary and archaeological evidence she discusses indicates that native woods were extensively employed within state-controlled systems of supply, especially in dockyards and large construction projects. Administrative texts further document the circulation and storage of standardised wooden components, largely made of local species, as well as the systematic reuse of ship timbers in architectural contexts. Within this framework, the marginal role of imported woods documented at Asyut does not appear to reflect a simple lack of access to foreign timber, but rather a selective technological and economic choice, consistent with a broader Middle Kingdom strategy of exploiting indigenous resources within major woodworking sectors.

2.4.2. Carpentry and joinery techniques

With regard to the working of raw material, numerous depictions of carpentry activities and a wide range of tools have been preserved, allowing the reconstruction of the main stages of the manufacturing process. An evolution over time has been observed in these tools, the most significant change concerning the metals employed. At the beginning of the Dynastic Period, blades were made mainly of copper, whereas from the 12th Dynasty onwards tin bronze was introduced. From the Late Period, the use of iron blades is occasionally attested (Scheel 1989, 49–50).

Several Old Kingdom reliefs, particularly those from the mastabas of Ti and Mereruka, depict craftsmen engaged in carving anthropomorphic wooden figures. The statues are held firmly between the legs while the sculptor works with small chisels. An assistant frequently appears beside him, possibly responsible for preparing the piece or managing the tools, providing further evidence for the cooperative organisation of labour. Similar scenes occur in Middle Kingdom models, in which artisans are shown carving wooden elements with fine tools. This iconographic evidence suggests that workshops were not specialised in a single activity, but rather functioned as polyvalent spaces in which both large structural elements (boats, beds, doors) and small carved objects were produced.

The scenes of Ti, Mereruka and Meketre already show the presence of supports such as trestles, forks or simple props used to stabilise the wood during carving.

A model representing a carpentry laboratory has survived from the tomb of Meketre, a nobleman of the late 11th-early 12th Dynasty discovered at Thebes. In this model some craftsmen hold the wooden element between their legs, while others use a supporting

block. The consistently ground-level working posture suggests that the absence of high worktables was a deeply rooted technical choice: working close to the ground provided greater stability and control during cutting and carving (Winlock 1955, 33–34).

The same model is an invaluable source, as it shows almost all the stages of the woodworking. Tree trunks were felled using axes with curved blades, then cleaned and prepared for transport. The logs were subsequently conveyed to the carpenters' workshops. The wood was then subjected to a period of seasoning lasting several months, during which direct exposure to sunlight was deliberately avoided in order to prevent excessively rapid drying. Nevertheless, the warm and arid Egyptian climate allowed for relatively rapid seasoning, as evidenced by the frequent presence of cracks and shrinkage observed in archaeological artefacts (Killen 1994, 14). The workshop was organised as an open courtyard with a covered section. At the centre of the scene, a sawyer is ripping a squared timber into planks, while eight men seated along the walls work the freshly cut boards with axes or sandstone abrasives. One carpenter is cutting a mortise along the edge of a plank, holding a chisel in one hand and a wooden mallet in the other. In the covered area, three men are working at a forge. Scattered in baskets are saws, axes, chisels, adzes, reamers and bow drills (Winlock 1955, 35).

Once a suitable wooden block had been obtained, the creation of the volumes has been hypothesised to proceed in a manner comparable to stone sculpture, through the use of a reference grid and a rough carving phase until the figure was achieved (Fiore Marocchetti et al. 2008, 201; Leospo 1989, 11). The volumes followed strict proportions dictated by the canon, based on anatomical reference points such as the hairline, the axis between neck and shoulders, the forearms and the knees (Robins 1993, 70–86). However, given the morphology of the wooden blocks and the fact that different parts were often worked separately and then assembled, this aspect would benefit from further investigation, as the use of the grid, although probably employed, must have encountered limits and practical difficulties do not present in stone sculpture.

The construction of wooden sculptures typically involved the assembly of several small wooden elements joined together with carpentry joints and plaster in order to achieve the desired volume (Beck 2024, 65–68). In many cases, the central core of the body (head, torso and legs) was carved from a single piece of wood: where the available block was not large enough, it could be enlarged by adding supplementary wooden sections. Other body parts were frequently produced separately and subsequently attached. The upper limbs were commonly made independently and fixed to the torso at the shoulders, likely to facilitate the shaping of the void between arms and body. This practice probably accelerated and simplified the carving process and aligns well with Winlock's suggestion that it also served the serial production of minor figures in models (Winlock 1955, 74). Computed tomography analysis of a New Kingdom wooden sculpture has demonstrated that, in at least one documented case, the arms originated from the same wooden block as the central body, as indicated by the perfect continuity of growth rings (Manfreda 2019, 46). The sculptor therefore deliberately detached the limbs from the core, carved them separately, and then reassembled the structure, confirming that this procedure was adopted to facilitate carving rather than imposed by material constraints. Although this evidence

derives from a single investigated example, it provides a clear demonstration of the technical logic underlying modular carving practices.

In cases where one or both forearms were bent at a right angle to the torso, the arms were not carved from a single block, as is more common for arms extended along the body, but from two separate elements: the upper arm, anchored at the shoulder, and the forearm, attached at the elbow. The anterior part of the feet was also frequently made separately.

As the terminal part of the legs, usually cylindrical, was directly inserted into the base, the forepart of the feet was added by attaching a wooden element at the ankle and fixing it to the base, and/or the leg with a dowel, or alternatively by modelling it in plaster. The practice of assembling these body parts is documented from the earliest Old Kingdom models (Harvey 2001, 12). Other elements could likewise be either assembled or carved from the central block depending on the type of sculpture, and the subject it represents.

Among the various jointing systems employed, dowels and mortise-and-tenon joints fulfilled a primary structural role in the assembly of figures, while half-lap and fork joints were used for more specific constructional needs. Other systems were known and employed in Egyptian woodworking, though generally for different categories of wooden objects. In many cases, joints relied primarily on mechanical interlocking, often reinforced by the application of plaster between components acting as an adhesive strengthening agent. Where a particularly tight fit was required, plaster could also be introduced into the joint cavity as a filler to improve structural stability (Eschenbrenner-Diemer 2017, 157; Tooley 1995, 64). From the New Kingdom onwards, the use of glue to reinforce joint strength is more frequently attested (Killen 1994, 18; Leospo 2001, 20-21).

It has also been observed that different wood species could be employed within the same object according to functional requirements; for example, the hardness of *Zizyphus spina-christi* made it particularly suitable for the manufacture of dowels (Gale et al. 2000, 347; Leospo 2001, 16). These jointing systems are generally not considered reliable chronological indicators, as they remained in use with little variation throughout Egyptian history (Fiore Marocchetti et al. 2008, 20; Leospo 1989a, 36).

By the beginning of the Old Kingdom, the full repertoire of Egyptian woodworking joints was already established. These techniques remained remarkably stable over time, attesting to a long-lived and highly conservative technical tradition transmitted within communities of practice (Arbuckle MacLeod 2018, 213; Gale et al. 2000, 358-367). Alongside purely structural solutions, woodworking practices could also incorporate ritual components directly embedded within the manufacturing process: in some cases, hidden hieroglyphic inscriptions or representations of protective deities were applied to joining surfaces and structurally vulnerable areas, likely to reinforce and ritually protect structurally vulnerable areas of the object (Beck 2024, 70-76).

While many of these technical solutions were shared across different categories of wooden artefacts, the scale of the object and its functional requirements strongly conditioned their specific application in sculpture and coffin production respectively. The technical organisation of coffin production in the early Middle Kingdom appears to have been largely decentralised and rooted in local workshops connected with provincial governors or temple institutions. Construction methods were closely conditioned by both material constraints and social demand: rectangular coffins were assembled from long planks

joined with dowels and tenons, whereas anthropoid coffins could be built from composite boards or hollowed from single logs of local wood when access to imported timber was restricted. Grajetzki argues that the strong stylistic differentiation between cemeteries reflects predominantly local manufacture rather than large-scale interregional trade (Grajetzki 2017, 26).

2.4.3. Painting materials

Between the Old and Middle Kingdoms, wood was only exceptionally left visible in funerary sculpture. The deliberate exposure of the wooden surface was generally reserved for figures carved from precious timbers or for representations of male tomb owners, in which usually the skin areas were left undecorated. In the vast majority of wooden serving figures and models, the surface was instead carefully prepared and painted. Painted decoration fulfilled several complementary functions: it improved the visual impact of the objects, concealed the use of sub-standard woods, masked natural defects such as knots and cracks, and, above all, disguised the joints between assembled elements in order to create the appearance of formal unity.

Ground layers were most frequently based on calcium carbonate or calcium sulphate (Gale et al. 2000, 367; Killen 1994, 16-17; Tooley 1995, 64). The interpretation of these layers, however, is often complicated by the ambiguous terminology employed in the literature. Generic expressions such as “plaster”, “paste” or “ground layer” occur alongside terms such as “stucco”, “gypsum”, the latter usually interpreted as calcium sulphate, yet these designations are frequently used in a non-analytical sense. In many cases it is not specified whether the material was actually analysed, nor which techniques were employed. As a result, the terminology may remain conjectural. This methodological limitation is particularly critical for serving figures and models, for which analytical investigations are still extremely scarce.

Painted decoration was applied with a brush, using pigments that were generally bound with natural gums or animal glues. Sporadic evidence for alternative binders, such as egg or honey, has also been recorded (Newman et al. 2000, 475-481). The pigments were inorganic and derived predominantly from natural mineral sources, with the notable exception of Egyptian blue and Egyptian green, which were artificially produced. Within this technical framework, the use of colour in serving figures and models follows a set of highly stable conventions. Across different periods, the eyes are systematically emphasised with kohl, garments are most often rendered in white, and chromatic choices appear to be closely linked to the recognisability of figures and actions rather than to purely aesthetic concerns. Gender distinction is likewise expressed through colour: female skin is conventionally painted yellow to indicate a fair, sun-protected appearance, whereas male skin is rendered in red to evoke a more tanned appearance associated with outdoor activities (Harvey 2001, 13).

An extensive corpus of Egyptological research has been devoted to the study of colour, particularly from lexical, perceptual, and symbolic perspectives. However, these aspects will not be examined in depth here, as priority is given instead to questions of artistic technique.

As noted by Eschenbrenner-Diemer, the pictorial decoration of wooden models accompanies the technical and stylistic evolution of their production while preserving a number of recurrent conventions over time (Eschenbrenner-Diemer 2017). During Phases I and II (6th–8th Dynasties/ First Intermediate Period–11th Dynasty), a functional and schematic type of painting constituted an integral component in the formal definition of the figures. The eyes outlined with kohl, garments painted white, hairstyles were also painted in black, while ornamental details remained rare and were generally restricted to high-quality examples. In the early phase the colour black was widely employed in Memphite productions as a technical and geographical marker rather than as a symbolic reference to the fertile Nile silt. During Phase I the bases could be left untreated or painted in black or grey, while in Phase II they tend to assume a grey-green tone. Provincial productions introduce local chromatic variants, yet without any substantial enrichment of the overall pictorial palette.

In Phase III (early 12th Dynasty), painting becomes more articulated and qualitatively refined in the best-organised centres, including Memphis, Meir and Asyut. At Meir A, a close integration between sculpture and painting can be observed: anatomical details are carefully carved and then enhanced through systematic use of kohl, together with a detailed rendering of hair, beards and textiles. In several instances, polychromy contributes directly to the visual distinction of roles, social status and functions within the scenes. At Asyut, although woodworking practice is often structurally simpler, surface decoration is treated with particular care. The sclerae of the eyes are rendered in a very bright white and framed by elongated kohl lines, baskets are painted yellow with black linear patterns, and chromatic decorations appear on female bodies, such as dotted motifs around the nipples and coloured embellishments on garments. Within this context, the models of Mesehti stand out as the highest level of pictorial quality documented in the area. In Phase IV (second half of the reign of Senusret I to Senusret III), painting acquires a markedly symbolic dimension. The hulls of funerary boats are frequently painted green or light blue in explicit connection with the Osirian and solar spheres. Scenes are executed with great care, and the figures are characterised by white loincloths extending to the ankles and hairstyles secured by white bands. In this final phase, polychromy is thus fully integrated into the renewed religious language that characterises the latest development of wooden models.

Overall, the pictorial decoration of wooden models cannot be regarded as a purely aesthetic addition. Even when executed in a summary manner, painting always serves to reinforce the legibility of the represented action and to ensure the ritual efficacy of the object. The quality of decoration is variable and not necessarily proportional to the social status of the deceased, confirming that symbolic recognition of the scene was often more significant than formal refinement in a modern sense (Di Biase-Dyson 2023; Eschenbrenner-Diemer 2017).

With specific reference to Asyut, the highest pictorial standards are currently documented above all for the funerary models, particularly those of Mesehti, whose chromatic refinement is fully comparable to that of the major contemporary centres. It must nevertheless be emphasised that, despite the clear stylistic evidence for a highly developed pictorial practice, systematic analytical investigations of pigments, binders and ground

layers on the models and serving figures from Asyut are still lacking. At present, our understanding therefore relies primarily on macroscopic observation and stylistic comparison with other production centres such as Meir and the Memphite area.

In funerary sculpture, can be observed also the use of polymaterial inserts. Alongside the 6th Dynasty models in which stone and wood were combined, other examples include the insertion of eyes made from hard stones into statues of the deceased, the application of textile garments to cover certain models, and the use of ropes and fabric sails in boat models (Fiore Marocchetti et al. 2008, 12). Despite this material plurality, a consistent logic governs the association of materials: poor-quality materials are never combined with precious ones, indicating a coherent hierarchy of value within the object (Donadoni 1989, 125).

The technical phase of surface finishing must be regarded as an integral component of the overall chaîne opératoire and required close coordination between carpenters and painters. Although documentary and analytical evidence for certain ritualised surface treatments, such as the recurrent application of red paint to the inner joints and rims of coffins with apotropaic meaning, is chiefly derived from the study of coffins, these practices nevertheless provide an important technological framework for interpreting the broader context of wooden production (Arbuckle MacLeod 2018, 211, 262). In general, most of models do not present finishing layers, as is more common in coffins, which often underwent treatment with resins or oils.

The painting of wooden serving figures and models emerges as a technically sophisticated yet still insufficiently explored field of study. In the case of Asyut, the high pictorial quality of the models is beyond doubt, but the materials and techniques employed in their surface decoration remain largely undocumented at the analytical level. This gap clearly underlines the need for future targeted diagnostic investigations capable of clarifying the technological foundations of one of the most expressive components of Middle Kingdom funerary production.

3. From Asyut to Turin: the funerary assemblage from the Tomb of Minhotep

3.1. Archaeological context: the necropolis of Asyut

3.1.1. The historical development of Asyut

Asyut is a city located in Middle Egypt, approximately 375 km south of Cairo, and was the ancient capital of the 13th nome of Upper Egypt. This nome, known as *Nedjefet-khentet* in Egyptian, or later *Atef*, extended northwards approximately as far as the modern town of Umm al-Qusur, while to the south it reached about 3 km beyond Asyut. The city of Asyut lies on the west bank of the Nile, almost equidistant from the ancient capitals of Upper and Lower Egypt (Kahl 2007, 3–15; Regulski et al. 2018, 1–3).

The city's prosperity, as well as its repeated destructions, was primarily attributable to its geographical position. The location of the site was of a strategic importance due to its position midway between Upper and Lower Egypt. This made it a perfect frontier zone between these two geographical entities and a central crossroads due to the presence of two important routes for the transport of people and goods. To the north of Asyut, the Nile's course is subject to a bend, resulting in rapids and strong currents, which made safe navigation difficult. Boats sailing downstream often had to stop there and wait for favourable conditions. A second route traversing the desert was also documented. Asyut marked the northern end of the desert route known as the *Darb al-Arba'in* ("Forty Days Road"), which connected Kobbe in Darfur to al-Shab, the Kharga Oasis, and finally Asyut, covering approximately 1,767 km (Kahl 2007, 14–15; Kahl and Osman 2022).

These elements contributed to the city's status as a significant strategic and military location, a flourishing commercial centre, and a crossroads of different people. This led the city becoming a hub for both scholars, craftspeople and commercial exchange. Moreover, Asyut was also an area of agricultural production, with extensive cultivated lands (Kahl 2007, 15; Regulski et al. 2018, 1–3; Leospo 1993, 35).

The ancient city lay beneath the present-day settlement, which has resulted in its current inaccessibility. Current knowledge indicates that the site was situated on the west bank of the Nile, on elevated ground, at a height of approximately 13 metres, in order to protect itself from the annual inundations. The city contained a variety of edifices, including palaces and gardens, as well as temples, libraries, schools, and granaries (Kahl and Kilian 2022, 22).

The most imposing building in the city was probably the temple of Wepwawet, the principal deity of the city, which was most likely located in the southern quarter of the settlement (Kahl 2007, 35–45). As the city's principal deity, his name, "Opener of the Ways", properly reflects Asyut's position along two major communication routes. While the epithet may refer to military conquest, it has also been linked to the "Opening of the Mouth" ritual or to the sun's passage through the firmament (Wilkinson 2003, 191–92).

Given the city's strategic importance, the prominence of a war-associated deity is unsurprising.

Other cults are also attested. Anubis, as a funerary god, probably had a temple at the foot of the Western Mountain, where the necropolis extended for several kilometres and comprised several hundred, perhaps over a thousand, burials. Temples dedicated to Osiris, where relics of the god were kept, Hathor, whose cult appears to have involved mainly female priestesses, and, in the Late Period, Thoth are likewise documented (Kahl 2007, 39–50).

Asyut is distinguished in Egyptian history for its remarkable resilience, having repeatedly risen from the ashes of destruction, maintaining a prominent political and cultural role from the First Intermediate Period to the Coptic era. During the First Intermediate Period, the city initially became the principal ally of Herakleopolis in the long civil war against Thebes (ca. 2060 BC) (Kahl et al. 2019, 24–28). Following the final defeat, as attested by the inscriptions found in the tombs of Iti-ibi and his son Khety II, Asyut appeared to have been reduced to a marginal centre. Nevertheless, the monumental tombs of the nomarchs demonstrate that the city retained artistic and literary vitality, and that despite the defeat, there were no remarkable power vacuums and the military ideology continued to be celebrated for generations (Zöller-Engelhardt 2022, 189–90). This continuity in the Asyut's political life during the period spanning the civil war and the triumph of the Theban Dynasty has led some scholars to hypothesise that the reunification of the kingdom, and the integration of the local rulers, was driven more by negotiations between the parties than by an actual violent military conquest (Moreno García 2017, 102–4).

During the Middle Kingdom, Asyut experienced a period of prosperity, as evidenced by the restoration of temples and the resumption of cult activities, as documented in the autobiographies of the wealthy nomarchs and tombs (Kahl 2007, 42–45; Regulski et al. 2018, 20). During the Second Intermediate Period, the city remained a crucial strategic centre, demarcating the border between Theban Egypt and the Delta regions that were under the dominion of the Hyksos. During the New Kingdom period, Asyut once again occupied a central place in the political geography of the region. The spoliation of statues, such as that of Ramesses II found at Tanis, illustrates how its artistic resources were highly valued and reused in the capitals (Kahl 2007, 41–42). During the Late and Ptolemaic periods, the city experienced a series of revolts and depopulation. Even in the periods of late antiquity and the Coptic era, Asyut continued to be subject to invasions and acts of plunder, as evidenced by textual sources recording the destruction of churches and monasteries by the Nubians. Nevertheless, the city continued to rebuild itself, thus exhibiting the resilience that characterises its entire history.

3.1.2. Asyut's necropolis: structure, use, and transformation

The ancient necropolis of Asyut is situated on the limestone elevation of Gebel Asyut al-Gharbi ("Western Mountain"), which is located immediately to the west of the city (Fig. 1). The site is a massif of approximately 200 metres in height, which has been extensively excavated by rock-cut tomb complexes of the nomarchs and by a dense constellation of tombs and minor structures distributed across several terraced levels of the cliff face.



Fig. 1 - Gebel Asyut al-Gharbi: view from the city (Archivio Museo Egizio C1078)

Despite huge transformations due to natural and anthropogenic events, the necropolis of Asyut still preserves essential traces of the political, religious, and social life of the region over a period of more than four millennia, thus offering a paradigmatic example of how Egyptian funerary sites underwent multiple and stratified uses well beyond their original function.

The necropolis represents one of the most extensive funerary complexes in Upper Egypt, with origins dating back to at least the First Intermediate Period, when the Western Mountain was utilised almost exclusively for funerary purposes: burials, rituals, and visits to the deceased. Concurrently, quarrying activity for building stone was undertaken in the southern regions of the massif. Gebel Asyut al-Gharbi, in fact, is predominantly composed of limestone, a characteristic that rendered it particularly suitable to the creation of subterranean chambers, including those of monumental dimension. Moreover, the availability of this abundant source of construction material played a pivotal role in supporting the urban structure of the surrounding community. The historical record indicates that these two functions often came into conflict, with periods in which the intensified end the expansion of quarrying resulted in structural collapses and the destruction of numerous ancient tombs (Kahl 2007, 59–62).

Throughout the centuries, the original function of the site has undergone significant changes. From the New Kingdom periods onwards, the reuse of certain tombs as secondary burial sites became a common practice, while others were exploited for their building material, or damaged by quarrying activities. The funerary use of the site

persisted throughout the Late Period and the Ptolemaic periods, as evidenced by the construction of new burials, alongside the more ancient ones. The necropolis was subject to robbery at various historical stages, perpetrated by both foreign invaders and local communities.

The decline of the ancient religion was not a decisive factor in the loss of the site's religious and funerary significance. Rather, these functions underwent a transformation. From late antiquity and throughout the medieval period, Coptic communities adapted numerous tombs as places of worship and refuge, with some being converted into chapels, monasteries, and hermit cells. This change in their usage resulted in the partial destruction or covering of the original wall decorations within the burials, replaced by new representations of a Christian character. Medieval sources further record the presence of the churches of the Virgin Mary and of Saint Theodore at Deir Rifeh, providing further evidence of the continuity of Christian use of the area. Following the Arab conquest, Muslims also employed parts of the mountain as a cemetery (Kahl 2007, 71–72).

3.1.3. Asyut's necropolis conservation history and state of preservation

To this day, the state of preservation of these tombs, and their relative study, is strongly affected by the vicissitudes that have occurred over the millennia. These events have been both environmental and anthropogenic in nature, and their stratification has profoundly shaped the appearance of the necropolis as it can currently be observed. Natural events, such as floods, earthquakes, and erosion profoundly altered the architectural structures. Bats, nesting birds, and other animals that found shelter within the tombs contributed to the deterioration of the interiors (Kahl 2007, 3–5).

Additional forms of degradation and destruction were caused by anthropogenic factors. Among these, the most significant was the exploitation of the mountain as a quarry, which led to systematic damage. This activity is documented particularly between the late eighteenth and early nineteenth centuries in the diaries of explorers and archaeologists, which allow for the partial reconstruction of a chronology of the destruction. A notable example in this respect concerns the disappearance of architectural elements from certain monumental tombs, such as pillars, the removal of which can still be inferred from the traces left *in situ*. In the case of the pillars of the tomb of Djefai-Hapi I, it is known that these elements were still in place as late as 1714, when Paul Lucas, visiting Egypt at the request of King Louis XIV, recorded their presence in his travel journals. However, by 1799 during Napoleon's expedition to Egypt and the explorations conducted by Jollois and Devillers, these pillars have disappeared. This detail is of crucial importance, as it contributes to the reconstruction of the conservation history of the necropolis. It is indeed highly plausible that the quarrying activities carried out on the mountain between 1714 and 1799 were responsible for the destruction or removal of these structural elements (Kahl 2007, 21–25). Moreover, the use of explosives, not limited to quarrying activities but also employed by archaeologists, such as Hogarth, during excavation operations, strongly influenced the preservation of the materials (Kahl 2007, 29).

Finally, it must be considered that many of the burials had been robbed over the centuries, with a subsequent dispersion of artefacts into the antiquities market. These were further

combined by clandestine excavations, which resulted in the further deprivation of a large part of the grave goods from their original funerary complexes (Del Vesco 2017, 295). Throughout history, the objectives of archaeologists working in official concessions and those of individuals engaged in the illicit excavation, or the tomb robbers, have frequently been in direct opposition. This has forced archaeologists to devise measures aimed at safeguarding both their work and the material artefacts unearthed during excavation.

One of the testimonies attesting to the advanced state of deterioration of the funerary complexes of Asyut is that of Francesco Ballerini (1903), drafted during the first reconnaissance explorations of the site by archaeologists of the Italian Archaeological Mission. In a letter addressed to his family, Ballerini described the mountain as a landscape of pierced caves, already heavily damaged by successive reuses: tombs stripped, frequented by hermits, persecuted Christians, Arab communities, and eventually reduced to shelters for wild animals. Furthermore, he noted how nineteenth-century travellers left graffiti and on occasion removed fragments of decorations (Del Vesco 2017, 295).

Indeed, looking at this brief excursus in this topic, becomes clear that over the millennia Gebel Asyut al-Gharbi was subjected to multiple vicissitudes and functions: a site of human and animal burial, a place of prayer, a quarry, a place of learning, a site of temples, churches and monasteries, a place of eremitic retreat and refuge from persecution for Christians, and finally, a place of interest for ancient and modern scholars, a site of archaeological excavations, and a military base.

3.1.4. Asyut's strategic and economic dimensions

The warlike attitude of the local community emerges not only from historical sources, but also from archaeological finds, particularly those discovered in the tombs of the nomarchs. In addition to the autobiographical texts, the funerary complexes of the provincial governors contain the most eloquent testimonies of the close association of power with control of military forces, reflected in the celebration of the troops and the display of military symbols. This significance did not diminish throughout the centuries, as evidenced by the numerous votive stelae of the New Kingdom that confirm the centrality of Asyut as a military stronghold. It is noteworthy that soldiers, second only to priests in this regard, were the main dedicators of offerings to the city deity Wepwawet. This phenomenon is likely attributable not only due to the warlike character of the deity, but also signifies the substantial military presence in Asyut, especially in comparison with other Egyptian cities (Kahl 2007, 141–49). Additionally, the presence of weapons and military equipment in many burials in the necropolis, including shields, arrows, and bows, serves to further reinforce the hypothesis of a highly militarised city. Indeed, the strategic importance of the city was so central to its identity that it was constantly reaffirmed in the funerary and cultic sphere. The Northern Soldiers Tomb (H 11.1), the Tomb of Khety II (Tomb IV/N 12.2), and the Tomb of Iti-ibi-iqer (Tomb N13.1) are some of the funerary contexts that best document this aspect, as they contain wall representations of soldiers in formation or engaged in combat. In these scenes the nomarch appears as commander-in-chief, patron of the security of the city and its territory. Military iconography, therefore,

served the purpose of communicating both the military power of the deceased and his ability to maintain order and defend the city's boundaries during his lifetime. This suggests that political power in Asyut was probably based largely on the control of troops. A particularly significant case is the depiction in the tomb of Iti-ibi (Tomb III), where Egyptian soldiers are shown engaged in combat with one another, an unusual theme that seems to allude to the internal conflicts that characterised the First Intermediate Period (Zöller-Engelhardt 2022).

In this context the tomb of the nomarch Mesehti (Tomb K 11.3), dated to the beginning of the Middle Kingdom, is of particular significance. It returned the famous wooden models of soldiers, now preserved in Cairo, which constitute one of the most detailed testimonies of military conceptions in ancient Egypt. The two groups represent two distinct corps: on the one hand, a formation of Egyptian infantrymen, arranged in parallel rows, dressed in short white tunics and equipped with rectangular shields; on the other, a contingent of about forty Nubian archers, recognisable by their red kilts and carefully rendered physiognomic features. The models found in this tomb are extremely similar to the wall decorations discovered in Tomb N13.1. This detail is particularly interesting since Iti-ibiqer was the father and predecessor of Mesehti. These depictions of Nubian soldiers can be indicative of the relationship between these two populations that could, depending on the historical period, be characterised either by belligerence or by alliance. Moreover, it is also evident that the Egyptian army could, when necessary, draw its strength from both indigenous soldiers and foreign mercenaries.

During the Middle Kingdom period, Asyut also maintained its status as a major commercial hub. These commercial activities attracted people from across the country and involved nations bordering Egypt. It was proved that Nubian military units were present in Asyut during the First Intermediate Period, and it is possible to observe how these exchanges persisted over time. It is hypothesised that the city was engaged in flourishing commercial exchanges with Nubians, Libyans, and Asiatics. Particularly striking evidence is the presence at Kerma, the capital of Kush, of a sculpture of Djefai-Hapi I and another depicting his wife Sennuwy. Another statue of the nomarch was discovered at Gebel Barkal, in Nubia, while yet another was found at Tell Hizzin, in Lebanon. Although there are different hypotheses concerning the modalities, periods, and reasons for explaining the presence of these objects in these locations, it is evident that Asyut throughout the centuries was an important centre of commerce and exchange, a meeting point between different peoples, and that the art produced at this site was held in high esteem even beyond the confines of Egypt (Moreno García 2017, 117–18).

3.1.5. The formation of an “Asyut style”: art, epigraphy, and local schools

The vibrancy of the city of Asyut is also expressed in the production of cultural and artistic works. In addition to its function as a commercial hub, the city also played a significant influence on theology, literature, and art in a broader sense. In the case of Djefai-Hapi I's tomb, it is possible to examine the qualitative level attained by the local artistic workshops on the basis of the wall decorations. In his study of a painted fragment from the tomb, Smith sought to explore this topic (William. S. Smith 1957, 221–24). A scene, which has

been partially preserved, depicts a pastoral landscape with boys picking figs and goats feeding on the foliage of the trees. The rendering of the figures and natural elements, although fragmentary and compromised by the state of preservation, displays an elegant and refined line, close to the finest productions of the Middle Kingdom. The style is characterised by a firm yet delicate touch, capable of combining formal precision with a naturalistic sensibility. This qualitative level is consistent with the best evidence from Bersheh and Meir, while showing distinct differences from the paintings of Beni Hasan, whose rendering is more rigid and provincial. The comparison with neighbouring sites suggests the existence in Asyut of a highly accomplished artisanal school already at the beginning of the 12th Dynasty, capable of anticipating the more mature pictorial expressions of the Middle Kingdom. This artistic tradition which emerged in the outcome of the challenges experienced during the First Intermediate Period, is characterised by a period of stylistic experimentation that saw the influence of both Memphite and Theban styles, as well as local peculiarities. From a broader standpoint, the quality of the artefacts from Asyut and their dissemination in contexts such as Kerma, suggests an active role of these artisans in the circulation and transformation of figurative models. Recent studies on the decorative programme of the tomb of Djefai-Hapi I have further reinforced this picture, emphasising the complexity and high artistic quality of local workshop traditions (Kahl 2016).

Another intriguing area of research pertains to the production of offering tables and stelae during the Middle Kingdom period. The offering tables from Asyut manifest a strong stylistic and iconographic continuity, characterised by the recurrence of distinctive elements. This persistence presence indicates not only the activity of workshops firmly rooted in the local community, but also the continuity of artisanal traditions transmitted throughout families or guilds lines. Artefacts from Asyut, dating to the reign of Senusret III, demonstrate a production style that is more autonomous than that of the capital, intended primarily to satisfy local patronage. Another salient issue pertains to the coherence among the various artefacts within the tomb. The inscriptions on the offering tables exhibit strong linguistic and orthographic correspondences with other artefacts, including coffins, stelae, and tomb inscriptions. The combination of epigraphic and iconographic elements in this region gives rise to a distinctive “Asyut style”, which sets it apart from the traditions of other Egyptian centres. Recent studies within the framework of the Asyut Project have contributed to the reassessment of regional artistic traditions and chronological questions connected to the necropolis (Kahl 2016, 19, 34–37, 2019, 43–54). Despite this marked identity, Asyut did not remain isolated. Indeed, analysis of several examples reveals that external influences were adopted and adapted according to local sensibilities. This indicates that the elite was attentive to adopting innovations from the centres of pharaonic power (Ilin-Tomich 2018, 88-93).

The Middle Kingdom is the period in which the literature considered “classical” was produced, which was copied, cited, and transmitted through its study in schools (Bresciani 2007, xi–xiii). The texts found in the tombs of the nomarchs of Asyut were extensively copied and enjoyed a widespread circulation throughout the kingdom in the following centuries. Furthermore, the analysis of the orthographic peculiarities of the

autobiographical texts, as well as those found on funerary materials such as coffins, attests to the existence of a local school.

The integration of this evidence with the study of artefacts unearthed, has enabled the establishment of a compelling hypothesis. It was possible that during the First Intermediate Period the city was home to an excellent theological school, providing the training of scribes, architects, and sculptors, in addition to a diverse array of artisanal production. The hypothesis, therefore, given the power of the nomarchs during that period and the wealth generated by the city through commerce and cultural exchanges, is that such artists and intellectuals were for the most part associated with the court of the nomarch or with temple organisations, which were the principal patrons of their works. This cultural excellence revived once again during the New Kingdom, when appears the first testimonies of the execution of large-scale works of art, such as sculptures and reliefs, alongside evidence of the presence of a local school for scribes. Indeed, on the walls of the tomb of Iti-ibi-iqer (N13.1), hundreds of graffiti inscriptions have been found, consisting of scribal exercises reproducing classical didactic texts (Kahl 2007, 151–54).

3.2. Archaeological explorations of Gebel Asyut al-Gharbi

The history of research at Gebel Asyut al-Gharbi reflects a succession of markedly different methodological approaches, ranging from antiquarian documentation and collection-driven excavations to increasingly systematic and interdisciplinary investigations. These shifting paradigms, together with the uneven preservation of documentation, have profoundly shaped our present understanding of the necropolis.

The current state of activities is characterised by two primary factors that impose significant constraints on research and accessibility. Firstly, the presence of a military base on Gebel Asyut al-gharbi renders the area inaccessible. Moreover, the modern Islamic cemetery located at the foot of the escarpment serves as a tangible testament to the enduring tradition of funerary practices within the site, thereby physically constraining further exploration and the development of new sectors along the foothill zone. The collection of written testimonies left by different subjects remains fundamental today for the interpretation and study of the necropolis and the materials recovered therein, highlighting in some cases changes in the state of preservation of the necropolis. Indeed, they constitute an essential, and often unique, record for monuments, or parts of them, that are now largely lost.

While the rise of the so-called “Egyptomania” in Europe, accompanied by a proliferation of exploratory and tourist journeys along the Nile, rendered the necropolis a popular destination for the European visitors, documenting in their travel journals and accounts that and playing a crucial role in the reconstruction of the events that have unfolded at the site over the last centuries, the advent of Egyptology gave rise to a series of national and international excavation campaign, aimed at recovering artefacts and at studying the site (Regulski et al. 2018, 4).

Unfortunately, not complete documentation concerning the excavation phases, the artefact unearthed, and of the precise geographical location of tombs and stratigraphic levels emerges as an issue: these limitations did not result in direct material losses, but led to a

significant loss of invaluable information, which is crucial for the study and reconstruction of the historical development of the necropolis.

3.2.1. Early explorations of the Asyut necropolis

During the 17th and 18th century CE, a strong European interest in Egypt was reawakened. The causes of this phenomenon were multiple and complex, although one possible contributing factor is the increased popularity of exploration and travel to culturally significant or exotic locations, a trend that was encouraged by the practice of the Grand Tour. During their journeys in Egypt, several of these scholars and travellers visited Asyut, recording in their travel journals descriptions of the city and, above all, of its rock-cut necropolis. For instance, Paul Lucas, who had been sent to Egypt in 1714 by Louis XIV, reported having visited more than two hundred tombs, which he regarded as among the most imposing structures he had ever seen in the Mediterranean. Similarly, the Danish traveller Norden provided detailed descriptions of the tombs and their funerary equipment in 1738 (Lucas 1719; Kahl 2007, 21-22).

The turning point came with the Napoleonic expedition (1798–1801), which combined military objectives with scientific exploration. In 1799, Asyut became the first city of Upper Egypt to be visited by the French scholars, who regarded it as being fundamental for the study of Egyptian art and writing. Indeed, it was here that the first complete hieroglyphic texts were copied. The work of the engineers René Edouard de Villiers du Terrage and Jean Baptiste Prosper Jollois, who were responsible for the chapter on Asyut in the *Description de l'Égypte*, provided surveys, plans, and engravings of the tombs. These remain essential for the study of this necropolis (Jollois et al. 1822; Kahl 2007, 22-24; Regulski et al. 2018, 4). Furthermore, during their visit the French Expedition also documented the contemporary city, describing the Mamluks presence and their military use of the territory. Dominique Vivant Denon, acting as a “field correspondent”, sketched the tombs while under enemy fire, leaving a vivid and unique account (Kahl 2007, 24-25). These expeditions, and above all the written testimonies left by these scholars, represented a starting point for the study of the nascent discipline of Egyptology, providing a first basis for all subsequent research on the necropolis and the city.

Subsequently, between 1828 and 1829, the necropolis of Asyut was the object of further explorations by the Franco-Tuscan expedition. Ippolito Rosellini, together with Champollion, visited the Western Mountain, observing the presence of monumental tombs, including one decorated with military scenes and another attributed to a dignitary named Roti (Del Vesco 2017, 294-295). Following this preliminary phase, the level of knowledge of the site remained restricted until the epigraphic studies of Francis Llewellyn Griffith. In 1888, he copied the inscriptions from several tombs of the nomarchs, overcoming considerable difficulties, and published the results the following year in a work that still today represents an essential source for their study (Griffith 1889). In 1893, Percy Newberry briefly visited the necropolis, producing sketches and transcriptions of texts. Both scholars, during their studies, were able to record only inscriptions and partially preserved remains, but also an indication that the monumental decorations were already in part deteriorated or lost (Kahl et al. 2019, 12; Regulski et al. 2018, 6). This phase

of the studies of the necropolis was therefore characterised primarily by descriptive and antiquarian interests rather than by systematic archaeological investigation.

A major contribution to the study of the site is attributable to the French mission of 1903 which was led by Charles Palanque on behalf of the *Institut Français d'Archéologie Orientale* (IFAO). During this campaign, twenty-six tombs were unearthed, twenty-one of which were not disturbed, an event of great significance given the widespread plundering of most burials. The director of the Institute, Émile Gaston Chassinat, published the results of the excavations, among which the unearthing of the extraordinary tomb of the Chancellor Nakhti was particularly noteworthy. Nakhti was a prominent figure who lived at the end of the First Intermediate Period. The richness and variety of his funerary assemblage, today divided between the Egyptian Museum in Cairo and the Louvre, made this find one of the most significant of the necropolis. It marked a pivotal moment in the history of archaeological research at Asyut, as it further demonstrated the exceptional archaeological and historical value of the necropolis, as well as its potential (Chassinat et al. 1911; Kahl 2007, 28-32; Kahl et al. 2019, 13-14).

3.2.2. Italian expeditions at Asyut

At the beginning of the 20th century several European institutions developed a strong interest in the area and launched archaeological campaigns, most likely due to the weight of the remarkable discoveries made by the French IFAO mission. The newly established Italian Archaeological Mission, founded by Ernesto Schiaparelli, is noteworthy. Between 1906 and 1913, the mission performed seven excavation seasons at Asyut, during which thousands of artefacts were unearthed (Kahl et al. 2019, 67–70; Del Vesco 2017, 293–94).

Ernesto Schiaparelli was one of the central figures of Italian archaeology during the late 19th and the early 20th century. He played a fundamental role in the development of Egyptological studies and in the formation of the collection housed within the Museo Egizio in Turin. Between 1884 and 1885, he undertook his first official expedition to Egypt, funded by the Ministry, with the aim of conducting research on monuments and acquiring antiquities for the Museum of Florence. During those months he periodically accompanied Maspero, who was his mentor, and had been the director of the Service des Antiquités since 1881, and participated in his inspections of Upper Egypt. Upon his return, Schiaparelli published contributions on the sites he had visited and, on the acquisitions made for the museum. The Florentine period enabled Schiaparelli to consolidate his network of professional relations with other European scholars. Furthermore, in 1886, he founded the *Associazione Nazionale per Soccorrere i Missionari Italiani* (A.N.S.M.I.), prompted by the profound impact of observing the challenging circumstances of Italian Catholic missions in Egypt (Regulski and Golia 2018, 8–9; Moiso 2022, 60–62).

From 1894 until his death in 1928, Schiaparelli served as director of the Museo Egizio in Turin. During his office, he oversaw a substantial expansion of the collections and consolidated the institution's reputation as an international centre for Egyptological studies. This choice marked the beginning of the most significant phase of his career. It was within this framework that Schiaparelli launched a series of systematic excavation

campaigns in Egypt, with the support of the Italian authorities and the cultural institutions of the period.

Following an initial phase of reorganisation of the collections, in 1901 he returned to Egypt, where he oversaw the acquisition of approximately 1,500 objects from the antiquities market. However, this experience ultimately convinced him of the greater scientific and economic value of excavation activities compared with market acquisitions, a view reinforced by the system of permits that allowed for the export of a substantial share of the finds. Consequently, following the presentation of his ideas to King Vittorio Emanuele III, in 1903, he assumed the roles of founder and director of the Italian Archaeological Mission (MAI). Between 1903 and 1920, he led or oversaw twelve excavation campaigns across eleven sites, meticulously selecting areas of significant historical value and potential in addressing chronological and typological gaps in the Turin collection. Among the practical criteria, proximity to Catholic missions capable of providing logistical support was also given due consideration (Kahl et al. 2019, 58–59; Regulski and Golia 2018, 8–9; Del Vesco 2017, 293–94).

From the very beginning of the excavation activities, he delegated a significant proportion of the operational direction to young collaborators, primarily Francesco Ballerini and, following his death, Virginio Rosa. They produced a considerable number of diaries, surveys, and extensive photographic campaigns, some of which remained unpublished. In recent years, the Museum has undertaken the study and the publication of these materials. In this respect, Schiaparelli proved to be a skilled organiser of archaeological missions, capable of coordinating complex teams composed of various professional figures. He recognised the importance of collaboration among specialists, a detail far from self-evident at the time, and on numerous occasions knew how to make effective use of their expertise. A notable example is the involvement, beginning in 1913, of the anthropologist Giovanni Marro, future director of the Museum of Anthropology in Turin, in the excavation work at Gebelein and Asyut. This innovative approach to the study of human remains has enabled significant progress in the field. Schiaparelli's capacity to establish a network of trusted assistants and specialists was a key strength of his work, ensuring continuity and precision in excavation activities (Moiso 2022, 70–74; Kahl et al. 2019, 3–5).

Schiaparelli's activity took place during a transitional phase in the development of archaeology, when older excavation practices, often driven by a collecting logic, were beginning to give way to a more systematic and scientific approach. His philological training and primary interest in texts and inscriptions account for the meticulous approach he took in addressing epigraphic documentation. However, his practical excavation experience was, at least in the early stages, less extensive than that of, for example, his British colleagues, who were at the time promoting new stratigraphic and typological methods. Nevertheless, while remaining partly tied to a traditional view of excavation that prioritised the object as a museum specimen, Schiaparelli also demonstrated a fair degree of openness towards greater attention to documentation and contextual recording. This is evidenced by the numerous photographs, notes, and drawings produced during his missions, as well as by the aforementioned concern for establishing multidisciplinary working groups (Kahl et al. 2019, 64–65).

However, it should be noted that this attention was not always placed at the forefront of his activities. Indeed, in some instances, the need to enrich the museum's collections took precedence over methodological rigour. For instance, as will be illustrated subsequently through the case study under examination, a significant amount of the items unearthed at Asyut arrived in Turin without documentation about their original context, since his selection privileged typological relevance. The retrospectively reconstruction of these contexts is rendered challenging by the incomplete publication of excavation activities and the inadequate documentation of specific operations.

Consequently, despite initial methodological deficiencies, it is now evident that Schiaparelli made a progressive effort to promote in Italy an approach increasingly aligned with the modern conception of archaeology as a historical science, oriented not only towards the artefact but also towards the understanding of the social, religious, and topographical dynamics of ancient communities. The results of such openness were manifested in the relationships Schiaparelli cultivated throughout his life, not only with his direct collaborators but also with other leading figures of international archaeology. His network of relations included his mentor Maspero, the French School, represented by Lefébvre, and the (though not always fully assimilated) observation of the methodological innovations introduced by the British School through Petrie (Kahl et al. 2019, 56–61).

In terms of academic contributions, the volume of his excavation output remained disproportionate in relation to the scale of the Mission's research, due to both to the accumulation of responsibilities and to his declared habit of publishing only once work had been completed. This approach that unfortunately resulted in the non-publication of a substantial portion of the material.

The research conducted by the MAI at Asyut between 1906 and 1913 represented the most extensive archaeological activity ever carried out on the site up to that point. The Italian Mission conducted a series of seven campaigns, during which they explored numerous tombs excavated in the cemetery of Gebel Asyut al-Gharbi. A particular focus was placed on burials datable to the 11th and 12th Dynasties. It is plausible that, subsequent to the fruitful campaign undertaken by Chassinat and Palanque, it was Maspero himself counselled his former student to direct his attention to this area. In support of this hypothesis, the scholar obtained the excavation concession for the southern sector of the necropolis, and in 1906 his first campaign began in the zone immediately above the area previously investigated by the French team. The camp was established on a terrace of the necropolis, with some of the rock-cut tombs being converted for use as a kitchen, storehouse, and workspaces. The excavation itself began in early May 1906, and during that inaugural season, exploratory trenches led to the identification of more than thirty burials and the recovery of approximately three hundred objects. The work was conducted with varying degrees of intensity. Shorter campaigns, such as that of 1907, served primarily to maintain the excavation concession, whereas more substantial seasons, such as the following one in 1908, employed up to two hundred labourers, both men and boys, and resulted in the recovery of a large number of tombs and associated material. During the winter of 1906–1907 the area was shared with the British Museum mission directed by David Hogarth, who was assigned the western portion of the northern extremity of the hill. Meanwhile, the Italians retained the remainder of the elevation. Among the most

significant discoveries were the tombs of Shemes and Minhotep, that were explored in 1908 and yielded a considerable quantity of funerary objects. In 1913, other tombs of particular importance were found: the so-called Northern Soldiers' Tomb (H11.1), recently published within the framework of the Asyut Project (Abdelrahim 2020), and the nearby tomb I10.1, both of which were datable respectively to the 11th Dynasty and the transition towards the 12th (Del Vesco 2017, 296–300).

The finds at Asyut were numerous and of great significance: intact tombs, inscriptions, and funerary assemblages were documented, allowing the reconstruction with precision of the rituals and burial practices of the ancient inhabitants of the region. The objects recovered span a wide typological spectrum, ranging from coffins to items of daily use. Schiaparelli's research also focused on small artefacts, including fragments of pottery, components of wooden models, and botanical and alimentary remains. These artefacts were regarded by Schiaparelli as valuable evidence for understanding the daily life and cultural context of the deceased. The total number of artefacts returned to Turin by the Italian Misson is approximately 3,000–3,200 artefacts, constituting about 9% of the museum's entire holdings. One of the criteria that guide Schiaparelli in the selection of these objects was the aim to fill chronological and typological gaps in the collection, while also preserving evidence of regional peculiarities (Kahl et al. 2019, 15–17). This orientation made the Museo Egizio in Turin one of the richest and most varied museums of its kind in the world, consolidating its prestige and fostering its establishment as a reference institution for Egyptological studies.

Schiaparelli delegated a significant proportion of the operational supervision to his junior collaborators. Francesco Ballerini served as his principal assistant until 1910, the year of his premature death. He was chiefly responsible for the preparation of the first photographic reports and excavation diaries, thereby contributing to the creation of a visual archive documenting both the topography of the site and the individual artefacts. From 1911 onwards, Virginio Rosa replaced Ballerini assuming his responsibility for the study of the archaeological context and the documentation, producing surveys of tombs and sites (Moiso 2022, 70–74).

These investigations produced material of considerable relevance for reconstructing the site's history, despite the scarcity of contextual documentation. However, deficiencies in the data collection process led to the export of numerous artefacts with insufficient records, resulting in the frequent loss of their association with specific tomb contexts. A notable example of this issue is the case of forty-six skulls that were extracted without any record of their skeletal or tomb association. This limits the analysis of these materials to generalised studies, precluding the reconstruction of contextual relationships. Moreover, despite the efforts of Schiaparelli and his collaborators in gathering documentation of their work, most of it remains unpublished. An exception to this is an anthropological article, the outcome of his collaboration with Marro (Marro 1913).

This material, comprising a vast corpus of notes, sketches, plans, and photographic negatives, was deposited in the archives of Turin and in national repositories, where it still lies today. The loss of the authors of this material, which frequently consist of concise notes that necessitate the writer's memory to be properly interpreted, has resulted in the irretrievable loss of a substantial amount of information. This loss has also precluded the

possibility of achieving a comprehensive reconstruction of the excavation campaigns and of the events that took place in the necropolis and in the city of Asyut (Kahl et al. 2019, 5, 67; Del Vesco 2017, 300–302).

Despite the impossibility of reconstructing the entire original framework, detailed studies have been conducted on this archival material in recent years. These studies have enabled a more precise localisation of the excavation campaigns and the reassignment of certain objects to specific portions of the mountain. This meticulous analysis of the preserved documents led, more than a century later, to the publication of the volume that examines this vast body of previously unpublished material on the Italian excavations at Asyut: *Asyut: The Excavations of the Italian Archaeological Mission (1906–1913)*, edited by Kahl, Sbriglio, Del Vesco, and Trapani.

Critical reflections on the artefacts from Asyut in the Turin collections, despite their very high value, have required (and continue to require) combined readings of archival sources, inventories, and the artefacts themselves.

3.2.3. British expedition at Asyut

As previously stated, between December 1906 and March 1907, the Italian Archaeological Mission shared the excavation site with a British expedition sponsored by the British Museum, under the direction of David Hogarth, who had been granted the north-western end of Gebel Asyut al-Gharbi. The assignment had been placed under his direction to him by E. A. Wallis Budge, Keeper of the Department of Egyptian and Assyrian Antiquities at the British Museum, who, in alignment with Schiaparelli and in agreement with Maspero, sought to address the gaps in the museum collections. The area under his responsibility was adjacent to that which had been granted to the Italians but did not include the large tombs of the nomarchs, which had already been known since the Napoleonic expedition. In establishing their quarters, the British expedition selected the tomb of Khety II (Tomb IV/N12.2), located within Schiaparelli's concession, for use as storage for the artefact they found (Kahl et al. 2019, 14–15; Regulski and Golia 2018, 10).

Hogarth, encouraged by the remarkable findings made during proceeding excavation campaigns, was particularly determined to seek for undisturbed tombs that would enable him to transfer their valuable funerary assemblages to the British Museum. However, he soon discovered that most burials within his concession had already been robbed. His correspondence reveals an escalating sense of frustration, stemming from his perception that the quality of his concession was inferior to that occupied by Schiaparelli, particularly because of the smaller size of the tombs and the high number of late and Roman-period burials. He also expressed dissatisfaction with his inability to find intact tombs preserving rich assemblages. He noted that in undisturbed burials he frequently encountered artefacts of minor value, while occasionally more interesting artefacts, such as wooden models, could be retrieved from plundered tombs. He further reported on the difficult working conditions and later declared that “For every profitable tomb at least twenty profitless had to be opened and, moreover, examined scrupulously ...” (Hogarth 1910, 155). Finally, he expressed concern over the issue of robbery, which occurred during nocturnal hours and involved the misappropriation of valuable items (Ryan 1995, 6).

It is possible that these circumstances may have contributed to the archaeologist's approach, which was not characterised by the rigour expected for such activities. This have led to a substantial loss of both material and invaluable information. In a period of less than three months, approximately 300 burials were investigated, ranging from the Old to the Middle Kingdom. The investigations often employed dynamite, with negative effects on the preservation of the site (Kahl 2007, 29). Of the tombs examined, only around sixty were considered to be of substantial interest. In the course of the excavation activities, Late, Ptolemaic, and Roman-period tombs have only been the subject of superficial investigation, and their significance has been underestimated. The documentation produced revealed itself as inadequate, both regarding the precise location of the tombs and their architectural description, and moreover it was never published. In 1988, the Egyptologist Donald P. Ryan was the first to reconstruct the archaeological events by studying the archival material left by Hogarth (Ryan 1995; Kahl et al. 2019, 15). This excavation campaign, in addition to the lack of contextual documentation and the consequent loss of valuable information, produced also a significant material loss of archaeological artefacts. In 1907, approximately 700 items were sent to the British Museum, distributed in 27 crates. A further 19 crates were dispatched to the Egyptian Museum in Cairo, but the number of objects contained therein is unknown, as they were subsequently misplaced. Furthermore, numerous artefacts deemed to be of minimal interest, such as undecorated coffins or common pottery vessels, were left *in situ*, particularly in the tomb of Khety II. This has rendered unfeasible a comprehensive reconstruction of the assemblages (Kahl et al. 2019, 15; Regulski and Golia 2018, 10; Ryan 1995, 9). A century later, only a portion of these materials, remaining in the tomb, was recovered by the joint German–Egyptian mission, while the remainder remains dispersed (Kahl et al. 2019, 15).

3.2.4. The exploration of Asyut's necropolis in the 20th and 21st centuries

Between 1910 and 1914, before the outbreak of the First World War, the Egyptologist Ahmed Bey Kamal (1851–1923) conducted several excavation campaigns at Asyut, acting on behalf of the local collector Sayed Bey Khashaba. Kamal assumed the role of scientific supervisor, while the execution of the work was entrusted to groups of fellahin employed by Khashaba. In 1910, Khashaba obtained an extensive excavation concession extending from Dairut to Deir el-Ganadla, thus encompassing significant sites such as Meir, Deir el-Gabrawi, and Asyut itself, where the investigations focused particularly on the slopes of the Gebel Asyut al-gharbi, probably in the area south of Tomb I (Kahl et al. 2019, 17).

The primary objective of these excavations was the establishment of a private collection. Consequently, there was minimal interest in conducting a systematic investigation, and a significant amount of the objects recovered were quickly entered into the international antiquities market. This resulted in the dispersion of their original contexts and, in some cases, the separation of closely related materials (Harvey 1991, 1-3). Nevertheless, at the Egyptologist's advising, Khashaba agreed to the establishment of a modest museum in Asyut to house part of the finds. However, over the passage of time, the collection was

dismantled and dispersed, with only a marginal fraction remaining in local institutions, such as the Coptic school of Asyut (Kahl 2007, 29).

From the perspective of documentation, Kamal published inventories of the materials recovered, but these records are partial and incomplete. Despite his efforts to maintain a scientific approach, the absence of a comprehensive archaeological report and of reliable data on the provenance of the objects often makes it impossible to establish with certainty whether specific artefacts indeed originated from Asyut or from other sites within the concession. This has fuelled historiographical debates: some scholars suggest that certain statues and artefacts attributed to the site should be reassigned to Meir, whereas others consider it plausible to maintain Asyut as the area of finding, albeit in the absence of conclusive evidence (Harvey 1991, 1-3; Kahl et al. 2019, 17).

Further investigations prior to the First World War were conducted by researchers, such as Pierre Montet, who between 1911 and 1914 copied the inscriptions present in Tombs I–VIII. These inscriptions, accompanied by photographs, were published in 1928. His work, however, did not include complete documentation of the painted decoration (Kahl et al. 2019, 17). Later, Hellmut Brunner, Wolfgang Schenkel, and Elmar Edel provided translations, commentaries, and reconstructions of the tomb facades, further consolidating the knowledge of the site (Kahl 2007, 28).

After the First World War, there was a marked decline in interest in Asyut and its necropolises, mainly due to the earlier large-scale excavations on Gebel Asyut al-Gharbi, which had left little prospect for major discoveries. Notable exceptions to this generalisation include the cleaning and survey activities carried out by the English Egyptologist Gerald Avery Wainwright, particularly in the courtyard of Tomb I and the Salakhana Tomb. Other exceptions are the brief surveys conducted by the Egyptian Egyptologists Moharram Kamal and Ali Hassan, and by the American and British researchers Donald B. Spaul and Diana Magee in the 1950s and 1980s respectively. Access to the site was further restricted by the use of the mountain as a military base from the 1960s onwards, limiting research opportunities for a period of over forty years (Kahl 2007, 29; Kahl et al. 2019, 17-18; Regulski et al. 2018, 10-11).

Archaeological research in Asyut experienced a significant revival from 2003 onward with the Egyptian–German initiative, known as “The Asyut Project”, which was conducted by a collaborative effort between the Freie Universität Berlin, the Johannes Gutenberg University of Mainz, and Sohag University in Egypt. Jochem Kahl and his colleagues have conducted a programme of research and excavation that, at the present time, has spanned more than two decades. This programme has included a systematic investigation of Gebel Asyut al-gharbi in the currently accessible areas. The primary objective of this study is to examine the centrality of the necropolis for the history of Asyut between the First Intermediate Period and the Middle Kingdom, as well as its reuse in later periods, such as the Late Antique and Islamic eras. In order to achieve this, the study will integrate also the accounts of ancient travellers. Adopting a holistic approach aimed at analysing the traces of the area’s use over time and the functional transformations of its structures, the project has carried out the mapping and systematic documentation of tombs, Coptic monasteries, Christian cemeteries, and the scars left by ancient quarries. The project also documented the tombs of nomarchs from the First Intermediate Period and the Middle Kingdom, wall

paintings, inscriptions, archaeological finds, and the reuse of monuments in subsequent periods. The study produced several notable results, including the unearthing of a hitherto unknown nomarch's tomb, the identification of trade routes importing goods from the Aegean, the Middle East, Gaza, and North Africa, the collection of zoological data on canine remains buried between the seventh century BC and the Roman period, and the study of Mamluk ceramics (Kahl et al. 2022, VII-VIII; Kahl et al. 2019, 18-21; Regulski et al. 2018, 11-13).

Since 2016, the British Museum Asyut Region Survey has integrated and expanded the scope of investigation through the study of smaller settlements such as Shutb (Shashotep). The aim of this study has been to understand the interactions between the ancient towns and to involve the local population in the rediscovery and preservation of their cultural heritage. This is an approach that addresses the delicate issue of coexistence between archaeology and urban growth. Concurrently, the British Museum has been undertaking a comprehensive reassessment of the materials collected by Hogarth. The reassessment involves a meticulous cross-referencing of excavation notes, tomb numbering, and typological comparisons. Subsequent projects following this trajectory include the 2016 initiative, funded by the Egyptological Seminar of the Freie Universität Berlin, which focuses on the study of artefacts from ancient and illicit excavations, now housed in the Shutb Antiquities store, and the German–Polish project launched in 2020, “Asyut – Centre of Ancient Trade,” which investigates Asyut's role as a commercial hub in antiquity and Late Antiquity (Kahl 2007, 1-2; Kahl et al. 2022, VII-VIII; Regulski et al. 2018, 10,13).

Among the studies that prioritised the examination of documents and sources, mention should also be made of Marcel Zitman's Ph.D. dissertation. In his essay he conducted a systematic survey of previously unpublished ancient materials that had, until then, appeared in publications on Asyut (Zitman 2010). Although this work has been partially surpassed by subsequent publications, it nevertheless provides valuable insights for the study of the site.

Finally, given that this section has addressed, although briefly, the approaches of different archaeologists to the study and excavation of the Asyut site, a brief consideration of current research is warranted. A diachronic reading of the research history at Gebel Asyut al-Gharbi reveals a succession of markedly different approaches to the site. Early travellers privileged descriptive accounts and visual documentation, producing invaluable testimonies but lacking archaeological method. The large-scale missions of the late 19th and early 20th centuries were often driven by collecting strategies and the enrichment of museum collections, with uneven attention to contextual recording. Transitional figures such as Schiaparelli oscillated between a typological–collecting logic and an emerging awareness of documentation and interdisciplinary collaboration, whereas other campaigns, such as that of Hogarth, remained strongly oriented toward the rapid acquisition of portable artefacts, sometimes at the expense of preservation.

By contrast, contemporary projects demonstrate a clear methodological shift. Rather than competing for the expansion of private or national collections, recent initiatives are grounded in systematic documentation, contextual reconstruction, archival reassessment, and international collaboration. This change in paradigm has enabled a more integrated

and historically nuanced understanding of the necropolis, its long-term transformations, and its material record (Kahl et al. 2022).

3.3. Minhotep's Tomb: funerary objects and context

The tomb containing the materials examined in this study was unearthed during the third excavation season at the site, conducted between 11 March and 13 May 1908, by the Italian Archaeological Mission, led by Schiaparelli. During this campaign, the Italian team concentrating in particular on the quadrants now designated as Step 2, located south of Tomb I, and Step 3, located above Tomb I (Kahl et al. 2019, 83).

3.3.1. Discovery and setting of the tomb

The 1908 excavation season at Asyut began under less favourable circumstances than originally anticipated. Financial constraints, administrative delays, and logistical difficulties affected the organisation of the mission from its earliest stages. These were primarily due to a reduction in funding from the Ministry of Public Education. However this issue was resolved thanks to the support of the King, who made additional funds available. Administrative delays and financial constraints caused the postponements in the departure, that occurred only in March, a period unfavourable for excavations in Upper Egypt. Consequently, in contrast to Schiaparelli's original plans, the work area was restricted to the site of Asyut alone. During this excavation season, Schiaparelli was accompanied in the field by Count Tommaso Gallarati Scotti and Benvenuto Savina, curator of the Museo Egizio.

The archival material preserved, which is useful for reconstructing the events of those two months of work, is unfortunately rather limited. It comprises Schiaparelli's excavation diary, three letters (two written by Schiaparelli and one by the Royal Ministry), the registers relating to expenses and the payment of workmen, scattered sheets containing notes on anthropological finds, and finally the handwritten inventory (Kahl et al. 2019, 286–87).

The activity, which was also carried out through the employment of over 200 local workmen, was primarily aimed at exploring the middle area of the mountain and at completing the investigations begun in 1906. The excavations activities started south of the tomb of Djefai-Hapi I (Tomb I, P10.1), with limited results, and then the focus shifted on Step 3. Excavations revealed robbed tombs and scattered materials were uncovered, including a large statue of Djefai-Hapi, a model granary, and a scene of food production. In this area, tombs containing mummies from the Late Period, and an intact anonymous burial were also identified. The most significant discovery in this sector, however, was that of the intact tomb of Shemes, found on 20 March, which contained his coffins and those of his wife, two statues representing the deceased, three boat models, pottery, and numerous other funerary objects. The discovery of this burial was of particular historical importance, as it was an intact tomb with a highly valuable funerary assemblage. Moreover, a factor of considerable importance concern that, according to the handwritten inventory, it enriched the museum with 133 new artefacts (Kahl et al. 2019, 82–84, 288–89).

Based on Schiaparelli's excavation journal, the tomb of Minhotep (identified in the text as Kemhotep or Kemhotpu, according to the transliteration in use at that time) was discovered on 13 April 1908. From the limited handwritten notes it is stated that this was a context that was previously disturbed, in which the following items were found, in order: "three male statues; one small female statue; one small handmaid statue; one small handmaid statue, broken; one small handmaid statue, broken; four broken boats; bread-making scene, broken; a piece of a shield and many arrows; several *nabut*; several coffins, I cannot specify how many, because some, even though they were brought through the said tomb, did not belong to it." The diary goes on to specifying that on the same day, the "main" coffin, various grave goods, and human skulls were also recovered. In the following days further objects were found in the same area, though it is not clear whether in the same tomb, listed as follows: "two coffins with inscriptions; several without inscriptions; several *carfassim* boxes, one with two small vessels and remains of a necklace; two tree logs containing child skeletons, broken; ten skulls; several vases; a box with a dog mummy; a [mallet]." (Kahl et al. 2019, 155, 209–10, 289–90).

The material, including the findings from the Minhotep' Tomb, was collected in forty crates: seven were destined for the Cairo Museum and thirty-three, containing the more valuable material, were sent to Turin. Altogether, the handwritten museum inventories from Turin relating to the 1907 and 1908 campaigns record 838 entries, although, owing to the limited documentation, it is not always possible to attribute the various objects either to the relevant excavation season or to their specific context of discovery.

These issues are also readily observable in the case of the tomb of Minhotep. The absence of detailed documentation renders the reconstruction of the context a highly complex undertaking. The precise location of the tomb remains unidentified, and its architectural structure cannot be determined. Consequently, it is not possible to ascertain whether, in addition to the burial chamber, a chapel was also present, and if so, in which of the two spaces the various objects were placed. Furthermore, the precise number of objects that were recovered within the tomb of Minhotep is unclear. While there is no doubt regarding some of them, in other cases it remains uncertain whether they were found inside the tomb itself or in its vicinity. This uncertainty persists despite comparison between the two primary sources of information at our disposal: the excavation journal and the handwritten inventory (Kahl et al. 2019, 290–91).

In general, wooden sculptures and models were placed either within the burial chamber or the *serdab*, and less frequently in the funerary chapel. In Asyut, the majority of models were situated in the proximity the coffin, typically on the floor, with a marked preference for an east-to-west orientation (Tooley 1989, 82–83). A particularly illustrative example is provided by the tomb of Nakhti, where the highest-quality sculptures were placed in the superstructure, while others were in the burial chamber near the coffin, as was customary. This finding suggests that the placement of the artefacts may have been intended to exhibit the high status of the deceased in his community during the lifetime. Given that the funerary chapel was a space of free access for the offering deposition and cultic activities, the decision to situate the most aesthetically refined artefacts there could have conveyed social significance (Eschenbrenner-Diemer 2017, 178–79).

3.3.2. Multiple inhumations and their interpretation

The absence of complete contextual documentation becomes especially problematic when addressing one of the most significant aspects of Minhotep's tomb: the number of individuals originally interred within it. There is no doubt that it was a multiple burial, but both the identity and the precise number of its occupants remain unresolved questions. The complexity of this matter is intensified by the hypothesis that the tomb was used for both sequential primary multiple burials and secondary burials and/or the deposition of individuals transferred from other areas, brought there at a later stage, either by robbers or by other agents prior to Schiaparelli's arrival. Subsequently, the exact number of bodies discovered *in situ* remains uncertain, as does the identification of those compatible with the presumed dating of the funerary assemblage (late 11th – early 12th Dynasty).

To try to estimate the actual number of the earlier occupants, attention must focus on the coffins, the human remains, and the associated funerary objects. With regard to the coffins that were recovered in the tomb, the exact number is uncertain. Schiaparelli explicitly stated that the burial was a disturbed context and that he was unable to specify the precise number of coffins that belonged to the tomb, since some had been deposited there but did not originally pertain to it. However, comparing this information to the coffins inventoried at the museum, those that appear to be relevant to this burial are: an anonymous coffin (S. 8807); a female coffin inscribed with the name Wepwawetemhat (S. 8912; S. 8922); and two coffins bearing the name of Minhotep, whose dimensions suggest that they were two independent coffins rather than a set (S. 8917 and S. 8919) (Kahl et al. 2019, 286-291). These are all rectangular wooden coffins, plastered and decorated with painted inscriptions, bearing the *udjat* eyes on the outer left side at the level of the deceased's head. This type of coffin is mainly attested between the First Intermediate Period and the Middle Kingdom. The human remains recovered and transported to Turin, including both complete bodies and numerous skulls, apart from those pertaining to the coffins mentioned above, are virtually impossible to assign to a specific context. Finally, the funerary objects unearthed include three inscribed male statues: two bearing the name Minhotep and one bearing the name Wepwawetemhat. Other elements, in particular the three offering-bearer statuettes and the four boat models, in terms of both numerical value and stylistic characteristics, suggest that these objects did not constitute a single coherent assemblage. Rather, they appeared to represent multiple sets that were deposited in a single location, despite their original belonging to different individuals. The only study among those examined that proposes estimates regarding the exact number of occupants is that by Zitman, who suggests a maximum of six individuals buried in the tomb (Zitman 2010, 218–19). Given the current inability to securely contextualize a significant proportion of the human remains, a more cautious approach is warranted. This involves proposing a minimum number of occupants, estimated at four or five individuals.

3.3.3. The Tomb's material culture: inventory and chronological assessment

It has been determined that the tomb of Minhotep is a multiple tomb. This characteristic is also reflected in the rest of the material unearthed within it. In addition to the human remains and the coffins, as previously mentioned, numerous other categories of objects were found inside the tomb. However, the deficiency of descriptive information concerning the circumstances of their unearthing renders it extremely difficult to determine the pertinence of these artefacts to the context of deposition, as well as to establish possible links between the objects and the individuals.

There are some clues that may assist in formulating reconstructive hypotheses, but they are very few and rather weak. Inscriptions, for instance, provide strong corroboration for the interpretation of artefacts, as evidenced by the sculptures and coffins bearing the name of Minhotep, between which a close relationship is highly probable. Other factors that may facilitate the associations among objects, enabling the formulation of additional hypothesis, are the observation of customary practices in the composition of funerary assemblages, stylistic evaluations, and technical features.

Despite this evidence, the material recovered from this tomb is generally treated and studied as a single corpus/assemblage, due precisely to the impossibility of discerning the various relationships between the objects.

Of particular significance within the grave goods are the weapons. This feature is common to many other burials in the necropolis, reflecting the importance of the martial sphere in the city of Asyut (Kahl et al. 2022, 4–6). The range of weaponry recovered from the Tomb of Minhotep includes fragments of shields, bows, and approximately eighty arrows.

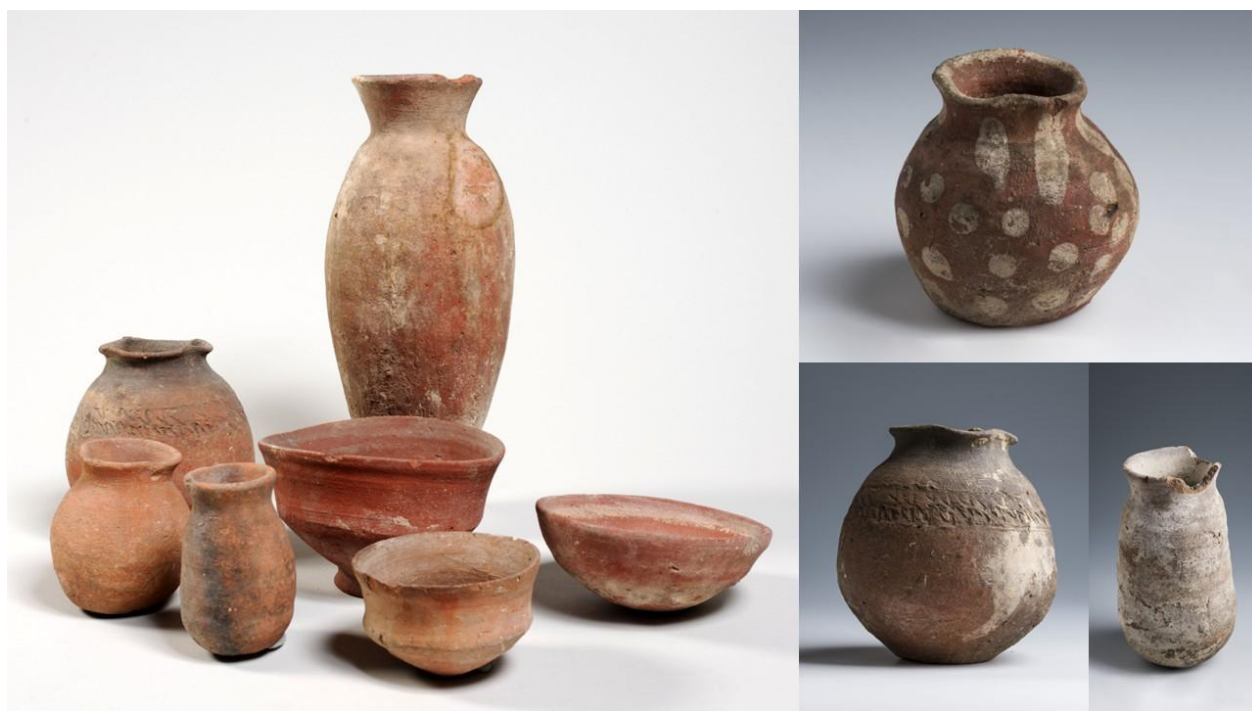


Fig. 2 – Examples of pottery from the tomb of Minhotep. On the right, three decorated jars, respectively: S.8867 dot-patterned design; S.8812, bands with incised geometric motifs; S.8820, white coating

In addition, there were objects more closely related to daily life, including headrests, sticks, and a large quantity of pottery. The latter is largely undecorated, with the exception of some pieces which are covered with a white slip, and others which bear simple embellishments, such as circular bands with incised geometric motifs, or painted decorations consisting of white dot-patterned designs (Fig. 2). The latter seems to be quite recurrent and therefore typical in Asyut (Rzeuska 2017, 179-186). The ceramics also display a fair degree of morphological variety, including globular and cylindrical jars, vases with conical necks, hemispherical and conical cups, simple and carinated bowls, as well as some pot stands.

Finally, among the specifically funerary objects, the wooden statues are worthy of particular attention. As previously mentioned, this corpus includes the two sculptures representing Minhotep (S.8787-8), and the male figure of Wepwawetemhat (S.8786) (Fig. 5). The three sculptures represent youthful male figures rendered in a standing, striding pose with the left leg advanced. They adhere to a consistent iconographic scheme, each figure standing upon a rectangular base inscribed with the name of the individual represented.

Within this corpus must also be included the three female offering bearer figures (S.8794-6), discussed in detail in chapter 5 (Fig. 3). The three artefacts demonstrate a uniform iconographic scheme, depicting women engaged in the act of carrying food offerings intended to sustain the deceased in the afterlife. The figures are shown standing with the left leg advanced, set on rectangular bases. Each balances a basket on her head, supported by the left hand, while the right arm, extended along the body, originally held an offering, now lost. They wear short black hair with a longer back lock and a white headband tied at the rear. Their white dress, suspended from shoulder straps, extends

from the chest

to mid-calf. The skin tone is rendered in yellow, and the eyes are outlined in black according to conventional Egyptian practice.

Unearthed in the same tomb, and likewise the subject of this study as described in chapter 6, are four boat models (S.8790-3) (Fig. 4). The examination of the arrangement of spaces intended to accommodate the crew and superstructural elements has made it possible to identify two sailing boat models (S.8790, S.8793) and two rowing boat models (S.8791, S.8792). The four models represent wooden rivercraft with crescent-shaped, flat-bottomed hulls and papyrus-



Fig. 3 – Offering bearers S. 8794; S. 8795; S. 8796



Fig. 4 – Boat models, top–bottom, left–right, S. 8790, S. 8791, S. 8792, S. 8793

form prows and sterns. The hulls are predominantly painted yellow, with red, black, and white details. Boat S.8793 differs iconographically in its white deck and use of blue pigment, while S.8792 shows minor stylistic variations in its decorative scheme. The remaining two models are closely comparable in iconography. In the sailing boats, the mast and sail are lost; the canopies of the rowing boats will be discussed separately. A set of nine oars (S.8793/1–9) is also preserved, though their original attribution remains uncertain. The surviving crew figures are largely uniform in composition and decoration: they display red-painted skin, short black hair with a white headband tied at the back, and a short white kilt. Facial features are minimally rendered and outlined in black.

Another wooden model unearthed in the same context is the so-called bread-making model (S. 8789) (Fig. 6). Scenes of bread-making and beer-brewing are frequently attested in funerary contexts, as they represent the foundation of the staple diet.

The chronology of the tomb has been established through the integrated evaluation of the various categories of material recovered within it, combining stylistic, epigraphic, and archaeological evidence. In particular, the chronological assessment relies on the comparative analysis of texts, pottery, coffins, and wooden sculptures.

The stylistic and epigraphic analysis of the coffins suggests a date between the late 11th Dynasty and the early 12th Dynasty, possibly extending into the reign of Amenemhat I. This chronological framework is broadly supported by the ceramic material associated with the burial. Zitman (2010, 220–21) dated the assemblage to the late 11th Dynasty and the beginning of the 12th on the basis of comparisons with pottery typologies attested both at Asyut and elsewhere in Egypt. More recent reassessments of the ceramic corpus conducted within the framework of the Asyut Project have further refined this picture. Kilian (2019, 141–42) observed that the pottery from the Tomb of Minhotep includes forms already attested during the late First Intermediate Period alongside types more characteristic of the early Middle Kingdom. This interpretation is consistent with the

context of a multiple burial, containing materials associated with different individuals buried within a relatively limited chronological span.

The statues representing Minhotep and Wepwawetemhat likewise display stylistic features comparable to other sculptures discovered at Asyut and more securely datable within the late 11th and early 12th Dynasty horizon. The closest comparison may be drawn with the monumental statues of Djefai-Hapi I (Museo Egizio, S.8650; Musée du Louvre, E 26915). Strong similarities are also observable with artefacts uncovered during the French excavation mission, including the statue from the intact tomb of Nakhti (Tomb 7, Cairo JE 36283), that of Wepwawetemhat (Tomb 14, Museum of Fine Arts, Boston 04.1780), and that of Ankhouf (Tomb 20, Cairo JE 34284) (Kahl 2007, 130, 151). Taken together, the available evidence therefore places the use of the Tomb of Minhotep within the late First Intermediate Period and the early 12th Dynasty horizon, probably not extending much beyond the early years of Senwosret I.

3.3.4. Visual and technical description of the non-analysed sculptures and models

The corpus comprises twelve wooden sculptures. While the recent diagnostic campaign focused on the boat models and the offering bearer figures, the present section addresses the remaining sculptures, which have not yet been subjected to instrumental analysis. A visual and technical description of these objects is provided here in order to complete the overview of the assemblage.

Among the sculptures excluded from the diagnostic investigation is a group of three male statues representing Minhotep and Wepwawetemhat (Fig. 5). These figures constitute the largest-scale anthropomorphic representations within the assemblage and form a coherent typological group within the corpus. The statue of Wepwawetemhat is the most significant, standing at 138 cm in height, while the figures of Minhotep are more modest in size, measuring 133 cm (S.8787) and 90 cm (S.8788), respectively. All three sculptures share the same iconography, namely the depiction of a young man standing and advancing with the left leg forward. The figures rest on rectangular bases inscribed with their name.

The right arm is extended along the body, holding a sceptre (*kheryp/sekhem*), which survives *in situ* only in the statue of Wepwawetemhat, while in the other two it is now lost. The figure's left hand is outstretched, grasping a long stick (*nabut*), which is positioned in front of it as the figure progresses on foot. The flesh tones are rendered by exposing the wood, which, due to the absence of a preparatory layer, is carefully smoothed and finished, showcasing remarkable precision in the carving. Particular attention is devoted to the anatomical details, a feature that is particularly evident in areas such as the clavicles, knees, and hands. The absence of pictorial layers facilitates the observation of the joints resulting from the assemblage, including those at the level of the shoulders, the left elbow, and the ankles. Other wooden inserts are also visible, such as the small dowels inserted in the chest to mark the nipples, or the insert placed to the right of the chest of Minhotep S.8788, perhaps intended to conceal gaps or imperfections in the main wooden block (Fig. 5). The wood's natural defects, including knots and shrinkage cracks, are also clearly



Fig. 5 – Left-right: sculpture of Minhotep S. 8787; sculpture of Minhotep 8788 (yellow arrow highlight a wooden insertion); sculpture of Wepwawetemhat S. 8786

visible. The figures wear only a short kilt, over which a layer of white plaster has been applied. The nature of the substance remains unclear. It is uncertain whether it constitutes a singular coating, or it is made of a ground layer that has been overlaid with pigment. Losses in the painted surface on sculptures S.8786 and S.8787 reveal the insertion of an

additional wooden piece at the front, intended to render the fold of fabric falling over the kilt.

The hair is short, helmet-like shaped, with a fringe falling over the forehead. At the sides the lower portion of the earlobes is left uncovered. The hair's texture is made through overlapping rows of small carved triangles. The surface is painted with a black pigment, apparently without the use of a ground layer. The same colour was used to paint the stick, as well as the cosmetic details around the eyes and the eyebrows.

The inner parts of the eyes, as evidenced by the surviving lacunae, must originally have been inlaid. As applied elements, generally composed of stone, glass, and/or ivory, inlaid eyes represent one of the most fragile components of wooden sculpture. These materials are particularly prone to loss over time, typically due to dimensional changes in the wooden support or the degradation of adhesives. In other cases, the removal of these inlays may have been intentional, often associated to robbery. The statue of Wepwawetemhat clearly fall into this latter case: there are visible traces of forced removal in the upper eye area and on the nose, showing marks consistent with downward scraping using a sharp tool. Some traces are also detectable on the statue of Minhotep S.8787, though these are less pronounced, and as a result there are insufficient elements to formulate the same hypothesis.

Despite the presence of similarities, such as prominent cheekbones and a low forehead, the physiognomies of the three male statues vary, enabling the evident differentiation of their faces. The statues representing Minhotep (S. 8797-8) and those depicting Wepwawetemhat (Torino, S. 8796; Boston, 04.1780) are cited by Eschenbrenner-Diemer as objects showing close similarities in style and technical execution, to the point of hypothesising a shared



Fig. 6 – Bread-making model S. 8789

production workshop (Eschenbrenner-Diemer 2017, 163). These sculptures unfortunately have not yet been the subject of scientific analyses within the framework of the present study. Consequently, no further information can be provided at this time. Subsequent research endeavours will be directed towards the completion of the study and the execution of a diagnostic campaign encompassing the entire corpus of sculptures from the tombs of Minhotep.

The assemblage also includes a wooden model representing a baking scene (S. 8789) (Fig. 6). Unlike the standing statues discussed above, this object depicts a multi-figure composition arranged on a single base and illustrates activities related to food production, in accordance with the well-attested Middle Kingdom tradition of funerary models.

The figures and objects are arranged on a thin, rectangular, though rather irregular, wooden base. On the right, male figure is depicted in a striding pose. His skin is painted in the conventional red, and he wears a short white kilt. With both hands, he holds above his head a large yellow jar, probably containing one of the raw materials required for production.

In the central area, adjacent to three large red vessels, is positioned a female figure. The figurine is characterised by a light skin painted with yellow pigment and wears a short white dress. She appears squatted, with her right hand closed into a fist, as if she were grasping a tool, and her left hand open and extended forward in front of her. A comparison of this posture with that of figures from similar models (Museo Egizio S. 13271 and S. 8652; Egyptian Museum Berlin, Inv. 1366 and 10828; Metropolitan Museum of Art, Inv. 20.3.12; Fitzwilliam Museum, E.71d.1903) suggests that the figure may be engaged either in baking bread or in arranging loaves for storage. In front of this figure stands another element, truncated-pyramidal in shape and painted red, which represents a pile of already baked conical loaves. On the left, two female figures, similarly painted yellow and dressed in short white garments, are depicted leaning forward as they manipulate the dough, which has been placed on a rectangular board. The outstretched arms of the figures emphasize the manual gesture, suggesting the cyclical rhythm of kneading.

From a technical perspective, all figures are carved in wood, with the main anatomical parts executed from a single block, while the arms were carved separately and attached to the

body with wooden pegs. The painted treatment is consistent with the chromatic conventions of the other figures of the tomb, including the graphic rendering of the eyes and eyebrows, whose contours are outlined in black.

As with the other complex models from the tomb, comparison with historical photographs reveals discrepancies between the current state of preservation of the bread-making scene and its earlier condition, including elements no longer preserved in situ and components that

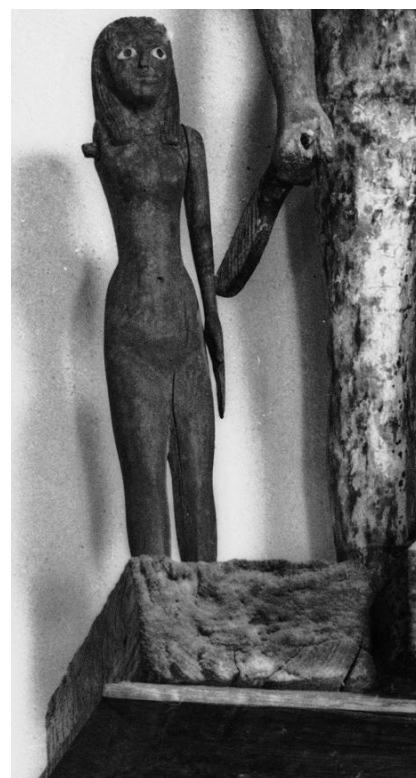


Fig. 7 – Missing sculpture

appear to have been arranged differently. As undertaken for the other artefacts examined in this study, future work could seek to identify dispersed elements and explore the possibility of proposing a plausible reconstruction of the original configuration.

Finally, according to the handwritten inventory and a historical photograph dating from the 1920s, this corpus of artefacts should also include an additional female sculpture of modest dimensions (Fig. 7). The sculpture depicts a nude female figure in a static standing pose, set upon a rectangular base. The figure is depicted standing upright on a rectangular base, with the arms positioned alongside the body. The proportions are slender, with a slightly elongated torso and narrow shoulders. The head is framed by a smooth, shoulder-length wig, and the facial features are rendered schematically, with large inlaid or, more probably, painted eyes. The surface appears uniformly dark in the available image, making it difficult to assess the original polychromy or state of preservation. At present, the whereabouts of the sculpture remain unknown, and the research aimed at clarifying possible current location is still ongoing.

3.3.5. State of art of production and style of the wooden sculptures and models in Asyut

As observed in the brief excursus on dating methods, the artefacts unearthed in Minhotep's Tomb, though lacking their original context, are remarkable consistent with the broader collection of findings from the necropolis. These additional observations serve not only as chronological reference points, but also as technical and stylistic benchmarks, thereby

facilitating a more profound understanding of the artefacts under study.

As discussed in chapter 2, burial customs initially centred on the figure of the pharaoh, before extending to the courtly elite and, eventually, being adopted by provincial elites. The distance of the latter from courtly art often led to reinterpretations and innovations in relation to the conventions of "official" art. Asyut follows this pattern while developing its own distinctive characteristics. One art form that is particularly well-developed in this area is wood carving, to the extent that a local school has been hypothesised to have existed in the city (Leospo 1988, 102). The most accomplished demonstration of the skills of Siutian woodcarvers is arguably manifested in the large-scale wooden sculptures of Djefai-Hapi. Two such examples have been found in the necropolis: one by the Italian Mission in 1908, now housed in the Museo Egizio (S. 8650), and one by Kamal expedition between 1913 and 1914, now in the Louvre (E 26915). The two artefacts are measured at 207 cm and 228 cm in height, respectively. The integration of provincial and official artistic styles is evident, for example, in the emphasis on physiognomic characterisation, as evidenced by the choice to depict an elongated body, in contrast with the geometric rendering of the hair curls (Kahl 2007, 131–32). The inlaid eyes, preserved only in the Turin statue, are particularly vivid and realistic, executed in hardstone intarsia.

Moreover, in order to gain a comprehensive understanding of the particularities and innovations of the Asyut context, it is important to adopt a broadened perspective and undertake comparative analysis with items originating from other geographical areas.

Such comparison may include proximate sites, such as Deir Rifeh where the models of the “Tomb of the Two Brothers” were unearthed, or the necropolis of Meir, as well as more distant sites, like Memphis or Thebes. A notable example of this approach is provided by the research of Eschenbrenner-Diemer, who mapped the geographical distribution of identifiable production areas on a chronological basis (Eschenbrenner-Diemer 2017). Prior to this, Tooley had already examined the regional distribution and trends of the models under her typological study (Tooley 1989), while Harvey, focusing on wooden sculptures, established stylistic criteria for dating such objects within the Old Kingdom (Harvey 2001). Harvey acknowledges that the stylistic dating criteria applied to stone sculpture cannot be directly transferred to wooden sculpture. This is due to intrinsic differences in material properties and workability, as well as the observation that certain formal changes often appear first in wood before occurring in stone, and vice versa. Consequently, any future research that seeks to build upon this study by extending the analysis to the First Intermediate Period and the Middle Kingdom would be of substantial value for the study of these sculptures (Harvey 2001, 12–13).

More recent scholarship has substantially broadened the interpretative framework applied to Egyptian wooden funerary figures and models, moving beyond questions of stylistic attribution, chronology, and regional distribution to address more directly their functions, aesthetic logic, and role within funerary practices. These studies have increasingly emphasised that these artefacts cannot be understood merely as miniature representations of daily activities or as simplified substitutes for real objects, but rather as material components embedded within broader systems of ritual action, social representation, and funerary belief (Eschenbrenner-Diemer 2024, 304–10; Beck 2023, 199–201). Wooden models and figures participated actively in the construction of funerary meaning, acting as material supports through which provisioning, mobility, status display, and concepts of rebirth could be expressed and perpetuated within the tomb environment (Eschenbrenner-Diemer 2024, 310–20).

At the same time, it has drawn renewed attention to the relationship between aesthetics and functionality. The quality of carving, painting, proportion, choice of materials, and overall visual coherence should not necessarily be interpreted solely as indicators of technical skill or economic investment, but also as elements contributing to the intended effectiveness and recognisability of the funerary equipment itself. Variability in execution quality may reflect multiple factors, including social status, access to resources, workshop organisation, and differing functional priorities within a single funerary assemblage (Eschenbrenner-Diemer 2024, 174–75; Zöller-Engelhardt 2023, 623–32). In this perspective, even highly schematic or less refined figures cannot automatically be regarded as unsuccessful or secondary products, since recognisability and ritual efficacy may have taken precedence over naturalistic rendering (Zöller-Engelhardt 2023, 631–32).

Finally, recent approaches increasingly stress the importance of considering these objects within their archaeological and relational contexts rather than as isolated artistic products. Beck has argued that funerary wooden representations may acquire different functions according to their position within funerary practices and their interactions with other elements of the burial assemblage, highlighting the dynamic relationship between objects, ritual actions, and the social meanings embedded within mortuary contexts. Such

perspectives are particularly relevant for fragmented or partially dislocated assemblages, where technical features, materiality, object biographies, and archaeological context must all contribute to interpretation (Beck 2023, 200–203; 212–13).

Against this broader interpretative background, Eschenbrenner-Diemer further highlights the peculiar characteristics of the Asyut corpus during the period relevant to the materials from Minhotep's tomb. An important observation concerns the marked qualitative disparity observable between funerary assemblages belonging to individuals of different social standing. Even when objects may derive from comparable production environments, differences in economic resources, access to skilled craftsmen, material selection, and investment in funerary equipment could substantially influence their final appearance and execution quality. The stylistic features that differentiate these sculptures, make them recognisable in relation to productions from other regions, mainly concern the depiction of the human figures populating the scenes. In particular, when observing the carving and decoration, it is possible to discern slender legs and well-proportioned figures. The subjects' physiognomies are distinguished by narrow noses and the absence of a mouth, with the exception of the figures of the offering bearers. Stucco is frequently employed as an adhesive and filler between assembled components, and for the construction of the front of the feet (Eschenbrenner-Diemer 2017, 157–58).

An interesting point highlighted by Eschenbrenner-Diemer concerns the greater care given to the painted decoration of the models.

As will be examined later, in the specific case of the sculptures under study, the painted decoration is generally carefully executed, although with noticeable variability in quality and refinement across different artefacts. Another observation concerns the general preference for local woods within Asyut workshop traditions (Eschenbrenner-Diemer 2017, 157–58).

The distinctive technical and stylistic features of these artefacts indicate a strong connection with the Asyut region, as exemplified by the soldier battalion models from the tomb of Mesehti or the sculptures from the tomb of Nakhty. While most cases likely reflect local production, Eschenbrenner-Diemer also observes evidence of contributions from multiple individuals in the manufacture of the diverse materials found in the necropolis. This observation is particularly relevant for the present research, as it supports the possibility of multiple contributors participating in the manufacture of funerary assemblages and encourages greater attention to technical variability within apparently coherent groups of objects (Eschenbrenner-Diemer 2017, 160–163).

Taken together, these observations suggest that regional identity cannot be reduced to isolated stylistic markers, but emerges from the interaction between material selection, manufacturing practices, workshop organisation, and aesthetic choices.

On the basis of these contributions, several methodological guidelines emerge for the present study. First, the importance of situating the Asyut corpus within a broader geographical and chronological framework through systematic comparison with material from other necropoleis. Second, the need to distinguish between iconographic conventions shared across regions and those stylistic or technical traits that may signal local workshop practices. Third, particular attention must be paid to polychromy, surface treatment, and

construction techniques, as these elements have proven especially diagnostic in previous scholarship on wooden sculpture.

Accordingly, the stylistic analysis undertaken here considers proportions and carving strategies, the rendering of physiognomic details, the treatment of painted decoration, and the use of ground layers. These parameters are examined comparatively within the Minhotep assemblage and against parallel productions from Asyut and other regions, with the aim of assessing degrees of coherence, variation, and possible workshop relationships.

3.4. Musealization and preservation of Minhotep's funerary objects

The artefacts recovered during the excavation season were subsequently inventoried and submitted to the Cairo Antiquities Service, which typically retained a portion of them. Following the division and packing of the objects into crates for shipment, they typically remained at the Franciscan Mission warehouses in Luxor for a period of about one year, as the export procedures were generally conducted in the subsequent year. On arrival in Turin, the materials were recorded in the Museo Egizio's handwritten inventory (Moiso 2022, 73–76).

The Museo Egizio, now housed in the Palazzo dell'Accademia delle Scienze (formerly the Collegio dei Nobili) in Via Accademia delle Scienze, was founded in 1824, as "Regio Museo dell'Antichità ed Egizio". The museum officially opened to the public in 1832, and by the mid-19th century work had begun on expanding and adapting the building for its new function. A new wing was erected at the rear of the courtyard, adjacent to the right wing. As suggested by its name, the museum initially encompassed a broader scope than just the Egyptian collection, incorporating prehistoric artifacts, Greek and Roman objects, and the mineralogical and geological collections. The space issue at the Accademia delle Scienze was further aggravated in 1865 by the relocation of the Galleria Sabauda's artworks. Prior to this, they had been housed in Palazzo Madama, which had been occupied by the Senate since 1848⁹. By the end of the 19th century, the construction of the new wing of the palace had been completed. The Museo dell'Antichità ed Egizio was assigned the ground and first floors, while the Galleria Sabauda was placed on the second floor. The scientific collections were relocated in 1878 to Palazzo Carignano (Donadoni Roveri 1990a, 265–69).

However, this solution was soon found to be inadequate. The excavations conducted by Schiaparelli between 1903 and 1937 resulted in the addition of approximately 30,000 new artefacts to the museum's collection. Having more than tripled the Egyptian collection, it became necessary the reconfiguration of the display. This process followed in two phases: the first in 1908, and the second, more substantial, was completed in 1924 (Donadoni Roveri 1990a, 271–73).

The most significant changes introduced by Schiaparelli affected the so-called "new wing", which was from this time designated the Schiaparelli Wing. Prior to this

⁹ In 1865 the capital, and with it the Senate, moved to Florence, but the Galleria Sabauda remained in its new location

development the structure comprised a single level, which Schiaparelli divided into two floors. The new space was subdivided into three large halls, where the artefacts from the excavations at Asyut and Gebelein were displayed. The rooms were organized geographically and by typology. The timing of the inauguration of these halls was a significant event, coinciding with the centenary celebrations of the museum's founding. The museum reopened to the public on 17 October, as reported by the newspaper *La Stampa*, and the reopening was marked by an official visit from the King¹⁰. This date is regarded as a *terminus ante quem* for the earliest known photograph of the wooden sculptures recovered from Minhotep's Tomb (Fig. 8). The photograph, executed on a glass plate by the Fratelli Alinari, and is currently preserved at the Archivio Storico



Fig. 8 - Wooden artefacts found in Minhotep Tomb, in their first setup in Museo Egizio. From above and from the left: Unknown; S.8794; S.8795; S.8796; S.8789; S.8793; S.8790; S.8792; S.8791; Not pertinent; S.8788; S.8786; S.8787. Firenze, Raccolte Museali Fratelli Alinari (RMFA)

Fondazione Alinari per la Fotografia¹¹. In this image, the sculptures can be observed in their first exhibition arrangement within the hall dedicated to Asyut. The objects are grouped by typology, with the smaller models placed on the upper shelves, and the sculptures representing the deceased displayed below. Beneath the smaller sculpture of Minhotep (S. 8788), it is possible to observe a representative portion of the significant number of arrows discovered in the tomb. At the sides, small sections of other objects are visible: in the upper left and right of the central shelving, examples of pottery can be glimpsed; in the upper right, the corner of a rectangular sarcophagus is discernible; while in the five-tier shelving on the lower right, numerous human remains are stacked, predominantly skulls. This photograph, while an invaluable source of

¹⁰http://www.archiviolaStampa.it/component/option,com_lastampa/task,search/mod,libera/action,viewer/Itemid,3/page,5/articleid,1169_01_1924_0249_0005_24874612/

¹¹ <https://www.alinari.it/it/>

information, was taken a minimum of twelve years after the discovery of the artefacts. Consequently, it cannot be determined whether the depicted images reflect the condition of the objects at the time of their finding. However, there is a strong possibility that the artefacts exhibited had already undergone conservation treatments and perhaps even reconfigurations.

The present hypothesis is supported by two main observations. The first concerns a comparison between the photograph and the few notes written by Schiaparelli in the excavation journal. It is evident from the journal that two of the offering-bearer sculptures, the four boat models, and the baking model were described as “broken” (Kahl et al. 2019, 155, 209–10, 289–90). However, the photograph shows that these objects were in relatively good condition. The precise implication of the archaeologist's use of the term “broken” remains ambiguous, as it could be interpreted as a reference to the absence of minor components or to the presence of fractures within the wooden artefact. While the exact meaning remains uncertain, both minor losses and structural interventions on the sculptures are observable, though the latter are not always easily datable.

The second observation pertains to a minor inaccuracy in the reconstruction of the figures on boat S. 8790, wherein the rowers are positioned in the wrong direction. This detail demonstrates that manipulations and reconstructions of the more complex objects had already taken place¹².

Consequently, it appears reasonable to assume that, after their discovery, the sculptures underwent restoration interventions, both structural and potentially cleaning, which may also have included the addition or repositioning of minor components for display or completion purposes. The chronological and geographic placement of these treatments remains an open question: it is not possible to determine whether they were carried out in Egypt immediately after excavation or later in Turin after their musealization.

In 1926, thanks to Marro's efforts, the Museo di Antropologia ed Etnografia (MAET) was founded in Turin. A close collaborator of Schiaparelli, he transferred a substantial number of human remains previously housed at the Museo Egizio to the new institution. This redistribution is reflected in the archival data: of the 838 inventory entries recorded after the 1907–1908 excavations, only 762 are extant today, the missing items consisting primarily of human remains incorporated into the MAET (Fiore Marocchetti 2019, 4-5; Kahl et al. 2019, 281-282; Mangiapane e Boano 2024). In the 1940s, Greek and Roman antiquities were separated from the Egyptian collection and relocated to two halls in the building's left wing, thereby freeing additional space for Egyptian material. Both the transfer of human remains, and the subsequent institutional reorganisation likely entailed a rearrangement of the collections, potentially altering the display configuration documented in the historical photographs of the 1920s.

At the outbreak of the Second World War, the then-director of the Museo Egizio, Giulio Farina, swiftly recognised the gravity of the situation and took decisive action to ensure the safety and conservation of the collection. He expresses particular concern regarding the potential risks posed by aerial bombardments in the city, which could result in

¹² Restoration campaigns over time and chronological placement hypotheses will be discussed in more detail in the following chapters

structural collapses and fires in the museum building. Initially, he closed the museum to the public and had emergency signals marked on the roof to indicate to bombers which buildings should be spared. With regard to the collection, Farina initially relocated it to the building's cellars. However, by 1942, the intensification of bombings prompted him to request its relocation outside the city. His caution proved justified, when in December of that year, a bomb fragment penetrated the ceiling of the Gebelein excavation hall in the Schiaparelli wing, causing a fire. The incident had a significant impact, accelerating the process of moving the artifacts. Meanwhile, Farina had fallen ill with an incurable disease, after which Carlo Carducci assumed the control of the operations to transfer the collection. With the exception of large immovable statues, which remained *in situ* protected by wooden structures or masonry cells filled with sand, the remainder of the collection was transported by truck to the Castello di Agliè, located approximately 40 km from Turin (Moiso 2022, 108–13).

In 1945, at the conclusion of the war, Ernesto Scamuzzi, the recently appointed director of the Museo Egizio, initiated the return and reinstallation of the collection. By 1964, the museum reopened to the public with a renewed exhibition, reorganized according to a new typological arrangement. However, the collection did not return without scars. It is probable that the hurried packing of objects during their various wartime relocations resulted in not all items being adequately catalogued. Composite objects were particularly adversely affected, as their multiple components were often separated or inadequately documented. Following the return of the artifacts, the museum faced a significant inventory-related challenge. A new catalogue was created for the objects for which the original context could no longer be reliably traced. The intention of identifying and potentially relocating them in the future. This postwar inventory, known as the *Catalogo Provvisorio* (Temporary, labelled as P. or Provv.), still contains approximately 8,200 items today (Kahl et al. 2019, 281–82).

A comparison of the wooden models from Minhotep's burial assemblage in their current arrangement with their appearance in prewar photographs, particularly in the 1920s photograph, reveals substantial changes (Fig. 9). Notwithstanding the restoration interventions that will be discussed at a later point, the most striking alteration pertains to the iconographic layout. In this regard, objects have been moved and rearranged, and numerous minor assembled elements have been lost. The dating of these changes is extremely challenging.



Fig. 9 - Example of the condition of Boat 1 in the 1920s and today

The Schiaparelli Wing, located on the mezzanine level, where the artefacts from the funerary assemblage were displayed, gradually proved unsuitable for the preservation of artefacts. Its flat roof and skylights created unstable thermal conditions: excessive cold in winter, overheating in summer, and recurrent risks of water infiltration. For these reasons, after the museum's reopening, the spaces were abandoned as galleries and converted into storage areas. Moreover, the arrival of the Temple of Ellesija in the city prompted new internal relocations within the museum between 1966 and 1969. The Museo Egizio once again required additional space from the Museo di Antichità, which was itself under strain due to new arrivals from excavation campaigns in the Piedmont region. Consequently, the Soprintendenza Archeologica opted to relocate the Museo di Antichità to a new site in the orangery of the Palazzo Reale, where it was installed in 1989 (Donadoni Roveri 1990a, 273–76).

This relocation benefited the Museo Egizio, allowing it to expand and reorganize in accordance with contemporary museological theories and updated scientific standards.

In the 1980s, under the direction of Anna Maria Donadoni Roveri, the Schiaparelli Wing was restructured to provide new exhibition space, definitively ruling out the option of a full relocation. The project transformed the wing into a five-storey building, including two subterranean levels, and connected it to the halls of the left wing, formerly occupied by the Museo di Antichità. In this new configuration, the first underground level was dedicated to the artefacts unearthed during Schiaparelli's excavations. The objects were exhibited according to a topographical criterion, and where documentation allowed, some showcases reproduced reconstructions of the original archaeological contexts. The inauguration of the renovated wing took place in 1991, coinciding with the VI International Congress of Egyptology that was held in Turin the same year (Moiso 2022, 118–21).

The establishment of the Museo delle Antichità Egizie Foundation of Turin in 2004, and the relocation of the Galleria Sabauda in the Palazzo Reale's Manica Nuova, between 2013 and 2014, resulted in a new renovation of the Museum, now benefiting from the use of the entire building. These works were completed in 2015, coinciding with the museum's complete reopening that featured a radical transformation of its layout. Since that time, the materials recovered from Minhotep's Tomb have been mainly exhibited on the second floor, in the room dedicated to the Middle Kingdom, with the exception of two boat models, which have instead been placed on the same floor in the mezzanines dedicated to material culture (Moiso 2022, 130–37).

Among the most recent developments, increasing attention has also been devoted to museum communication strategies aimed at making scientific investigation and archaeometric research more accessible to broader audiences. The growing emphasis within Egyptological and archaeological research on materiality, manufacturing technologies, conservation sciences, object biographies, and interdisciplinary investigation is progressively influencing not only scholarly approaches, but also public engagement and museum narratives. In recent years, the Museo Egizio has increasingly strengthened approaches integrating traditional Egyptological interpretation with information relating to materials, production technologies, conservation practices, and scientific investigation,

reflecting a wider tendency towards communicating archaeological heritage through both historical interpretation and material evidence.

Projects such as *Archeologia Invisibile* (Ferraris 2022) and the more recent permanent installation *Materia. Forma del Tempo* exemplifies this tendency, foregrounding the growing role of archaeometry, digital investigation, conservation science, and material analysis in both research and dissemination. Such developments reflect an emerging museological perspective in which scientific data are no longer regarded merely as specialist tools supporting research, but increasingly become part of the interpretative framework through which cultural heritage is communicated to broader audiences.

4. Diagnostic plan: materials and methods

4.1. Methodological framework

The main objectives of the research aim to define production methodologies of the group of wooden funerary sculptures originating from the tomb of Minhotep at Asyut. In order to achieve this objective, the study places emphasis on technical and archaeometry analysis through the examination of materials, techniques, and construction methods. A further objective of the project is the reconstruction of the original display and reception of the artefacts within the museum context, also in light of the historical photographic documentation. The present study therefore seeks to identify possible erratic components that may belong to the Minhotep assemblage and, on the basis of the technical and scientific data, to propose a more coherent hypothesis of display.

In light of these objectives, research on these sculptures must be grounded in a multidisciplinary approach, integrating historical-artistic analysis with technical-scientific investigation. Indeed, while archival documentation and stylistic study allow the sculptures to be placed within their cultural context, diagnostic techniques provide objective data from which it is possible to reconstruct information concerning the constituent materials, the manufacturing processes, and the state of preservation.

From this standpoint, a fundamental aspect of the research concerned the formulation of a diagnostic plan, conceived as a structured and progressive sequence of analyses, proceeding from macroscopic observations and non-invasive techniques, culminating in micro-analytical investigations. This process does not consist merely in the progressive application of analytical tools but rather represents an interpretative pathway, in which each result is integrated with historical knowledge as well as with the conservation and display requirements of the objects. The definition of the diagnostic plan required meticulous planning, as is often the case in such contexts, with multiple layers of considerations had to be taken into account. These can be categorised into three main perspectives: Egyptological, conservation-related, and scientific.

From the Egyptological standpoint, it was necessary to formulate an efficient research strategy for the study of bibliographic, archival, and other documentary sources. This strategy was aimed at accurately assessing the state of the art and deepening the historical and stylistic study of the sculptures under examination. Equally, it was required to deliberate on the optimal formulation of the research objectives and the requests that the scientific analyses were expected to address. In this respect, the methodological process was articulated through a progressive breakdown into more specific and manageable research questions, starting from a general objective. For instance, investigating the possible presence of specialised workshops or craftsmen required identifying meaningful diagnostic criteria, including materials, ground layers, pictorial choices, tool marks, and recurring technical solutions. These questions subsequently guided the selection of the most suitable analytical techniques.

At this stage, scientific considerations are brought to bear in evaluating the choice of diagnostic techniques. The preliminary evaluation is invariably pragmatic in nature,

concerning the assessment of the facilities and resources that are available. Subsequently, a thorough examination was conducted to ascertain the various potentialities and limitations, both those intrinsic to the available technologies and those associated with the materials analysed. Even though all the artefacts examined can be broadly defined as wooden sculptures, they exhibit significant variations among themselves, especially from a typological standpoint. Consequently, in the planning of the diagnostic programme, consideration was given to the necessity of conducting analyses capable of establishing correlations between different types of artefacts, with the aim of identifying technical and material variations. This issue was mitigated by adopting a further subdivision of the artefacts on a typological basis.

Consequently, a multi-technical approach was preferred, to combine the distinct potentialities of each technique, thereby reducing the impact of their respective limitations. On this basis, the diagnostic plan was structured according to a criterion progressing from the least invasive techniques, such as contactless methods, towards more invasive ones, culminating in micro-sampling.

The conservation assessment conducted at the beginning of the study guided all subsequent operations, balancing research needs with the preservation of the artefacts. To safeguard their uniqueness and fragility, micro-sampling was minimised in favour of non-invasive methods, with some data intentionally deferred until future analytical opportunities. Furthermore, while this was not the primary objective of the research, the conservation state and traces of previous restorations were examined to enhance the interpretive value of the analyses and to inform future preservation strategies.

As will become evident in the following description of the diagnostic phases, the approach adopted on the basis of these considerations is not particularly original, but rather largely consistent with methodologies that are already well established and widely applied in numerous studies, both within the field of Egyptology and more broadly in the domain of cultural heritage.

Nevertheless, these methodological premises enabled us to reflect on the possibility and necessity of effectively integrating the various areas of expertise, maintaining this line of action throughout the entire course of the study. From the earliest stages of the preliminary research to the final phases of result dissemination, a broad and multidisciplinary approach has been sought, allowing each discipline to fully express its own specific perspectives, while remaining accessible to specialists from different fields.

A clear structuring of a reasoned pathway along which to proceed in such cases is essential, particularly since studies of this nature often require a considerable amount of work carried out by multiple specialists in order to achieve even modest results. It is therefore of the utmost importance that the information obtained be utilised to its fullest potential. It is also important to emphasise certain intrinsic limitations of the investigation. It was not possible to obtain direct answers to all of the questions formulated at the outset of the study. This was due the constraints in access to specific technologies, the technical limitations of each methodology, and the conservation requirements of the objects themselves. Consequently, some investigations were purely prospective in nature, contingent upon subsequent technological advancements. Conversely, other investigations yielded partial data, requiring further validation. Such awareness constitutes an integral

part of the scientific process and represents the foundation for a critical and replicable approach in archaeometric and conservation research. Moreover, it is our hope that the definition of this methodological framework may open new perspectives for future studies, both in deepening the stylistic and technical questions and in developing conservation strategies aimed at the recontextualization of erratic materials.

The following sections of this chapter will illustrate the selection of methodologies and their sequence of application, providing a description of each technique employed. For every methodology, the modes of application to the case study, the type of information obtainable, and the interpretative limitations will be discussed.

The relationship between the research questions, the methods selected to address them, the expected analytical outputs, and the principal interpretative limitations is summarised in the following synoptic table (Table 1). This scheme is intended to make explicit the methodological architecture underlying the diagnostic plan and to clarify how each analytical strand contributes to the integrated interpretation of the corpus.

Table 1 - Synoptic table. Relationship between research questions, methods, outputs, interpretative contribution, and limitations

RESEARCH QUESTION	METHODS AND SOURCES	DATA PRODUCED	INTERPRETATIVE CONTRIBUTION	INTERPRETATIVE LIMITATIONS
CONTEXTUALISE THE MINHOTEPI CORPUS	Bibliographic study; archival and museum documents; photographic records; direct observation of the artefacts	Reconstruction of chronological and cultural framework, excavation and museum history; identification of relevant links between objects	Provides the historical basis for formulating diagnostic questions and for interpreting technical data within a coherent Egyptological and museological context	The literature is uneven; archival documentation is incomplete; photographic materials are not precisely datable; stylistic comparison alone cannot provide secure attribution or dating
IDENTIFY ERRATIC ELEMENTS LACKING A SECURELY CONTEXTUAL ATTACHMENT TO THE MINHOTEPI ASSEMBLAGE	Historical photographs; museum inventories; direct observation and comparison of joints, morphology, decoration, and losses; CT for structural verification	List of candidate components; evidence for or against compatibility with the main objects; reconstruction hypotheses for missing or displaced elements	Supports a more coherent reconstruction of the display history and possible original configuration of the assemblage, while distinguishing compatible fragments from alien or later associated elements	Historical photographs are often black and white, may show dirt, or unclear details; not all missing components are identifiable; compatibility does not demonstrate original association; post-excavation movements may have altered associations

ASSESS THE NATURE OF THE WOODEN SUPPORTS AND EXPLORE THE POSSIBILITY OF IDENTIFYING DIFFERENT WOODS NON-INVASIVELY.	Consultation with wood scientists; visual examination of exposed areas and losses; CT imaging; comparison of internal anatomical features	Preliminary information on wood morphology, block selection, defects, pith, knots, grain orientation, and possible differences between components	Contributes to understanding raw material choices, availability, workshop pragmatism, and the extent to which different components may have been selected according to function or constraint	Actually, definitive anatomical identification would require sampling from multiple blocks; non-invasive imaging may suggest structural differences but cannot always provide secure species identification; preservation and degradation of the wood can reduce diagnostic visibility
RECONSTRUCT CONSTRUCTION TECHNIQUES, ASSEMBLY SYSTEMS, AND PRODUCTION CHOICES	Macroscopic and microscopic visual observation; CT-based examination of internal structures	Identification of wooden blocks, joints, dowels, fractures, reassembled parts, tool marks, construction sequence, voids, cracks, and internal discontinuities	Clarifies how the sculptures and models were made and repaired, allowing comparison of technical solutions across typological groups and individual objects	Surface layers conceal much of the support; CT cannot always distinguish materials with similar X-ray attenuation; small details may remain ambiguous
CHARACTERISE GROUND LAYERS, PIGMENTS, AND PAINTING TECHNIQUES	Multiband imaging (VIS, UVF, IRR-NIR, IRFC-NIR, VIL); XRF; reflection FTIR; optical microscopy of cross-sections and SEM-EDS on selected samples.	Preliminary mapping of surface responses; elemental and molecular information; stratigraphic sequence; identification or hypothesis of painting materials, fillers, degradation products	Allows the comparison of material and pictorial procedures, helping to distinguish recurring workshop practices from object-specific or typological variations	Imaging is mainly indicative; XRF provides elemental rather than mineralogical information and cannot detect light elements; reflection FTIR may be affected by surface roughness, overlapping bands, degradation products, and coatings; SEM-EDS data are limited to sampled numbers
EVALUATE THE CONSERVATION STATE AND IDENTIFY TRACES OF ANCIENT OR MODERN INTERVENTIONS	Visual observation; UVF imaging; CT; FTIR; comparison with historical photographs and museum records	Evidence of cracks, detachments, losses, fills, adhesives, coatings, retouching, reassemblies, and changes in display configuration	Helps distinguish original features from later interventions and provides information relevant to future conservation planning and risk assessment	Some interventions are difficult to date; conservation materials may mask or alter the response of original materials; photographic comparison cannot quantify removed or added material

INVESTIGATE WHETHER RECURRENT TECHNICAL PATTERNS MAY INDICATE SHARED PRODUCTION PRACTICES, OR DIFFERENT HANDS	Integrated comparison of visual, CT, imaging, XRF, FTIR, and SEM-EDS results across bearers, boat models, crews, and detached components	Comparative dataset on material choices, construction methods, ground and paint stratigraphy, chromatic organisation, tool marks, and practical solutions adopted	Provides a basis for discussing production organisation and degrees of technical coherence or variation within the assemblage	Shared solutions may reflect shared production practices rather than the same workshop or hand; differences may result from object type, wood selection, or later alteration; the corpus is limited
DEFINE AN ETHICALLY SUSTAINABLE DIAGNOSTIC SEQUENCE AND MINIMISE INVASIVE PROCEDURES WHILE PRESERVING ANALYTICAL VALUE	Progressive diagnostic workflow; targeted sampling after preliminary analyses; exclusion of methods requiring excessive sampling	Reduced number of samples; prioritisation of comparable and representative areas; explicit recognition of questions deferred to future research	Demonstrates that the diagnostic plan was not a simple list of techniques but a staged decision-making process balancing research potential, conservation ethics, and available resources	The sequential approach slowed the research process; invasive analyses were limited; some questions remain only partially addressed

4.2. Historical and documentary research

Throughout the entire course of the project, the study of written and visual sources has represented a constant line of investigation, carried out in close connection with the scientific analyses.

The present study unfolded along three complementary lines. First, a review of the extant literature was conducted to assess the current state of research and to contextualize the sculptures within broader debates. This process enabled the identification of interpretative trends, unresolved issues, and potential directions for further inquiry. Second, archival documentation and museum materials were examined, including excavation reports, inventories, restoration files, and both historical and recent photographs. This provided essential information on the history, movements, and transformations of the corpus. Finally, direct observation of the artefacts, both those under investigation and related examples, offered a first-hand perspective on their material, technical, and stylistic features. These three strands of inquiry, developed in parallel and constantly interacting with one another, laid the foundation for the historical and stylistic understanding of the corpus, but also for the design of the diagnostic strategy, and the subsequent interpretation of the scientific outcomes.

4.2.1. The bibliographic study

The bibliographic study began with an initial phase of in-depth research on the Necropolis of Asyut. In this regard, the investigation focused particularly on the period in which the funerary assemblage was presumably produced, between the end of the First Intermediate Period and the beginning of the Middle Kingdom, and subsequently on the phases of the site's rediscovery by archaeologists and the succession of the various excavation campaigns. The latter research contributed significantly to clarifying the site's layout, burial typologies, and associated material assemblages. A particular attention was devoted to the excavation campaigns conducted by Schiaparelli (1906–1913) and those carried out by Hogarth during the same period on the opposite side of the mountain (1906–1907).

The present study proceeded with the search for examples of wooden funerary sculpture suitable for comparison, thus allowing the sculptures under examination to be placed within a broader framework. A thorough examination was conducted on sculptures originating from the same site of Asyut were examined, including both contemporary pieces and those belonging to earlier or later historical periods. Furthermore, the investigation encompassed sculptures and models from disparate geographical regions, thereby ensuring a comprehensive exploration of the subject. This phase of the research proved to be of significant value in providing a more precise contextualisation of the visual conventions and stylistic features adopted by the Asyut artisans in the production of these artefacts. Moreover, it provided an awareness, albeit at a relatively general level, of the stylistic evolution over time and of the qualitative differences observable between objects associated with the burials of individuals from different social strata. In this respect, corpus and repertory publications have been an invaluable resource, offering a coherent and accessible overview of homogeneous material.

Finally, the study of the state of the art regarding technical knowledge was carried out primarily through the analysis of manuals, academic theses, and restoration reports concerning materials comparable to those examined in this research. In this instance, due to the limited literature specifically dedicated to wooden sculpture, most of the consulted sources pertained to the broader fields of sculpture or woodworking.

A range of additional texts were also reviewed addressing more specific topics in detail, including the production of models, and boat models, extending even to furniture making. This broader scope was adopted in order to gain a wider understanding of the different types of joints known and employed in the Egyptian context, although these studies did not always provide a sufficient level of detail regarding technical aspects.

A further line of inquiry addressed fragmentary and dispersed material, including objects affected by post-excavation displacements, museum reorganisation processes, or the fragmentation of original assemblages. Although often receiving less attention than complete artefacts, fragmentary materials may provide valuable evidence for reconstructing partially dispersed funerary groups, refining chronological and contextual assessments, and identifying technical features otherwise difficult to access, including construction methods, joining systems, and manufacturing choices (Zöller-Engelhardt 2016, 27–32; Marco et al. 2019, 463–65). Moreover, the reassessment of museum collections and archival documentation may facilitate the reconnection of dispersed object groups and

the reconstruction of original associations that have been altered through excavation history, distribution practices, or later museum trajectories (Stevenson 2019, 13–16). Such perspectives proved particularly relevant in the present study given the research focus on erratic elements, reconstruction hypotheses, and object biographies.

Despite the fundamental nature of this type of research, its limitations are often underestimated, particularly regarding the amount of material to be analysed in relation to the researcher's actual resources. Several factors must be considered when attempting to achieve a comprehensive and exhaustive analysis. Such factors include the time available, prior preparation, access to sources, and language skills. It is acknowledged that these factors make it difficult to achieve such an analysis, even within the framework of a multi-year project.

4.2.2. The archival documentation and museum materials

The second research line focused on the study of both historical and recent documentary materials available for the artefacts under examination. With regard to the documentation produced by Schiaparelli, its consultation was greatly facilitated by the 2019 publication in which the authors undertook the task of releasing the previously unpublished materials produced by the Italian Archaeological Mission during the excavation campaigns at Asyut (Kahl et al. 2019). A further privileged circumstance was the possibility of being assisted in this research by one of the authors of that publication, Del Vesco. His guidance significantly facilitated both access to the materials and their accurate interpretation.

Another crucial source for this research was the collection of photographic resources. Access to these materials was facilitated by two major digitalisation projects of the photographic archives, which were conducted between 2008–2010 and 2018–2021, respectively. The outcomes of these initiatives resulted, respectively, in the digitisation of 2,000 glass plates and in the publication of 45,000 freely accessible images on an online platform (Moiso and Montonati 2021). In addition to these resources, further materials were consulted through the museum's online collection database, as well as through internal documentation kindly provided by the curators and registrars of the Museum.

As stated in chapter 3, during his period as Director of the Museum, Schiaparelli encouraged the systematic production of photographic material, particularly during excavation activities, a practice that was subsequently continued by his collaborators. During this period, a significant number of photographic plates were produced, which now form the principal core of the Museo Egizio's photographic archive (Moiso and Montonati 2021, 88–89). In addition to the photographic campaigns carried out by museum staff, several others were commissioned from external professionals. Among these, the photographs taken by the Fratelli Alinari proved particularly valuable, including the plate representing the first photographic documentation of the sculptures found in the tomb of Minhotep. These images were later digitised by the Fratelli Alinari Archive, greatly facilitating their accessibility and consultation.

The photographic campaigns carried out on the artefacts over the years have facilitated the observation of alterations of these objects over time. The most evident alterations are those to the display configuration of the works, including the repositioning, loss, or addition of

elements. Furthermore, it has been possible to ascertain the execution of specific conservation treatments, both structural and, more notably, concerning the surface cleaning of the pictorial layer. These latter operations are subject to hypothesis formulations, as visual observation alone does not allow the determination of the quantity or distribution of the material removed. Consequently, the use of prior photographic documentation facilitates a more precise comprehension of the artefacts' condition before the interventions.

A significant limitation inherent in such evaluations pertains to the inability to ascertain precise chronologies for the majority of the photographic materials examined. With the exception of a few examples, such as those taken by the Fratelli Alinari and the more recent documentation, which, although not always precisely datable, can at least be attributed to a general time frame, the situation in most cases remains rather uncertain. The only reliable chronological reference is the *post quem* provided by colour photographs, whose regular use became established mainly from the 1960s onwards. However, in the case of black and white photographs, this same criterion cannot be applied, as they coexisted with colour photography for a considerable period before being definitively replaced.

Nevertheless, in some instances, a partial reconstruction of the chronological sequence can be attempted through cross-referencing the various pieces of information observable across different photographs. In this phase of the research as well, the support of the museum staff, particularly Montonati, was crucial in facilitating the understanding and interpretation of the available material. This collaboration also facilitated a productive exchange concerning the search for erratic elements, a line of investigation previously undertaken, at least in part, by Montonati himself, who kindly shared his findings with us. The final phase of this research conducted on the materials held within the Museum constituted the search for erratic elements, that is components visible in the 1920s photographs but no longer present in the objects today. As previously mentioned, following an examination of the conservation history of the artefacts, the first resources consulted for identifying the erratic elements were the "Supplementary Inventory" (S.), covering entries between S.07911 and S.15685, which contains the materials unearthed by the Italian Archaeological Mission (MAI) at Asyut (in particular, entries between S.08650 and S.09487 refer to the 1907–08 excavation campaigns), and the "Temporary Inventory" (P./Prov.), which includes all erratic materials not attributable to a specific context and compiled in the post-war period following the collection's return to Turin.

The investigation started with the observation of the artefacts in their current state, with particular attention being paid to the visible joining elements. These joints were then compared with those of the components that were still in place at the time, in order to assess their compatibility. At this preliminary stage of analysis, it was possible to identify certain materials as unrelated to the sculptures. Moreover, it was found that others had been repositioned differently from their original configuration.

The joints were also compared with those components that were no longer present but visible in the historical photographs from the 1920s. Subsequent analysis of the image was then undertaken to determine the main characteristics that could facilitate identification of each missing component. These characteristics included the joining system with the main

object, its morphology, the presence of errors or peculiarities in the painted decoration, and the presence and shape of any losses in the decorative layers¹³.

In relation to the assessments conducted on the pictorial surface, it is necessary to consider the limitations inherent to the use of a black and white reference photograph. Additionally, the noticeably poorer state of surface cleanliness of the objects at the time of the image capture relative to their present condition must be taken in account.

At this stage, the precise number of missing elements was known, and for many of them, an aesthetic profile to be searched for had been established. The initial phase of the research was conducted digitally, with the investigation being narrowed to those inventory numbers corresponding to objects that were compatible with the identified profiles. A subsequent phase involved the direct observation of the selected materials, which allowed for a further refinement of the selection. This process resulted in a list of materials that were included among the objects under study, with the aim of scientifically verifying their actual compatibility with the main artwork.

4.2.3. The observation of the artefacts

As illustrated by the preceding phase the final stage of the study addressed in this section is arguably the most significant one, namely the direct observation of the artefacts. This constitutes one of the most essential tools available to a conservator, as it enables the examination of the material substance itself and the formulation of hypotheses concerning the methods and techniques employed in the creation of the object, its conservation history, and its present state of preservation.

In this phase, the artefacts were subjected to a visual examination, carried out also by means of 2.5x magnifying lenses and a digital video microscope. The observation was conducted under conditions of diffuse light, raking light, and, in some cases, ultraviolet light. The handling of the object also formed an integral part of the process, allowing observation from multiple perspectives and providing crucial information, both for the interpretation of texture and materiality, and for assessing aspects such as weight.

The observation is generally carried out following a sequential approach, focusing on the examination of the support, ground layers, pictorial film, and any modern interventions. In the present case, the observation of the wooden support proved to be the most complex phase, as it is largely concealed by the overlying layers. Consequently, this stage relied heavily on the morphological reading of the artefacts and on the examination of areas affected by losses in the decorative layers.

During the observation process, particular attention was devoted to the interpretation of the material and its volumes, with specific interest in identifying elements such as defects in the wooden matrix, tool marks or traces indicative of specific working gestures, and any discontinuities that might suggest the presence of joints, assemblages, or fractures.

In the case of objects composed of multiple elements, particularly when some of these are absent, it is essential to observe the traces left by their former presence on the surface. These traces not only indicate the presence of elements that are no longer attached but also

¹³ See Appendix B

provide valuable information regarding their original position and dimensions. Such data are crucial for the identification of erratic or alien components.

During the examination of the pictorial layers attention was also paid on stratigraphic sequence of the paint layers and to the traces that reveal the artisan's working gestures, such as the precision of the painted fields and graphic elements, chromatic and stylistic choices, or signs of hesitation and reworking. When juxtaposed with stylistic and analytical evaluations of material choices, these observations on the artist's gestures can serve as a useful tool for identifying different hands involved in the execution.

The assessment and recognition of possible conservation treatments were carried out by observing discrepancies in volumetric composition that might suggest the presence of adhesives or reassemblies, the continuity or discontinuity of craquelure patterns, and material or chromatic differences that could indicate the application of recent materials or retouching on the pictorial surface.

4.3. Development of the diagnostic plan

As previously mentioned, the planning of the scientific investigations was primarily guided by four main criteria: the accessibility of the analytical facilities, the typological subdivision of the artefacts, the adoption of a multi-technique approach, and the prioritization of non-invasive methods. In light of the significance and the fragility of the sculptures, the diagnostic strategy was thus designed to minimise the number of analyses and, above all, to reduce sampling to the bare minimum required, while ensuring that the results obtained from the different objects could be directly compared. Consequently, a comprehensive diagnostic strategy was formulated with minor modification to align with the distinctive typological attributes of each sculpture. The artefacts were thus grouped by type, and the outcomes derived from each group served to guide any further, more targeted analytical investigations when necessary.

The main objectives of the diagnostic investigations concerned the study of the construction technique, with a particular emphasis on the identification of the materials employed, the examination of supports morphology, the analysis of the joining systems and the decorative layers, and the recognition of tool marks. Secondly, the analysis of the state of preservation, the alterations, and the presence of both ancient and modern restorations was also undertaken. These latter aspects were regarded as 'secondary', as they were considered ancillary to the primary need to distinguish between elements pertaining to the original construction technique and those of later origin. In the context of a potential conservative intervention, these aspects would undoubtedly require further investigation.

The diagnostic campaign, carried out at the Centro Conservazione Restauro "La Venaria Reale" (CCR) and at the Museo Egizio, was articulated in two complementary phases. The first was entirely focused on non-invasive investigations, while the second, which was envisaged only after the evaluation of the preliminary results, was dedicated to micro-invasive analyses. The purpose of these analyses was to refine the understanding of the materials and their stratigraphic organization.

The initial phase included complete photographic documentation of the sculptures under visible light, intended both for archival purposes and as a reference for later analytical stages. A series of multiband imaging analyses were also acquired, such as ultraviolet-induced visible fluorescence photography (UVF), near infrared reflectography nm (IRR-NIR), false-colour infrared imaging (IRFC-NIR) and visible-induced luminescence photography (VIL).

A particularly significant contribution to the study was then offered by computed tomography (CT), which made it possible to explore non-invasively the internal structure of the sculptures. This technique supplied valuable data on the conservation state and physical characteristics of the wood, on the technical details of the assembly systems, and on the thickness and distribution of the pictorial layers. In the case of erratic elements, it also enabled the verification of the correspondence between joints, and the correlation between adjacent elements, thus providing essential information for assessing whether these fragments could belong to the same ensemble. A further pertinent issue that was addressed was the identification of the wood species employed in the sculptures. Since each object is composed of multiple wooden blocks of different species, a traditional anatomical approach would have necessitated an extensive number of samples. To avoid the necessity of such invasive procedures, the research explored, in collaboration with wood scientists, the potential of microtomographic imaging as a possible non-invasive tool to distinguish between different species or, at least, to detect possible structural differences among them.

Complementary to imaging, non-invasive elemental and molecular analyses were carried out to investigate the composition of pigments and other surface materials. X-ray fluorescence spectroscopy (XRF) was used to identify elemental components, while reflection Fourier-transform infrared spectroscopy (FTIR) contributed to the recognition of molecular substances on the surface. The outcomes of these analyses not only provided valuable information in their own right, but also contributed to identifying the areas and materials most suitable for subsequent in-depth investigations.

The second phase of the diagnostic plan focused on a more detailed characterisation of materials through micro-invasive investigations. The selection of sampling points was carefully carried out in order to ensure the representativity of the collected data and their comparability among the various sculptures. Cross-sections were produced and they were observed under optical microscopy in both visible and ultraviolet light, and under scanning electron microscopy (SEM) coupled with energy-dispersive spectroscopy (EDS) for the characterization of inorganic pigments and inert materials.

The invasive analyses conducted during this study were limited exclusively to the sculptures representing offering bearers. This choice was primarily dictated by time constraints in carrying out the diagnostic campaign, although the difficulty of selecting a limited number of micro-invasive sampling points on complex artefacts, such as the boat models, must also be taken into account. Therefore, it was preferred to sacrifice the acquisition of additional data rather than to accelerate the process at the expense of accuracy in the selection and representativeness of the samples.

The significance of the methodological sequence that has been adopted is precisely in this consideration. The performance and assessment of outcomes from non-invasive

investigations prior to the planning of micro-invasive investigations is disadvantageous in terms of its effect on the pace of the study. However, it is advantageous in terms of the more cautious and informed approach that can be taken with regard to the artefacts.

This reasoning guided the adoption of a multi-technical, non-invasive approach, where cross-comparison of results allows the techniques to corroborate one another or, when discrepancies arise, to identify areas requiring further analysis.

Finally, it is important to briefly mention certain analytical techniques that were initially considered but subsequently discarded during the course of the study. In the context of the invasive analyses, the potential for conducting investigations aimed at identifying the wooden material, and the ground and pictorial layers had initially been considered.

The initial hypothesis was to perform transmission FTIR analyses. However, this option was soon dismissed due to the satisfactory results obtained through reflection FTIR, as it was deemed insufficiently sensitive for the intended purpose. The material under examination was not only heavily degraded and rich in oxalates, but also impure, being contaminated by residues derived from pigments and from restoration materials such as adhesives or consolidants (for instance, Paraloid B72). The possibility of conducting gas chromatography to detect the binders was thus contemplated, but it required approximately 1 mg of sample for an optimal analysis. Since binding medium constitutes only a minimal fraction of the sample, as it is largely obscured by pigments, restoration materials, and degradation products, a larger sample volume would be required to obtain a meaningful measurement. Therefore, in consideration of the thinness of the pictorial layer and the limited dimensions of the objects, this analytical technique was excluded, thereby renouncing the examination of this particular technical feature, pending future access to analytical facilities requiring smaller sample quantities for reliable binder characterisation.

4.3.1. Photographic imaging

Within the framework of the diagnostic plan, imaging analyses represented a crucial first step toward the characterisation of the sculptures. These investigations were conceived as entirely non-invasive, providing an essential overview of the objects' surface and subsurface features before any targeted analytical or sampling activities were undertaken. The employment of different portions of the electromagnetic spectrum, allows the documentation of materials and techniques, the detection of traces of past intervention, and the identification of areas of particular interest for subsequent study. These analyses were conducted at the CCR laboratories by specialised professionals.

The multispectral analyses were conducted by placing the objects in a fixed position and capturing all the images in the different spectral bands sequentially, without moving them (Fig. 10). This process resulted in a set of superimposable photographs, allowing for direct comparison. For all imaging investigations, the photographic acquisitions were carried out using a Nikon Z7 II full-spectrum mirrorless body modified to extend the spectral sensitivity range to approximately 350–1100 nm. The camera was equipped with an 8256 × 5504-pixel silicon CMOS sensor plus UV-IR Cut and BG40 filters (IR and fitted with a high-pass filter centred at 830 (±20) nm.).



Fig. 10 – Photographic setup (Boat 0)

The artefacts were initially photographed under diffuse visible light. The photographic setup employed two flash units (Godox QT-1200II) positioned symmetrically to the right and left of the object, at an angle of approximately 45° to the surface normal, with softening

diffusers used to obtain an even and well-balanced illumination.

The raw files were processed through a standardised workflow using Adobe Lightroom, Adobe Photoshop and PTGui software. The process included colour calibration by placing a Calibrite ColorChecker Classic 24-colour reference target within the shooting frame during acquisition, allowing consistent colour management and cross-image comparability across the entire dataset.

Following the acquisition in visible light, near-infrared reflectography (IRR-NIR) was performed to reveal information not detectable to the naked eye of heterogeneous materials beneath the superficial paint layer, such as underlying features, gaps or alterations, past restorations. The illumination setup again employed two Godox QT-1200II flash units positioned symmetrically on either side of the object, thereby ensuring an even distribution of light over the examined surface. The images were recorded within the near-infrared range, approximately 830–1100 nm. The post-processing of the infrared images was conducted using Adobe Lightroom and Adobe Photoshop. A Calibrite ColorChecker Classic 24-colour reference target was included in the acquisition field, employed in this case exclusively for greyscale calibration to optimise exposure and tonal balance in the NIR range. The workflow had previously been standardised through calibration against a Spectralon Labsphere 99 % reflectance standard, ensuring consistent radiometric accuracy and facilitating the comparison of the resulting reflectograms across the dataset.

With the sets of images acquired in both visible and near-infrared light, it was then possible to produce false-colour infrared composites (IRFC-NIR), aimed at enhancing the visual differentiation of materials with similar chromatic appearances but differing

spectral responses. The false-colour images were produced within the RGB colour space of Adobe Photoshop by combining one image captured in reflected visible light with another acquired in the infrared range. During processing, the RGB channels of the visible image were reassigned so that the green (G) and red (R) channels replaced respectively the blue (B) and green (G) positions, while the red (R) channel was filled with the corresponding infrared image. The process of channel reassignment resulted in the production of composite images of the NIR-R-G (RGB) type. The resulting false-colour renderings allowed a rapid and intuitive distinction between pigments and materials exhibiting similar tones in visible light, but with different chemical composition. This technique supports the interpretation of the uniformity of surface materials, and the presence of past retouches. It facilitates the formulation of preliminary hypotheses concerning the nature of the pigments, and the planning of subsequent analytical investigations.

The subsequent phase involved the documentation of ultraviolet-induced visible fluorescence photography (UVF), a technique particularly effective in identifying organic and inorganic substances that exhibit characteristic visible fluorescence emissions when excited with ultraviolet light. The objects were illuminated using two 5 W UV LED lamps with an emission peak centred at 365 (± 10) nm. The image processing was carried out using Adobe Lightroom, Adobe Photoshop, and PTGui software applications. Non-luminescent spectroscopic standards were employed during post-production to ensure the reliability of the observed fluorescence and to prevent false chromatic artefacts. This phase provided crucial information about substances invisible or indistinguishable to the naked eye, including surface coatings, and restoration materials. These substances often respond distinctly under ultraviolet excitation, thereby significantly contributing to the interpretation of the decorative techniques and conservation history of the sculptures. Moreover, in such cases, the identification of coatings or latter additions that might compromise the representativity of sampling points, is fundamental for the following investigations.

Finally, visible-induced infrared luminescence (VIL) imaging was performed to detect the presence of materials that emit in the infrared region when excited by visible light. Of particular significance are the Egyptian blue, the Han blue, the Han purple and modern pigments such as cadmium-based pigments and manganese blue. The objects were illuminated by a continuous white LED light source that was fitted with a UV-IR Cut filter. The images were acquired within the spectral range of approximately 830–1100 nm. The post-processing of the images was conducted using Adobe Lightroom and Adobe Photoshop. Colour calibration and exposure adjustment were refined by including in the frame a Calibrite ColorChecker Classic 24-colour target, used specifically to evaluate and reduce reflected-light components. In addition, a standard sample of Egyptian blue (Kremer Pigmente n. 10060) was introduced as a comparative reference, ensuring the correct identification of infrared-emitting pigments within the recorded images.

To facilitate the visual interpretation of luminescent responses, false-colour VIL (VILFC) images were generated, with the same workflow of the IRFC. The infrared luminescence image was assigned to the red channel, while the visible red and green channels were reassigned to the green and blue channels respectively. Through this channel

reassignment, infrared-emitting materials acquire characteristic false-colour hues, allowing their distribution to be more readily distinguished from non-luminescent areas. These techniques allow for a general overview of the manufacturing practices and materials under analysis through a non-invasive approach. However, they are not without limitations, which must be taken into account to achieve coherent and reliable evaluations. Firstly, the investigated artefacts, due to their complex and three-dimensional nature, do not always allow for the optimal rendering of such investigations. The resulting outputs are two-dimensional and, even when obtained through multiple shooting angles, they cannot fully capture all possible points of view. A second intrinsic limitation concerns the fact that the detection of specific pigments or features is not always possible through these techniques. This aspect is closely connected to a third and more significant issue: the interpretation of the results is based on the colours recorded by the camera. This factor introduces an inherent margin of interpretative subjectivity, as different observers may perceive colours differently, and distinct materials may respond with similar hues. Consequently, the interpretation of these analyses in terms of material identification is, except for a few specific cases, approximate and must be corroborated by data obtained through other analytical techniques.

4.3.2. X-ray tomography

X-ray tomographic imaging represents one of the most informative non-invasive diagnostic techniques available for the study of three-dimensional artefacts. Computed tomography (CT) allows the visualisation of the internal structure of objects in three dimensions by exploiting the different interaction of X-rays with materials with different atomic number, density or thickness. This approach enables the identification of structural, technical and conservation features of the artefacts.

For the present study, tomographic acquisitions were performed at the CCR using a custom-built CT system developed within the *neu_ART* project (Nervo 2013) and subsequently upgraded with the possibility of using a flat-panel detector (Vigorelli et al. 2020). The apparatus is equipped with a General Electric Eresco 42 MF4 X-ray source with a tungsten anode and a 0.8 mm beryllium window. The emitted beam assumes a conical geometry with an elliptical section (approximately 40° vertically and 60° horizontally), and a focal spot of approximately 3 mm. A 2 mm aluminium filter was placed in front of the tube exit window to absorb low-energy radiation and reduce beam-hardening effects. The tube, which was equipped with an air-cooling system, was used in irradiation cycles that lasted approximately 40 minutes, followed by a 20-minute cooling period to prevent overheating.

The digital detection system, for what concerned the sculptures of offering bearers, consisted of a high resolution flat panel detector Shad-o-Box 6 K HS produced by Teledyne Dalsa, with a pixel dimension of 49,5 µm, and an active area of 11,4x14,6 cm. Due to its dimensions, the detector is especially well suited for recording small-sized objects. For larger artefacts, however, a system with a wider active area is preferable. Therefore, to acquire the boat models, the detector used was a Rad-icon 2329HS flat-panel detector by Teledyne Dalsa, which possesses the same pixel dimension, but an active area

of 23x29 cm. Despite the variation in dimensions of the detectors' active areas, in order to capture the complete geometry of most of the acquired objects, given their large dimensions, it was necessary to carry out multiple acquisition stages by vertically shifting detector and source. In consideration of the rectangular shape of the detectors, their orientation was determined in accordance with the geometry of the artefact being acquired.

Image acquisition was controlled through a custom made LabView software and carried out by rotating the object on a precision motorised rotating platform of about 20 cm diameter (Newport URS150BPP), on which the artefacts under analysis were placed. The offering bearers, whose figures are mounted on a wooden base, were simply placed on the platform. However, the precaution of positioning a wooden board topped with a sheet of Ethafoam® between the metal base and the object was taken, in order to obtain a clean separation between the object and the platform during post-production, as the Ethafoam® is reasonably transparent to X-rays. An exception was the offering bearer S. 8794, whose base was found to be lacking in stability during the rotation process. Consequently, the base was partially inserted into a custom-shaped Ethafoam® support, with the specific intention of improving its stability (Fig. 11).



Fig. 11 – CT setup, Bearer 8794 (Bearer C). Light blue arrow: source; Pink arrow: rotating platform; Yellow arrow: Bearer C; Green arrow: detector

The same apparatus was later employed for the wooden boat models. Each hull was mounted vertically on the rotating platform, supported by a custom counter-mould made of laminated Ethafoam® plates glued to a wooden board. This vertical configuration reduced the X-ray path length through the object, thereby optimising the penetration achievable with the available source energy while still ensuring sufficient image clarity. At the same time, it allowed the boats to be positioned in close proximity to the detector, maximising image resolution and minimising parallax distortion (Fig. 12). However, due to the geometry of the hulls and their vertical position, although this did not pose any risk to the stability of the object on the rotating platform, it caused a slight flag-like vibration in the upper part of the artefact, protruding from the support, when the platform's rotational movement came to a stop. Despite the imperceptibility of this movement, there was a potential compromise to the acquisition process. Therefore, a brief delay was implemented prior to image capture in order to allow the artefact to stabilise. Finally, the smaller

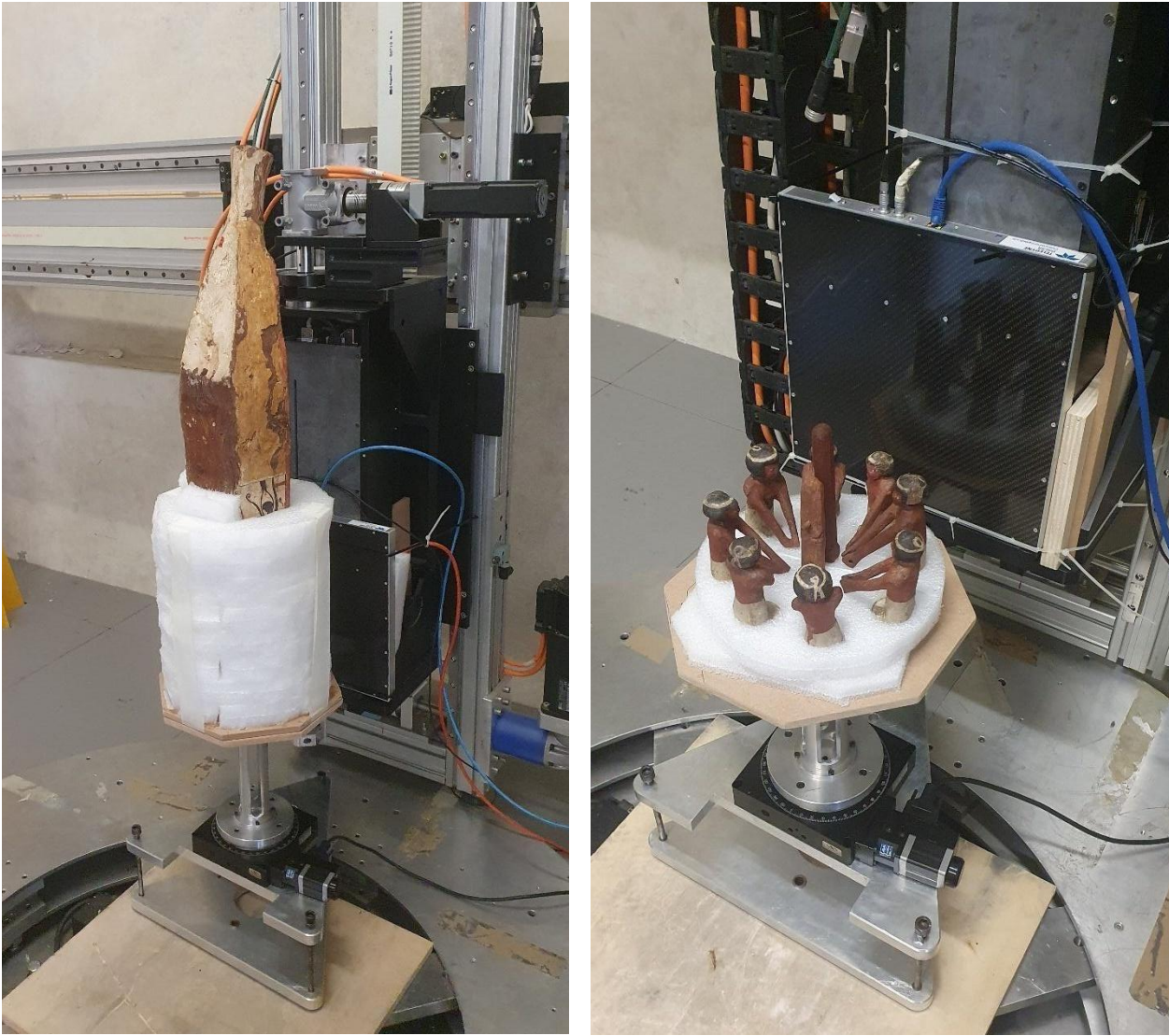


Fig. 12 – Left: Boat 8792 (Boat 2) CT setup. Right: Set of sailors 2 setup

elements, such as fragments, assembled components, and crew members, were subjected to tomographic analysis in groups and mounted on a wooden board topped with a custom shaped Ethafoam® base designed to accommodate the various pieces (Fig. 12). The configuration was intended to maximise the use of the available space within a single scan and thereby minimise the number of tomographic acquisitions required. Before and after each tomographic session, the white-field (X-ray on, no object) and dark-field (X-ray off) references were acquired to correct for beam inhomogeneities and eliminate background noise in the postproduction phase. For the execution of the different working sessions, the artefacts were divided as follows: offering bearer S.8795 (Bearer A), offering bearer S.8796 (Bearer B), offering bearer S.8794 (Bearer C), boat model S.8790 (Boat 0/B0), boat model S.8791 (Boat 1/B1), boat model S.8792 (Boat 2/B2), boat model S.8793 (Boat 3/B3), a set of erratic fragments related to the offering bearers, and 4 sets of sailors and nautical elements, including both the sailors belonging to the boats and the erratic sailors (labelled as E). The elements that compose these latter sets, mostly grouped according to geometric and spatial requirements, were illustrated in Table 2. The parameters set for the acquisition of the different artefacts and groups of artefacts are described in Table 3.

Table 2. Sets of minor elements for CT analysis

Offering bearers fragments	Set of sailors 1	Set of sailors 2	Set of sailors 3	Set of sailors 4
Right arm (P. 0045)	Sailor B1 (B1-1)	Sailor B0 (B0-1D)	Sailor B0 (B0-T)	Sailor B2 (B2-1)
Left arm (P. 0065)	Sailor B1 (B1-2)	Sailor B0 (B0-2D)	Passenger (B1-E4P/ S.14813/127)	Sailor B2 (B2-2)
Duck wing (S.08165/32)	Sailor (B1-E1/ S.14813/71)	Sailor B0 (B0-3D)	Sailor (B1-E5H/ S.14813/132)	Sailor B2 (B2-3)
Duck wing (S.08165/33)	Sailor (B1-E2/ S.14813/72)	Sailor B0 (B0-4D)	Sailor (B2-E2H/ S.14813/131)	Sailor B2 (B2-4)
	Sailor (B1-E3/ S.14813/48)	Sailor B0 (B0-1S)	Quarter rudder oar stanchions (B1-E/ S. 14829/2)	Sailor B2 (B2-5)
	Sailor (B2-E1/ S.14813/134)	Sailor B0 (B0-2S)	Quarter rudder oar stanchions (B1-E/ S. 14829/3)	Passenger B2 (B2-6P)
		Sailor B0 (B0-3S)	Canopy (S. 14828/16)	Canopy B1
		Sailor B0 (B0-4S)		
		B0 - Quarter rudder oar stanchions		
		B1 - Crossbeam quarter rudder		

Table 3. CT experimental detail

Object	Bearer A	Bearer B	Bearer C	Offering bearers fragments
Geometry dimensions	60x12,5x25,5 cm ³	44,7x14x13 cm ³	63,5x17x23 cm ³	13x13x10 cm ³
X-ray detector	Shad-o-Box 6 K HS (vertical)	Shad-o-Box 6 K HS (vertical)	Shad-o-Box 6 K HS (horizontal)	Shad-o-Box 6 K HS (vertical)
Tube voltage	80 Kv	80 kV	80 kV	80 Kv
Tube current	10 mA	10 mA	10 mA	10 mA
Integration time	1750 ms	1650 ms	1400 ms	1400 ms
Angular step	0,25°	0,25°	0,25°	0,25°
N° of projections	1440	1440	1440	1440
Scan portions	3	5	5	1

Source-Detector Distance (SDD)	3,75 m	3,735 m	3,75 m	3,75 m
Source-Object Distance (SOD)	3,51 m	3,535 m	3,45 m	3,45 m
Object-Detector Distance (ODD)	240 mm	200 mm	300 mm	300 mm
Magnification	1,07	1,06	1,09	1,09
Binning	/	/	/	/
Voxel size	46 μm	47 μm	46 μm	46 μm
Penumbra	205 μm	170 μm	261 μm	261 μm

Object	Boat 0	Boat 1	Boat 2	Boat 3
Geometry dimensions	17,5x83x16,5 cm ³	19,5x84x10 cm ³	19x84x17 cm ³	14,5x62x8 cm ³
X-ray detector	Rad-icon 2329HS (horizontal)	Rad-icon 2329HS (horizontal)	Rad-icon 2329HS (horizontal)	Rad-icon 2329HS (vertical)
Tube voltage	90 kV	90 kV	90 kV	90 kV
Tube current	9,5 mA	9,5 mA	9,5 mA	9,5 mA
Integration time	350 ms	350 ms	520 ms	350 ms
Angular step	0,15°	0,15°	0,15°	0,15°
N° of projections	2400	2400	2400	2400
Scan portions	5	5	5	3
Source-Detector Distance (SDD)	3,758 m	3,758 m	3,758 m	3,758 m
Source-Object Distance (SOD)	3,549 m	3,549 m	3,549 m	3,549 m
Object-Detector Distance (ODD)	209 mm	209 mm	209 mm	209 mm
Magnification	1.06	1.06	1.06	1,06
Binning	2x	2x	2x	2x
Voxel size	93,49 μm	93,49 μm	93,49 μm	93,49 μm
Penumbra	177 μm	177 μm	177 μm	177 μm

Object	Set of sailors 1	Set of sailors 2	Set of sailors 3	Set of sailors 4
Geometry dimensions	21x20,5x20,5 cm ³	18x25x25 cm ³	18x25x25 cm ³	22,5x20,5x20,5 cm ³
X-ray detector	Rad-icon 2329HS (vertical)	Rad-icon 2329HS (horizontal)	Rad-icon 2329HS (horizontal)	Rad-icon 2329HS (horizontal)

Tube voltage	90 kV	90 kV	90 kV	90 kV
Tube current	9,5 mA	9,5 mA	9,5 mA	9,5 mA
Integration time	350 ms	350 ms	350 ms	350 ms
Angular step	0,15°	0,15°	0,15°	0,15°
N° of projections	2400	2400	2400	2400
Scan portions	1	1	1	1
Source-Detector Distance (SDD)	3,758 m	3,758 m	3,758 m	3,758 m
Source-Object Distance (SOD)	3,549 m	3,549 m	3,549 m	3,549 m
Object-Detector Distance (ODD)	209 mm	209 mm	209 mm	209 mm
Magnification	1,06	1,06	1,06	1,06
Binning	2x	2x	2x	2x
Voxel size	93,49 μ m	93,49 μ m	93,49 μ m	93,49 μ m
Penumbra	177 μ m	177 μ m	177 μ m	177 μ m

Following data acquisition, the tomographic projections underwent a multi-step post-processing workflow designed to optimise image quality and carry out the three-dimensional reconstruction of the dataset. The raw radiographs were first converted from the original TIFF format to SDT files using MATLAB, ensuring compatibility with the subsequent reconstruction software. The subsequent phase was carried out in ParRec (Brancaccio et al. 2011), where dark-field and white-field corrections were implemented. The same software was utilised to extract attenuation data from the corrected radiographs, which were then employed to generate sinograms, which represent the foundational matrices for volumetric reconstruction. Once the correct centre was defined, the appropriate reconstruction geometry, fan-beam or cone-beam, depending on the scanning configuration, was selected to ensure optimal spatial accuracy. In particular, the reconstruction of the three models of offering bearers and the related set of fragments was performed in fan beam configuration, while all the others have been reconstructed in cone beam.

The reconstructed datasets were subsequently processed and visualised using ORS Dragonfly 2022.2 or VGStudio Max 2.2, which allowed the observation and analysis of the three-dimensional volumes as well as of the orthogonal cross-sections along the three axes of the cartesian planes. These softwares also facilitated the isolation of individual structural components, the measurement of internal features, and a detailed assessment of the objects' conservation state.

The resulting CT scans provided a detailed visualisation of the sculptures' internal morphology, including the orientation and distribution of the different wooden blocks, the assembly systems, and the condition of the material. The analysis enabled the

identification of structural joints, restoration inserts, and filling materials, in addition to the evaluation of cracks, voids, and biological degradation presence. In the case of the painted surfaces, tomographic data also contributed to the assessment of the adhesion and continuity of the ground and paint layers, highlighting areas affected by detachments or losses. Another highly useful feature concerns the possibility to adjust the brightness balance parameters, which allows, as needed, the enhancement of darker areas or the reduction of lighter ones, thereby making it possible to highlight specific details of interest. The only aspect of the technique that requires particular caution lies in its inability to distinguish between materials of similar X-ray mass attenuation coefficient, which may lead to misinterpretations, for instance, in the identification of restoration elements or material stratifications. Finally, the grey scale is a discrete measurement unit, that allows the comparison of elements within a single file, and it does not permit the extension of such evaluations to all the different sculptures.

4.3.3. X-ray fluorescence

X-ray fluorescence (XRF) spectroscopy was employed as a non-invasive analytical method aimed at determining the elemental composition of the polychrome surfaces. The technique is based on the detection of characteristic X-rays emitted by the atoms of a given material when excited by a primary X-ray source. As it does not require sampling and any form of surface preparation or contact, it represents an ideal approach for the investigation of artefacts, allowing in many cases the identification of the inorganic part associated with pigments, fillers, and preparation materials. The analyses were primarily intended to identify the chemical elements constituting the painting materials and to support the interpretation of the painting techniques and material correspondences among the sculptures. In particular, XRF allows the detection in air of elements from Na to U, allowing the formulation of hypotheses concerning the pigments nature, and providing a valuable correlation with the data obtained from complementary spectroscopic and imaging techniques.

During the analytical campaign, two different instruments were employed, selected according to the logistical and conservation requirements of the individual objects. Two of the three offering bearer sculptures (Bearer A and B) were analysed using both setups, while the wooden boats and other artefacts were investigated exclusively with the instrument at the CCR laboratories.

The majority of the analyses was performed with the Bruker ARTAX 200 Micro-EDXRF spectrometer, housed at the CCR (Fig. 13). The system is equipped with a fine-focus X-ray source featuring a molybdenum anode, and a silicon drift detector (SDD) with an 8 μm beryllium window, offering an average energy resolution of approximately 144 eV (full width at half maximum on the Mn $K\alpha$ line). The instrument incorporates a 4096-channel analogue-to-digital converter, a range of interchangeable filters, and two collimators to adjust the analytical spot size. Measurements were conducted at 30 kV, 1500 μA , with an acquisition time of 120 s, 2 mm of spot size and without filter, while a continuous helium flux was applied to the measurement area to improve detection limits, enabling the identification of elements down to sodium ($Z=11$).

A second set of measurements was executed with a THERMO Niton XL5 Plus portable spectrometer (Department of Chemistry, University of Turin), specifically used for the Offering Bearers A and B, which could not be moved from the Museo Egizio (Fig. 14). This handheld instrument is equipped with a graphene-window silicon drift detector (SDD) providing an energy resolution of approximately 135 eV, and a silver anode X-ray tube operating within the range 6–50 kV and 0–500 μ A, with a maximum power output of 5 W. Each analysis consisted of four sequential acquisitions, optimised for different energy ranges: Main (40 kV, Al/Fe filter), High (50 kV, Mo filter), Low (20 kV, Cu filter), and Light (7 kV, no filter). The measurement area was elliptical, with a diameter of about 3 mm, and each full analytical cycle lasted 120 seconds. The probe was mounted on a tripod support, ensuring stable positioning and flexible orientation during *in situ* measurements.

All spectra were exported in .txt format, raw data were normalised according to the anode of the instrument employed. and subsequently plotted using Origin software for graphical

visualisation and peak interpretation.

For comparative analysis, the data were examined preferentially in logarithmic scale, a representation that enhances the visibility of low-intensity peaks and facilitates the identification of minor elements. The number of the measurement points for each sculpture, along with the corresponding photographic maps of the analysed areas can be found in Appendix E.

When interpreting the data, it is important to consider the limitations of the XRF technique. Owing to the three-dimensional morphology of the sculptures, some areas were physically inaccessible to the probe, particularly recessed or protruding zones that prevented close proximity with the detector head. Furthermore, the technique provides only elemental information, without distinguishing the chemical state to the mineralogical compound of each element or different layers composition. Consequently, the differentiation of pigments with similar elemental compositions is not possible solely through XRF analysis. Elements with $Z < 11$, such as C or O, remain below

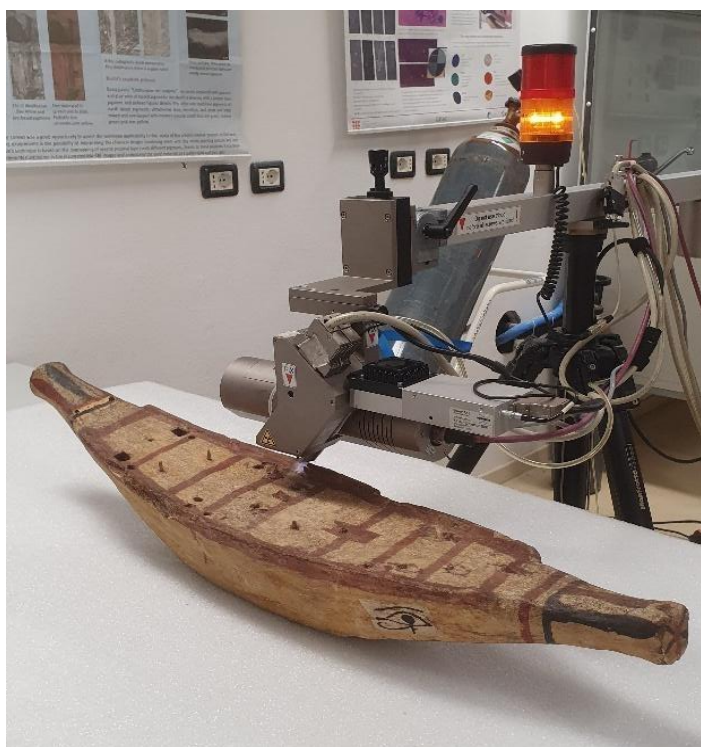


Fig. 13 – Bruker ARTAX 200 Micro-EDXRF spectrometer, measurement on Boat 1



Fig. 14 – THERMO Niton XL5 Plus portable spectrometer, measurement on Bearer B

the detection threshold. Consequently, the XRF results were interpreted in conjunction with the data from complementary analytical techniques, such as FTIR and imaging analyses, to achieve a comprehensive understanding of the materials and painting techniques.

4.3.4. Fourier Transform Infrared Spectroscopy

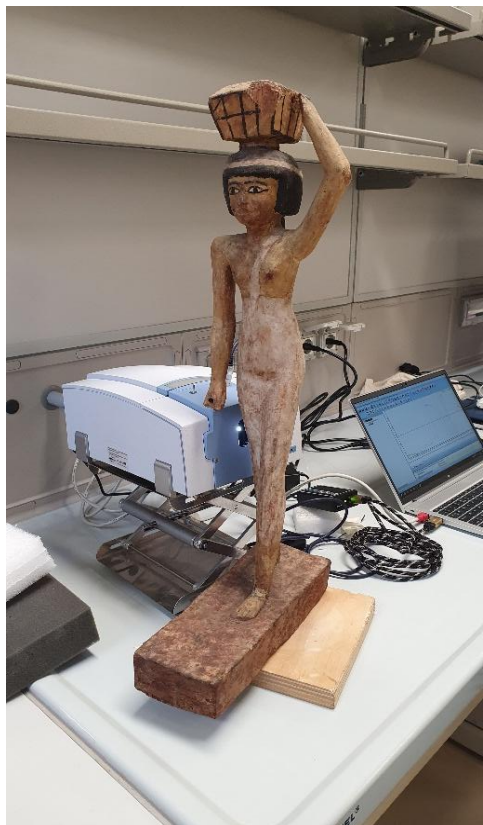


Fig. 15 – Reflection FTIR setup, measurement on Bearer C

In the framework of this study, Fourier Transform Infrared Spectroscopy (FTIR) analysis has been shown to provide significant insights regarding the presence of organic and inorganic molecules on the pictorial surface of the sculptures. It also allows the detection of degradation products resulting from through oxidation or hydrolysis processes, in addition to the identification of materials from conservation treatments. The interpretation of the spectra, therefore, contributes both to the understanding of the original painting techniques and to the reconstruction of the conservation history of the objects.

The analyses were conducted using reflection-mode FTIR, a non-invasive variant of the technique that allows the molecular characterisation of materials directly on the surface of the objects. The analyses were performed using a Bruker Alpha II spectrometer equipped with a specular reflection module and a DLATGS (deuterated L-alanine doped triglycine sulphate) detector (Fig. 15). Spectra were collected in the mid-infrared region ($6000\text{--}400\text{ cm}^{-1}$) at a spectral

resolution of 4 cm^{-1} , with an average of 64 scans per point of analysis to ensure a satisfactory signal-to-noise ratio. Moreover, the instrument independently discards the low-quality spectra from the final count of 64 scans, and background spectra were acquired prior to each measurement session to guarantee accurate baseline correction and eliminate atmospheric interferences. Spectral processing was carried out using Bruker OPUS software, while the visualisation and comparison of the results were performed with Thermo Scientific OMNIC. The number of measurements acquired from each sculpture and the areas of analysis are summarized in Appendix E.

Despite its effectiveness in detecting molecular vibrations and distinguishing functional groups, FTIR spectroscopy also presents certain limitations. As was highlighted in the XRF analysis, the three-dimensional configuration of the objects often made it impossible to bring the instrument sufficiently close to certain regions, due to physical obstructions. The geometric limitations imposed on the system resulted in restrictions to specific zones of interest, thereby inevitably reducing the number of points that could be measured. Furthermore, since the technique requires a stable optical alignment between the probe

and the surface, irregular or non-planar areas could not always be analysed effectively. It is important to note that the reflection mode may also introduce distortions related to surface roughness and thickness of the analysed layer. Finally, overlapping absorption bands can hinder the precise identification of individual components, particularly in complex mixtures such as polychrome layers made of natural pigments, with the presence of degradation and restoration products, and environmental pollutants. Nevertheless, when interpreted in conjunction with complementary analytical data, FTIR provides a reliable and non-invasive means of characterising the superficial materials present on the surface. This represents an essential step in the integrated diagnostic workflow.

4.3.5. Micro-invasive analyses: stratigraphic samples

Despite the diagnostic strategy privileged non-invasive methods, a limited number of micro-invasive analyses were necessary to acquire information that could not be obtained through alternative means. In particular, the three offering bearer sculptures were subjected to stratigraphic micro-sampling.

The sampling procedure was conducted with extreme attention to both quantity and location, in accordance with rigorous ethical criteria. The selection of points was made in correspondence of areas of significant analytical interest, comparable between the different sculptures, while ensuring that the intervention would not compromise the integrity of the artefacts. In particular, two points were selected for each sculpture, corresponding to the white dress and the black wig, plus one point of yellow on Bearer C. The selection of the specific sampling points was conducted in agreement with the Italian heritage authority and informed by the findings of analytical investigations, in order to avoid areas compromised by degradation or conservative treatments.

The sampling process was conducted by means of a lancet and glasses with a 2.5× magnification factor. Before being embedded, the samples were observed and photographed on both sides using an Olympus SZX10 stereomicroscope equipped with an Olympus Color View I digital camera, providing an overview of each sample and its general structure.

The paint samples were embedded and prepared as polished cross sections to enable microscopic and micro-analytical examination of the stratigraphic sequence. Each fragment was enclosed within a double layer of Struers EpoFix epoxy resin, a two-component low-viscosity system composed of a bisphenol A–epichlorohydrin resin containing C12–C14 alkyl glycidyl ethers, and an amine hardener based on triethylenetetramine. The material was selected for its excellent transparency, minimal shrinkage, and stability at room temperature. Once cured, the excess resin was removed, and the exposed surface was wet-polished using Struers abrasive papers of progressively finer grit size. This method was employed to unveil the comprehensive stratigraphic profile of the paint layers. This step was performed under water to reduce frictional heating and to prevent detachment or loss of fragile strata. Due to the extreme hydrophilic nature of the materials, some areas of the sample remained slightly below the surface due

to the partial solubilisation of the layers. However, this issue was considered preferable to dry polishing, which could have compromised the integrity of the sample.

The four samples collected from Bearers A and B, the same cross-sections sampled in previous years before the beginning of this study, were analysed again, with the surface being re-polished to expose it anew by removing the old superficial layer that had undergone graphitisation and any impurities that had accumulated over time. In this way, it was possible to avoid unnecessary additional sampling.

The resulting seven polished sections were suitable for observation at high magnification and for subsequent analyses using both optical and electron microscopy.

These were first examined with an Olympus BX51 polarising microscope, fitted with a digital camera Olympus DP71, which allowed detailed imaging of the sequence, morphology, and texture of the layers, under both visible and UV illumination.

To complement optical observations, the cross-sections were analysed with scanning electron microscopy (SEM) coupled with energy-dispersive X-ray spectroscopy (EDS). The analyses were performed with a Zeiss EVO 60 microscope equipped with a lanthanum hexaboride (LaB_6) electron source combined with an Oxford Ultim Max 40 mm² EDS microprobe for semi-quantitative elemental analysis.

The samples were coated with a thin conductive layer of graphite and analysed in high-vacuum mode at an acceleration voltage (EHT) of 20 kV.

SEM observation provided high-resolution images of the microstructure of the paint layers and, in specific cases, of the wood fibres allowing the detection of the stratigraphic sequence.

The EDS spectra provided elemental data that facilitated the differentiation of inorganic materials within the individual layers, thereby complementing the information obtained by XRF and FTIR analyses for the identification of ground layers and pigments. Elemental mapping further allowed the visualisation of the distribution of selected elements across the cross-sections, supporting the stratigraphic interpretation of the layers.

Despite the wealth of information obtainable, stratigraphic analysis remains a micro-invasive and partially destructive technique. The extremely limited sample size, while minimising aesthetic impact, also constrains the representativity of the results. Nevertheless, when combined with non-invasive data, cross-sectional and SEM/EDS analyses provide an indispensable contribution to the comprehensive understanding of the materials and techniques employed in the sculptures' production.

5. Study of the Offering-Bearer models

5.1. Iconographic and typological study

Offering-bearer sculptures represent a specific component of Middle Kingdom funerary equipment. Although offering-bearers appear across media from the Old Kingdom onwards, their meaning, and visual articulation can vary according to context. Figures engaged in the presentation and transport of offerings occupy a central position, as they directly mediate between the material provision for the deceased and its visual and ritual representation.

In two-dimensional representations, offering-bearers are typically embedded within extended narrative or processional scenes displayed on chapel walls, often accompanied by captions or labels specifying the nature and origin of the offerings. These compositions privilege multiplicity, enumeration, and explicit differentiation, and have been widely interpreted as visualising abundance on a territorial scale. As discussed by Tooley, such processions, attested in royal monuments from the 4th and 5th Dynasties and later adopted in large private tombs, can be understood as ideal representations of the nomes of Upper and Lower Egypt, whose agricultural productivity eternally sustained the king and, by extension, elite tomb owners (Tooley 1989, 177–178). Within this framework, offering-bearers operate as part of a broader system of fecundity figures, in the sense articulated by Baines, embodying the continuous availability of resources rather than depicting specific individuals engaged in discrete actions (Baines 1985, 17–67). The two-dimensional medium thus emphasises visibility, quantity, and semantic precision, aligning these images with the public performance of the mortuary cult and its maintenance by the living (Barker 2022, 92–105). Three-dimensional offering-bearer sculptures, by contrast, reflect both a change of medium and a progressive transformation of meaning. As the iconographic scheme of offering processions was transferred from royal to private funerary contexts, constraints of space and scale necessitated a gradual reduction in the number of represented figures (Tooley 1989, 177–178). This quantitative contraction appears to have been accompanied by a semantic shift: rather than embodying the collective abundance generated by the territorial divisions of Egypt, offering-bearer figures increasingly came to be understood as members of the deceased's household, entrusted with the perpetual provision of offerings on a more personal level. In the Middle Kingdom, this process reached its most condensed expression in the practice of furnishing tomb assemblages with offering-bearer statues arranged in pairs, which may be interpreted as schematic evocations of the duality of the Two Lands, echoing in highly compressed form the logic already established in Old Kingdom scenes.

Concealed within the burial chamber and removed from the sphere of ritual action performed by the living, wooden models were primarily concerned with provisioning the deceased in the afterlife rather than with the visual display of abundance or administrative order (Barker 2022, 92–105). The shift from two to three-dimensional representation therefore did not merely entail a reduction in scale or number, but a reconfiguration of the offering-bearer motif, in which symbolic condensation, material presence, and operative

efficacy replaced the emphasis on multiplicity and explicit enumeration characteristic of wall scenes. What emerges is a complex interpretative framework, in which the different types of offering-bearers reflect distinct visual strategies adopted to render the offering system present and operative within the funerary space. In fact, these two representational strategies are not necessarily mutually exclusive but may coexist fulfilling complementary roles shaped by their respective media, locations, and functions.

Differences between the two media are reinforced by divergent patterns of gender representation. While wall scenes overwhelmingly privilege male offering-bearers, three-dimensional assemblages are dominated by female figures, particularly among isolated statues. Tooley's examination of provenanced Middle Kingdom examples records a strong predominance of female figures over male ones (187 against 26), indicating that this pattern is not incidental (Tooley 1989, 225; Barker 2022, 93). Barker has plausibly connected this prevalence to earlier Old Kingdom reliefs in which mortuary estates were personified as female offering-bearers carrying baskets on their heads, each embodying the produce of a specific region. In the condensed three-dimensional medium, such associations could be encapsulated within a single figure, allowing the output of an entire real or idealised estate to be rendered present in material form (Barker 2022, 93–94; Tooley 1995, 22).

The distinct priorities of three-dimensional representations are further evident in the treatment of the offerings themselves. Whereas wall scenes frequently specify the contents of baskets and containers, often depicting supply emerging from their tops, wooden models typically, although not always, employ closed or solid loads, with little or no indication of specific contents. As Barker has observed, this choice cannot be attributed solely to technical limitations, as wooden sculpture would have allowed for hollow containers. Rather, it appears to reflect a deliberate strategy, whereby a single figure could symbolically encompass the totality of desired provisions (Barker 2022, 92–105). In this sense, three-dimensional offering-bearers operate less as descriptive images and more as material substitutes, whose efficacy resides in their physical presence rather than in narrative or textual precision.

5.1.1. Iconographic description

The sculptures referred to as A (S. 8795), B (S. 8796), and C (S. 8794) are three polychrome wooden sculptures representing offering bearers, which share a very similar iconography and pictorial decoration (Fig. 16). In terms of scale, offering-bearer figures rank second only to representations of the deceased and are usually larger than the other sculptures in the assemblage (Tooley 2005, 534). Furthermore, they are distinguished by a higher quality of craftsmanship, manifesting a greater quality and precision in their execution (Barker 2022, 93; Roth 2002, 118; Tooley 2005, 534). The importance attributed to offering-bearer figures within the funerary assemblage is further reflected in their frequent execution at a comparatively larger scale and with a higher level of craftsmanship than other categories of wooden models (Roth 2002, 118; Roth et al. 1989, 39; Tooley 2005, 426). Although three-dimensional offering-bearer models are numerically fewer than their two-dimensional

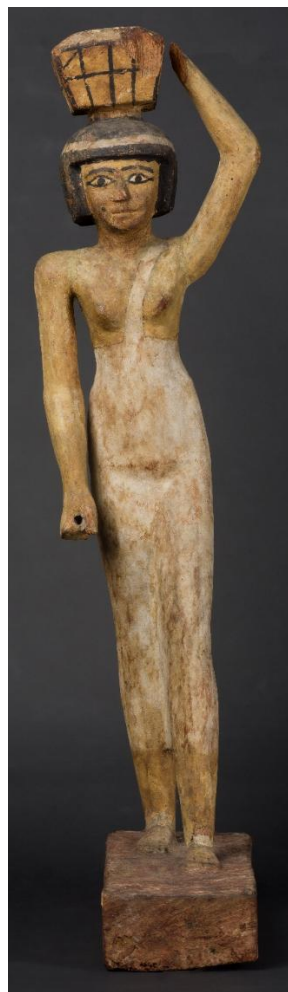
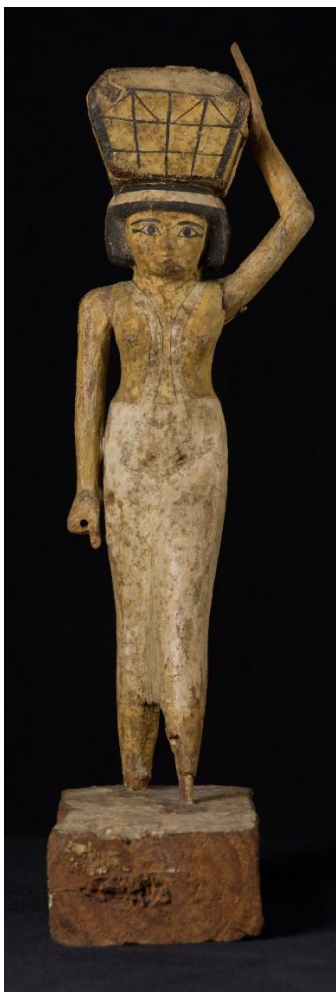
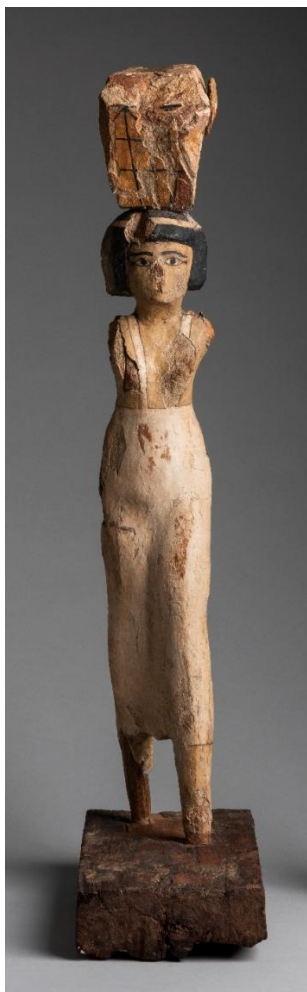


Fig. 16: Bearers A (S. 8795), B (S. 8796), and C (S. 8794)

counterparts, some of the finest surviving examples of wooden models belong to this theme, in certain cases approaching the level of refinement reserved for statues of the tomb owner

himself. This contrast between quantity in wall scenes and quality in sculptural models underscores the high conceptual value assigned to the representation of offering transport within the funerary context (Barker 2022, 93).

They depict standing female figures, mounted on rectangular bases. All are shown in a striding pose with the left foot advanced and carrying offerings for the deceased. All the figures display a yellow-coloured skin tone. The face is characterised by the rendering of only the eyes and eyebrows, while the mouth is not delineated. The eyes are further embellished with the characteristic cosmetic treatment that extends their form outwards. This, like the other details of the figure, was painted using black coloured lines on the surface. The sequence of the paint layers appears to suggest that the area of the eyes was saved during the application of the skin tone: the white currently visible would therefore correspond to the ground layer. Subsequently, once the yellow had been applied, the shape of the eye would have been defined by a black outline, followed by the rendering of the centrally placed pupil. Further decorative details of the sculptures include a painted beauty mark on the right cheek of Bearer C and a decoration in the area of the breast, visible exclusively on Bearer B. In Bearer A, the presence of this element cannot be ascertained due to losses, while in Bearer C it is absent. The decoration serves to render the areola of the breast by means of a series of dots arranged in a circle, with a central dot.

The figures are characterised by a black hairstyle, short at the front, with a long rear tail reaching approximately to the middle of the back. The hairstyle is completed by a white band placed across the fringe and tied at the back of the head. In all the offering bearers, the band was executed as a negative, leaving the white ground layer exposed. Moreover, the outlines of the band do not appear to have been previously traced in black and thus seem to have been defined freehand during the application of the black paint of the hair.

The knot itself is clearly legible in Bearers B and C and is characterised by a single upper central loop with a black dot at its centre, round in Bearer B and oval in Bearer C. In Bearer A, the upper loop is not visible. However, it is not possible to determine with certainty whether this absence is attributable to a stylistic choice or to later alterations, as the area of the head near the basket was affected by extensive restoration interventions, and significant overpainting of the black hair has been hypothesised.

This evidence must therefore be interpreted with caution. In the lower area of the knot, a single ribbon is also present, descending centrally in relation to the hair tail and extending to just below the shoulders.

The garments are white and undecorated, consisting of a skirt that descends from chest height, closely enveloping the hips and legs of the figures down to mid-calf level. In Bearers A and B, the garment is supported by two shoulder straps passing between the breasts, whereas in figure C it is held in place by a single strap positioned at the centre of the skirt and passing over the left shoulder. The arms currently identified as belonging to Bearer A would make her the only one among the sculptures to be decorated with bracelets at the wrists (Fig. 17). These are rendered as a band of larger yellow and red rectangles, interposed with narrower white rectangles, all defined by black contour lines.



Fig. 17 – From the left: duck wing S. 8165/32 (Bearer A); S. 8165/33 (Bearer C); left arm Provv. 65; right arm Provv. 45, both linked to Bearer A

The offering bearers are characterised by a basket placed on the head, in the shape of an inverted truncated pyramid, kept in balance with the aid of the left hand. The upward-facing arm is slightly bent at the elbow, and the hand is open and rests against one side of the basket. It can be observed that the hand of Bearer A barely projects beyond the basket element, whereas in the cases of Bearer B and, presumably, Bearer C, by approximately reconstructing the proportions of the currently missing hand, the upper extremity of the hands projects noticeably beyond the basket covering. The basket, yellow in colour, is decorated with a black grid pattern composed of five vertical and four horizontal lines in the case of Bearers A and B, and only three horizontal lines in Bearer C. Along the upper band, within the area delimited by the squares, two pairs of opposing lines at 45° are observed in sculptures A and B, whereas in sculpture C a single oblique line is present in the two outermost peripheral squares (Fig. 18). The right arm, by contrast, is extended along the body, and the clenched hand holds an offering of a different nature, generally poultry. Although other types of offerings have also been identified, the position of the arm suggests the latter as the most likely. Moreover, although none of the offering bearers currently preserves this offering *in situ*, with the aid of photographs from the 1920s it is possible to observe the presence of two duck wings associated with Bearers A and C (Fig. 17). Both display a decoration consisting of fine black and presumably red lines on a white ground, as well as a thicker line defining the upper and lower perimeter of the wing.

The decoration of the bases differs slightly among the three sculptures (Fig. 19). The base of Bearer A was decorated primarily in red, although this is poorly preserved along the lateral surfaces. On the upper face of the base, in the front area, a white band is also visible, with traces of black lines whose nature is difficult to interpret due to the fragmentary preservation of the decoration in this area. This element, together with other technical features discussed later in the chapter, contributes to raising doubts as to the actual association of the base with the offering bearer sculpture. The base of sculpture B



Fig. 18 – Detail of the upper area of Bearer A, B and C

was decorated with a white paint layer on the upper face, while the lateral areas preserve red paint layers. Finally, the base of sculpture C is entirely red.

As highlighted so far, the three sculptures are extremely similar in their chromatic choices and share the same palette, composed of a limited range of simple colours: white, black, yellow, and red. With particular reference to the yellow colour, in all three sculptures both the skin tones and the basket display the same chromatic appearance, leading, already prior to the scientific analyses, to the hypothesis that the same pigment was used.

The proportions of the figures were analysed by applying the proportional measurement method employed by Harvey in the study of Egyptian wooden sculpture, based on the use of the 18-unit canon formalised by Robins (Harvey 2006, 165–166; Robins 1993, 64–69). The canonical height of the figure was identified between the soles of the feet and the hairline and divided into 18 units, against which the main anatomical reference points (neck–shoulder junction, elbow, pelvis, knee) were verified.

The analysis, conducted both on the sculptures themselves and on orthogonal photographs (considered suitable for the assessment of relative proportions), shows that all the analysed figures follow the same canonical proportions observed in Old Kingdom wooden sculpture, with any deviations falling within the limits of tolerance also identified by Harvey. The data therefore indicate full continuity with the earlier proportional tradition, in agreement with observations made for wooden productions dating from the end of the Old Kingdom to the First Intermediate Period, in which the proportional canon remains essentially unchanged despite stylistic and qualitative differences (Harvey 2006, 165–166). This proportional continuity is not, however, immediately apparent from direct observation of the sculptures. This is mainly due to the marked variability in the proportions and dimensions of the accessory elements, particularly the baskets, which

display pronounced differences from one example to another. The lack of uniformity in these elements contributes to altering the overall visual impact of the figures, partially masking the underlying regularity of the bodily proportions, which instead emerges clearly only through a systematic proportional analysis.



Fig. 19 – Detail of the basements of Bearers A, B and C. Purple arrow: white band on Bearer A; orange arrows: traces of the feet of Bearer B

5.1.2. Typological framework

From a compositional perspective, the wooden offering-bearer sculptures can be broadly divided into two principal configurations. The first consists of single figures, most commonly female, depicted in isolation and engaged in the transport or presentation of offerings. The second comprises processional groups, in which multiple figures advance in sequence on a shared base (Fig. 20). These processions may include figures of a single sex or combine male and female individuals, suggesting that the visual articulation of collective provision was not governed by a rigid gender-based scheme. In both configurations, forward movement and the reiteration of the offering gesture are emphasised, reinforcing notions of continuity and perpetual supply rather than episodic action.

A further level of classification can be established on the basis of the type of offering represented. These include figures bearing foodstuffs, such as bread or agricultural produce, figures associated with animal offerings, represented either through the transport of live animals or butchered carcasses, and figures carrying vessels intended for libations. This functional differentiation does not correspond to distinct postural types, as similar bodily attitudes are employed across different categories of offerings. Instead, it highlights the adaptability of the offering-bearer motif, which could accommodate a wide range of provisions while preserving its underlying symbolic role.

Across both single figures and processional groups, the repertoire of poses remains highly standardised. The body is typically rendered in an upright stance, with the left leg advanced to suggest motion, while the arms are engaged in supporting or presenting the



Fig. 20 - The Bersha Procession, late 11th Dynasty – early 12th Dynasty, 2010–1961 B.C.E. Middle Kingdom, Deir el-Bersha, Tomb 10, shaft A (Djehutynakht), Boston Museum of Fine Arts

offering. Variations are largely confined to the manner in which the load is carried, such as against the torso, on the shoulder or head, or grasped with one or both hands, rather than to differences in overall bodily attitude.

Finally, recurring features such as basket forms and pattern decoration, garments, coiffures, hair ornaments, and overall silhouette suggest the existence of patterned choices that may reflect chronological trends, regional preferences, or workshop practices.

A methodological framework for approaching such patterns is provided by Harvey's typological study of Old Kingdom wooden sculptures, which demonstrated that the systematic analysis of formal details, considered both individually and in recurring combinations, can yield meaningful insights into chronology, production traditions, and modes of transmission, even in the absence of secure archaeological contexts. By assembling a large corpus and isolating diagnostic features relating to dress, coiffure, stance, and accessories, Harvey showed that wooden sculpture followed internally coherent developmental trajectories, reflecting shared conventions over time. Her study thus established that seemingly minor formal elements can function as structured indicators when analysed within a consistent typological framework (Harvey 2001).

At present, however, no equivalent typological synthesis exists for Middle Kingdom wooden sculptures, limiting the possibility of tracing comparable patterns of formal development and production practices for this period. Within this perspective, the systematic documentation of iconographic features in Middle Kingdom offering-bearer figures, when considered in conjunction with technical and material observations, may

contribute to laying the groundwork for such a future synthesis. The integration of formal typology with production-related data holds the potential, once a sufficiently broad comparative framework is established, to move beyond general stylistic attribution and towards the identification of more specific production contexts, regional traditions, or workshop-related practices.

5.1.3. Iconographic comparisons

In order to place the offering bearers A, B, and C within a broader iconographic context and to assess the possible recurrence of formal or decorative solutions useful for the interpretation of the artefacts, the comparisons presented in this section have been deliberately narrowed. For reasons of concision and methodological coherence, they include exclusively sculptures originating from the same site of Asyut, attributable to the same chronological horizon and right comparable from a typological perspective, namely female offering bearers with short hairstyles, engaged in carrying a basket on the head and a secondary offering analogous to that attested in the sculptures under examination (Tooley 1989, 229–31).

On this basis, the comparative analysis draws on a selected group of offering-bearer sculptures¹⁴ that can be considered directly comparable to the figures under study. The comparisons are based on the examination of available photographic documentation. To facilitate orientation and readability, the objects taken into consideration are listed below according to their current museum of conservation:

Musée du Louvre, Paris

- E 11990 – Provenance: Asyut, tomb of Wepwawetemhat (Tomb 14); Leader archaeologist: Charles Palanque (Fig. 21)
- E 11991 – Provenance: Asyut, tomb of Ankhef; Leader archaeologist: Charles Palanque (Fig. 22)
- E 11992 – Provenance: Asyut, tomb of Nakhti ? (Tomb 7); Leader archaeologist: Charles Palanque (Fig. 23)
- E 12001 – Provenance: Asyut, tomb unknown; Leader archaeologist: Charles Palanque (Fig. 24)
- E 12029 – Provenance: Asyut, tomb of Nakhti (Tomb 7); Leader archaeologist: Charles Palanque (Fig. 25)
- E 20575 – Provenance: Asyut, tomb of Pakhetemhat; Leader archaeologist: Charles Palanque (Fig. 26)

Egyptian Museum, Cairo

- JE 36290 – Provenance: Asyut, tomb of Nakhti (Tomb 7); Leader archaeologist: Charles Palanque (Fig. 27)

¹⁴ See Appendix C

- JE 36291 - Provenance: Asyut, tomb of Nakhti (Tomb 7); Leader archaeologist: Charles Palanque (Fig. 28)

Museo Egizio, Torino

- S. 14786 – Provenience: Asyut; Leader archaeologist: Ernesto Schiaparelli (Fig. 29)

Museum of Fine Arts, Boston

- 04.1774 – Provenance: Asyut, tomb 6; Leader archaeologist: Charles Palanque (Fig. 30)

British Museum, London

- EA 45055 – Provenance: Asyut; Tomb: Hogarth Tomb VI; Archaeologist: David G. Hogarth (Figure 31)
- EA 45074 – Provenance: Asyut; Tomb: Hogarth Tomb VI; Archaeologist: David G. Hogarth (Fig. 32)
- EA 45075 – Provenance: Asyut; Tomb: Hogarth Tomb VI; Archaeologist: David G. Hogarth

Particularly significant is the chromatic relationship between the skin tones and the basket. In all the comparative examples, the basket is rendered in the same colour as the skin, generally a yellow hue of varying intensity. Even in examples characterised by a more complex and refined palette, such as Louvre E 12029 and JE 36290, chromatic continuity between the body and the basket is maintained, suggesting a deliberate iconographic choice.

The eye make-up and the rendering of the eyebrows likewise display a range of solutions that can be traced back to a limited number of main schemes. Some examples show a thicker and more elongated stroke, comparable to that of Bearer C, as in Louvre E 12001, while others display a more controlled rendering similar to that observed in Bearers A and B, such as Louvre E 11990, E 11991, Boston 04.1774, and British Museum EA 45055. In cases such as British Museum EA 45075, the stroke instead appears imprecise and markedly elongated, in keeping with an overall coarser level of workmanship. In S. 14786, the eyebrows are rendered as a unified, continuous band crossing the nasal bridge, rather than as two separate elements. This feature appears to be relatively unusual and may therefore be regarded as a distinctive stylistic trait.

Among the anatomical details, the rendering of the nipples is depicted by means of a circle of dots with an additional, larger central dot (Louvre E 11991; E 11992; E 12029; Boston 04.1774; Torino S. 14786; British Museum EA 45075), in close analogy with what is observed in Bearer B. Alternatively, the complete absence of defining elements in this area has also been recorded. Rarer features include the beauty mark on the cheek, attested in Bearer C, in Louvre E 12029 and Torino S. 14786, suggesting a selective and non-systematic decorative element, as well as the presence of the navel, observed only in Louvre E 11992 and attributable to the absence of the upper part of the garment, which left the navel visible. Separate consideration should be given to the rendering of the mouth, which is generally not graphically defined. However, exceptions have been identified, notably in the sculptures Boston 04.1774 and Louvre E 20575.



Fig. 21 - E 11990, tomb of Wepwawetemhat, early XII dyn., Louvre



Fig. 22 - E 11991 tomb of Ankhef, early XII dyn., Louvre



Fig. 23 - E 11992, tomb of Nakhti ?, early XII dyn., Louvre



Fig. 24 - E 12001, tomb unknown, early XII dyn., Louvre



Fig. 25 - E 12029, tomb of Nakhti, early XII dyn., Louvre



Fig. 26 - E 20575, tomb of Nakhti, early XII dyn., Louvre



Fig. 27 - JE 36290, tomb of Nakhti, early XII dyn., GEM; drawing from Chassinat & Palanque, 1911: Pl IX



Fig. 28 - JE 36291, tomb of Nakhti, early XII dyn., GEM; drawing from Chassinat & Palanque, 1911: Pl X



Fig. 29 - S. 14786, First Intermediate Period, 2118-1980 BCE, ME



Fig. 30 - 04.1774, Tomb 6, early XII dyn., BMFA



Figure 31 – EA 45055, Hogarth Tomb VI, early XII dyn., BM



Fig. 32 - EA 45075, Hogarth Tomb VI, early XII dyn., BM

One of the elements that exhibits significant variability is the frontal band with the rear knot. A particularly close comparison is offered by the offering bearer Louvre E 12001, which features a band with a knot characterised by an upper loop and two divergent lower elements, formally comparable to that observed in Offering Bearers B and C, although rendered in a more pronounced manner. In other examples, the frontal band is entirely absent, as in the case of Louvre E 11990, which displays neither the white band nor the characteristic hair tail. In further cases, the band is present but lacks the knot, as observed, for instance, in Louvre E 12029, Torino S. 14786, and in the examples from the Egyptian Museum in Cairo (JE 36290; JE 36291). Finally, for several comparative examples, the presence or absence of the knot cannot be ascertained due to the limitations of the available photographic documentation, and such cases therefore cannot be interpreted unambiguously. This distribution suggests that the band and the knot, while constituting a recurrent and formally significant element, do not represent a mandatory feature of the iconographic type, but rather a variant selectively adopted within a shared repertoire.

The design of the basket likewise constitutes one of the areas richest in variation, as it allows for a clear distinction between different decorative schemes. Offering Bearers A, B, and C display not only a simple grid of vertical and horizontal lines, but also a more elaborate motif characterised by the presence of oblique lines within the upper band of the basket. This same decorative scheme recurs in several of the comparative examples, confirming the existence of a shared and directly comparable iconographic solution. In particular, the presence of oblique lines is attested in Louvre E 12001 and in EA 45055, where they appear arranged in opposing pairs, and in Louvre E 11990, which, while retaining on the front and sides a grid analogous to that of Bearers A and B, introduces on the back a variant with four triangles in the panels of the upper band. Alongside this group, examples characterised by a grid lacking oblique lines are also attested, composed exclusively of rectangles or squares defined by horizontal and vertical lines. This simpler scheme can be observed, for instance, in Louvre E 11991 and Boston 04.1774. In the comparative examples EA 45074 and EA 45075, by contrast, the decoration of the basket is articulated in a more complex manner: in particular, in EA 45075 the grid is organised into superimposed bands, with rows of rectangles of differing dimensions and decorated upper borders. In these latter cases, however, both the carving and the painted application appear less controlled and more imprecise, suggesting that greater complexity in the decorative motif of the basket does not necessarily correspond to a higher level of workmanship.

Overall, the distribution of these schemes suggests that the presence or absence of oblique lines is not random, but rather reflects deliberate decorative choices, potentially linked to workshop conventions or specific formal preferences. The recurrence of the motif with oblique lines in the comparisons most closely related to Bearers A, B, and C reinforces the interpretation of the latter as part of an iconographically fairly coherent group.

Another potentially relevant aspect concerns the hand projecting from the basket. This feature, absent in Bearer A but clearly attested in Bearers B and C, finds parallels in numerous comparative examples, including E 12001, E 11992, E 12029, JE 36290, S. 14786, and 04.1774, where the hand emerges to a greater or lesser extent from the edge of the basket. In other cases, such as Louvre E 11990 or British Museum EA 45055, the hand is

only slightly projecting. The recurrence of this solution suggests that the projecting hand may represent a consolidated iconographic variant, which could be of interest to correlate with the proportions of the basket itself. This would make it possible to determine whether it reflects a technical choice linked to proportional relationships between the figure and the basket, or whether it constitutes an iconographic element related to other considerations.

The shoulder straps of the garment constitute a further point of comparison. The presence of two straps, as in Bearers A and B, finds parallels in some examples (Louvre E 11990; British Museum EA 45055; Torino S. 14786), whereas the single left-shoulder solution attested in sculpture C recurs with some frequency (Louvre E 11991; E 12029; E 20575; Boston 04.1774; British Museum EA 45075). In at least one case (Louvre E 11992), the garment lacks straps altogether and begins at navel height, representing a significant variant within the group.

Finally, some examples display additional elements that contribute to outlining a framework of controlled variability: the presence of necklaces (Louvre E 11992; Boston 04.1774; JE 36291), of beaded skirts applied over the garment or of coloured textiles, of bracelets and anklets, or of particularly sophisticated solutions in the rendering of the hair, such as the painted continuation of the hair tail on the back in Louvre E 12029, JE 36290, and JE 36291.

Overall, these comparisons show that Offering Bearers A, B, and C are fully integrated within a shared iconographic repertoire, characterised by a core of recurring solutions accompanied by specific variants. Such differences, far from indicating substantial typological divergences, rather appear to reflect execution choices and the skill of the artisans, as well as levels of refinement and probably differing economic means of the patrons, thus providing an articulated framework within which to interpret the individual sculptures.

5.2. Bearer A (S. 8795)

5.2.1. Bearer A: Wooden structure and carving technique

The sculpture, measuring 60 × 12.5 × 25.5 cm, was composed of at least ten¹⁵ different carved and assembled wooden components. Some of these are immediately legible due to the presence of visible joints edge, while others were identified through tomographic investigations, as they are concealed by the paint layers. The type of wood employed is a hardwood which, on macroscopic observation, appears to be compatible with the fig genus, probably a *Ficus sycomorus*. The wood is rather fibrous and rich in defects such as knots, fibre deviation, shrinkage cracks, and other defects that will be described in greater detail below.

The central body of the figure was carved from a main wooden block lacking the pith. The dimensions of this element were probably insufficient to allow the carving of the entire

¹⁵ Three for the main figure, one for the basket, one for the ponytail, two for the arms, two for the duck, one for the base

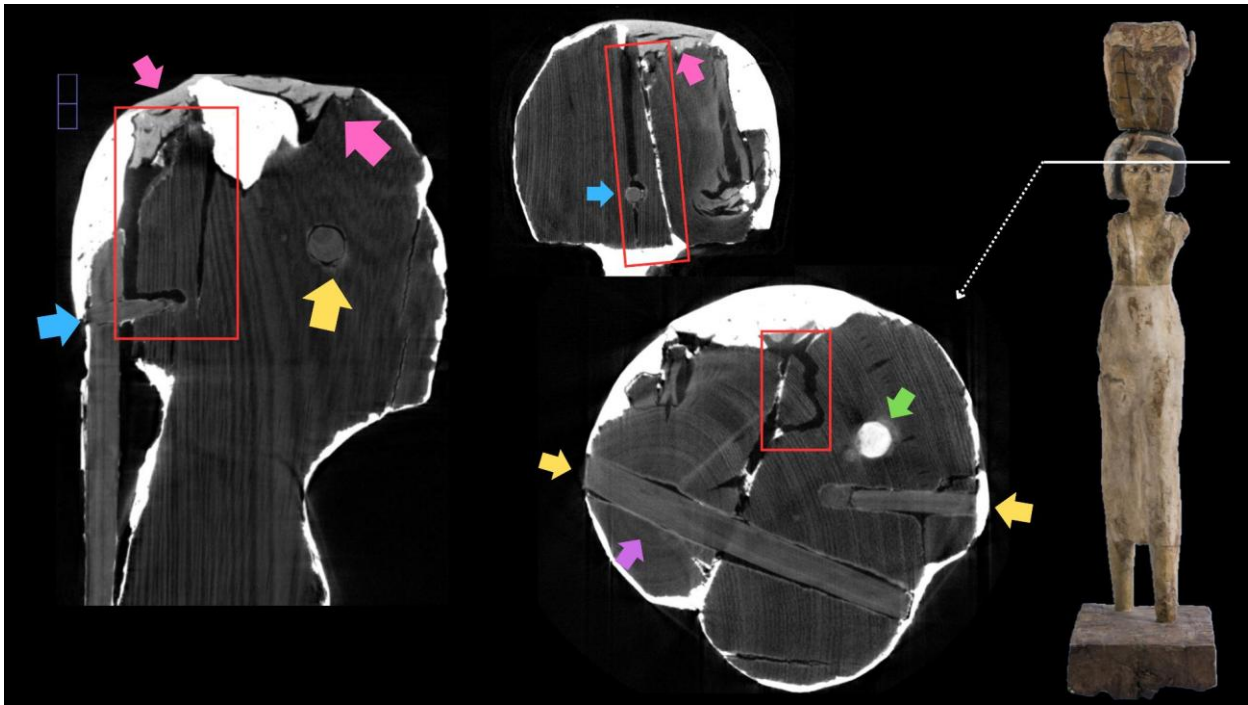


Fig. 33 - Tomographic images of head of Bearer A. From the left: lateral slice of the head, vertical slice of the posterior area of the head, and transverse slice taken from the area indicated in the figure by the white arrows. Purple arrows: pith. Yellow arrows: dowels for the assembly of the additional wooden elements of the head. Green arrow: dowel for the assembly of the basket. Light blue arrows: dowel for the assembly of the hair tail. Pink arrow: presence of restoration paste with lower radiopacity. Red squares: wood piece detached due to the insert of a wooden dowel.

figure. Consequently, in the area of the head two additional wooden pieces were added, assembled to the main block by means of two wooden dowels arranged transversely (Fig. 33). The larger of these added elements, which includes the pith, was positioned to complete the right side of the head. It is attached to the main block by a dowel inserted into the anterior area of the head, passing through the entire width of the elements and intersecting precisely the area of the pith of the added block. In the same area, the detachment of an irregularly shaped section of wood from the main block can be observed, occurring at the inner zone, at the interface with the added wooden block (Fig. 33). It can be noted that the presence of paste¹⁶ is limited exclusively to the interface of the join between the detached fragment and the added block, and not along the fracture line, which must therefore have formed after the joining of the two elements. Moreover, the separation of the fragment from the main body is sufficiently pronounced (ca. 1.5 mm) to make the presence of adhesive materials that are transparent to tomography unlikely. This is consistent with the proposed hypothesis, namely that the fragment became detached during the carving process, but at a stage when intervention in the internal area was no longer possible. The detachment may in fact have been caused by the insertion of the transverse dowel supporting the wooden block forming the hair tail, as the fracture line appears to be aligned with the dowel seat (Fig. 33). The fragment appears to be retained in

¹⁶ In this essay, the term paste designates a composite material consisting of an organic binder (e.g., animal glue or plant gum) combined with calcium sulphate or calcium carbonate, typically employed for filling losses, shaping details, or levelling surfaces beneath the polychromy layers

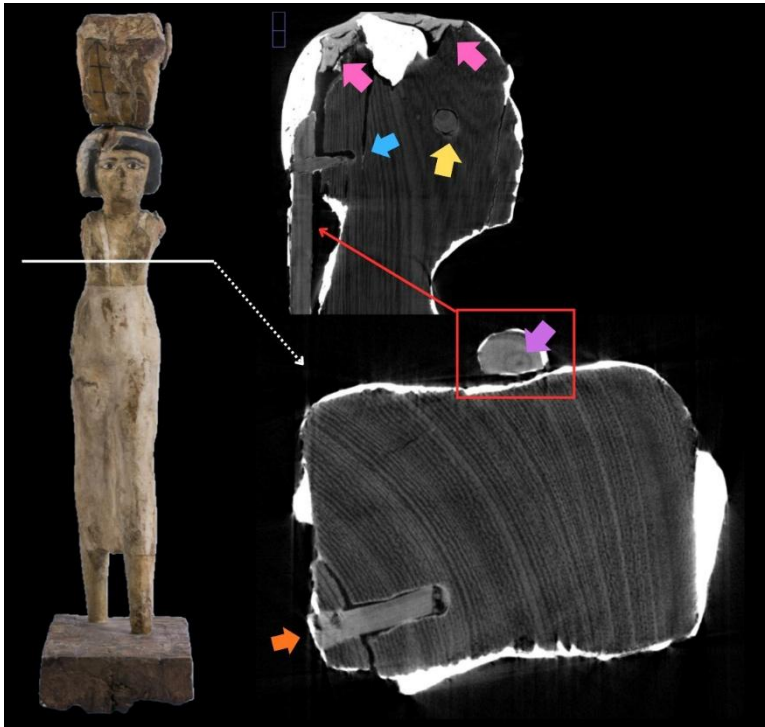


Fig. 34: Tomographic images of Bearer A. From the left: Bearer A, lateral slice of the head, and transverse slice of the chest, taken from the area indicated in the figure by the white arrows. Purple arrows: pith. Yellow arrows: dowels for the assembly of the additional wooden elements of the head. Light blue arrows: dowel for the assembly of the hair tail. Pink arrow: presence of restoration paste with lower radiopacity. Orange arrow: dowel for the assembly of the fragment detached from the chest. Right red square: hair tail.

position primarily by its internal location, where the solidity exerted by the surrounding elements limits its mobility. It is in fact positioned between the main block to which it belongs, the added block, to which it is further anchored by paste, and a thick layer of paste behind it. The latter serves to define the posterior volumes of the head, compensating for the insufficient volume of the wooden elements and allowing the completion of the modelling.

The second dowel connects the second wooden insert to the left side of the main wooden block (Fig. 33). In this case, the dowel appears markedly oversized in relation to the limited dimension of the element it is intended to secure:

the dowel measures approximately 11.85×2 mm, whereas the wooden element measures approximately 5×7.5 mm. This oversizing of the fastening element is also observable in another area of the central body. On the right side, at breast level, a reassembly of a wooden element belonging to the main block can be observed, which probably detached accidentally during the carving process (Fig. 34). This reconstruction is based on the observation of continuity in the sequence of growth rings and on the perfect congruence between the fracture line and a growth ring, suggesting a phenomenon of ring shake in the wood, or alternatively an error in calibration during carving. The element was repositioned by means of a wooden dowel whose dimensions (c. 9.40×2.5 mm) are clearly excessive in relation to the size of the element to be secured (c. 4×9 mm).

The basket was produced separately from the body of the figure, carved from a distinct wooden block and subsequently assembled on the head with two wooden dowels arranged vertically. This solution appears consistent with the complex construction of the head, which would have made the implementation of alternative solutions technically quite complex. However, this configuration, particularly in view of the height of the basket element, renders the system less stable, and the area has indeed been subject over time to fractures and subsequent reassemblies.

Diagnostic analyses and the 2019 restoration report indicate that one of the dowels was fractured in its median piece, while the other remained intact.

At a later stage, the two elements were re-associated through the use of adhesives and filling materials, following methods that are no longer considered appropriate. These interventions also resulted in the incorrect positioning of the basket, which had been glued directly to the posterior surface of the head. This configuration caused the element to tilt forward at an angle inconsistent with the original arrangement of the sculpture. During the recent restoration intervention, the basket was therefore detached and repositioned correctly using more compatible and less invasive materials and methodologies.

This operation revealed a complex stratification of restoration materials, indicating that several intervention phases affected the same area over time. The earliest identifiable intervention appears to be broadly contemporary with those observed on the legs and the base. This interpretation is supported by the presence of the same grey paste at the dowels and extensively on the lower surface of the basket. The correlation between external visual examination and CT data confirms this hypothesis, as the paste in question shows significantly lower radiopacity than the original material (Fig. 33, Fig. 34).

Above this first layer, traces of an adhesive and a second filling material are detectable, likely associated with a later re-gluing phase. Finally, a thicker filler layer overlies these materials, probably intended to enhance structural stability and reduce the visual impact of the void between basket and head. The presence of a small metal nail inserted between the basket and the head was also recorded, the phase of its insertion not being clearly definable at present. The retouching associated with this last phases also extended to the hair area, for which the presence of extensive overpainting has been hypothesised, due to the heavily reworked surface and the noticeably reduced craquelure in comparison with surrounding original paint layers.

The back hair tail was made from a separate wooden strip including the pith (Fig. 33, Fig. 34). As the posterior volumes were largely modelled through the use of paste, the wooden strip was simply set against the main block and secured to it by means of a wooden dowel arranged transversely at the back of the head. This arrangement inevitably created a step of the thickness of the strip that was subsequently disguised with paste, allowing the overall roundness of the head to be maintained.

Both the arms and the poultry offering are no longer preserved *in situ* but are visible in historical photographs from the 1920s. A more detailed technical discussion of these elements will therefore be addressed later in the paragraph specifically dedicated to them (5.2.3).

The original anchoring system between Bearer A and its base is today difficult to reconstruct due to extensive later interventions. The terminal areas of the legs and the feet are no longer preserved, and no clear traces of their original insertion survive on the present base. It is therefore impossible to determine with certainty the manufacturing technique originally adopted: the feet may have been carved separately and inserted into the base, or alternatively modelled in paste.

The current base displays several anomalous features. Made of a wood of lower quality than that used for the figure, it presents non-functional interlocking elements: a mortise-tenon joint on the left side, a cavity partially filled by a dowel on the right, a regular loss of material on the back compatible with a partially cut mortise, and, on the underside, a recess containing a rectangular wooden insert. These elements strongly suggest that the

base derives from reused material whose previous structural function would account for the presence of joints that are no longer operative.

More significantly, the upper surface of the base does not preserve the typical system for inserting the feet. Instead, a modern wooden block of irregular shape was introduced into the posterior area corresponding to the anchoring zone. This insert, immediately recognisable as modern due to differences in colour, grain, and compactness, occupies approximately half of the total thickness of the base. Two cavities were carved into this insert to accommodate the terminal area of the legs. While the left leg is intact, the right leg is incomplete and required the addition of a further cylindrical wooden element acting as a stabilising bridge. The legs were fixed using a filling material whose radiopacity and granulometry differ from the original paste, as the one visible on the head area. Comparable leg-stabilisation systems are observable on other sculptures in the Museo Egizio, such as the statue of Nakht (Cat. 3103), where similar structural inserts were introduced to stabilize missing lower limbs (Fiore Marocchetti et al. 2008, 30–31). This parallel further supports the interpretation of the present solution as a restoration intervention rather than an original construction feature. Both inserts were extensively filled and retouched to conceal the intervention. These retouching were removed during the 2019 conservation treatment, making the assembly system fully legible (Fig. 35).

Although complex wooden anchoring systems are attested in ancient sculpture, they generally belong to later chronological horizons and differ materially from the clearly modern elements observed here. The present solution, rather than carving two simple cavities directly into a regular block, appears unnecessarily convoluted. If the base had originally belonged to the sculpture, either traces of the original foot insertion or a more straightforward adaptation was expected. The complete absence of identifiable traces of the feet in the areas where they should be expected, together with the atypical white band with a presumed inscription on the base, an element not commonly associated with offering-bearers, further complicates the interpretation. While it cannot be entirely excluded that the base originally belonged to the sculpture and became so deteriorated that a radical intervention was required, the cumulative evidence makes this hypothesis less convincing.

It is therefore proposed that the base consists of an ancient but non-pertinent element, possibly originally belonging to another object. For example, it may originally have derived from a coffin, which would account for the presence of multiple non-functional interlocking joints, or alternatively from the base of another sculpture, originally provided with a smaller rectangular mortise than the present recess accommodating the modern insert (Beck 2024, 66–67).

At an undetermined moment in the conservation history of the object, likely between its discovery and the early twentieth-century photographic documentation, this element was associated with Bearer A in order to complete the missing lower zone and allow the sculpture to stand upright. The resulting assembly thus appears more consistent with a pastiche created for display purposes than with the original construction system of the sculpture. Comparable cases of pastiches formed through the reassociation of non-pertinent elements are documented within the Museo Egizio collections, indicating that

such integrative practices were not uncommon in the institution's earlier conservation history (Connor 2017; Auenmüller 2025).

Probably due to the complex articulation of the wooden blocks in this sculpture, the overall quality of the carving is generally mediocre, especially when compared with the other sculptures examined. Areas can be observed in which the modelling is only roughly sketched and, in some cases, lacks a subsequent smoothing phase, resulting in the persistence of tool marks, visible in the tomographic images. In particular, surfaces characterised by stepped discontinuities caused by wood chipping can be identified, which do not appear to have been subsequently regularised (Fig. 36).



Fig. 35 – Bearer A, modern wooden inserts



Fig. 36 – Bearer A, back area discontinuities attributable to tool marks

5.2.2. Bearer A: Painted decoration¹⁷

The lack of care in the carving is, however, balanced by pastes application, covering all the surface with a white ground layer. This layer serves to regularise the surface and to provide a ground for the application of the paint layers, but also, as previously noted, acts as a filling material. This latter function is particularly evident in the area of the head, where substantial thicknesses were required to fill voids, but it can also be observed more generally in the masking of joints and wood defects. Finally, its distribution, with markedly uneven thicknesses across the surface, clearly reveals its role in modelling the volumes that had been roughly shaped during the carving phase. The thickness of the ground layer is in fact highly variable, ranging from a minimum of approximately 0.30

¹⁷ See Appendix D-E-F for the analysis results and spectra

mm to a maximum of approximately 3 mm, except in areas where it serves a filling function, where the thicknesses are considerably greater.

XRF analyses revealed the systematic presence of calcium at all analysed points, while FTIR analyses in reflection mode allowed the identification of calcite and silicates. Stratigraphic investigations carried out by SEM-EDS on two samples, taken respectively from the white garment and the black wig, show that the first layer applied to the wooden support consists exclusively of calcium, with silicon impurities, a result consistent with a ground layer based on calcium carbonate.

The palette employed for the decoration of Bearer A is limited to four colours. Direct observation of the object suggests that the chromatic stratigraphy over the ground layer followed a sequence consisting of an initial application of white, followed by yellow and finally black. The base constitutes a distinct case, as it may not be related to the sculpture. The interpretation of the painting technique is partly conditioned by the fragmentary nature of the sculpture. Nevertheless, the colour fields generally appear flat and fairly homogeneous. The yellow applications locally display slight irregularities, which can be interpreted as variations in the pigment load on the brush, but no complex chromatic overlapping is observed.

The black lines used to define facial details and contours are relatively thin, with their thickness modulated according to the element depicted. For example, thinner for the contours of the garment and thicker for the lines defining the basket. This feature appears common between all the three bearers. The lines are executed with a generally confident and controlled stroke. Minor inaccuracies are nonetheless present, particularly at points where the line is interrupted and subsequently resumed (Fig. 37). An element of particular interest is represented by the execution of the tail of the eye make-up on the left eye: infrared investigations clearly show that the initial mark was drawn with a greater extension than the final form, which was subsequently reduced and filled in, indicating a reconsideration during the execution phase (Fig. 38).

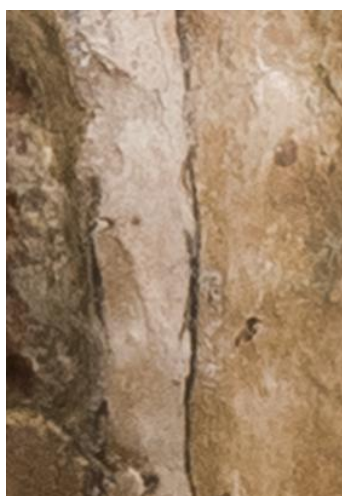
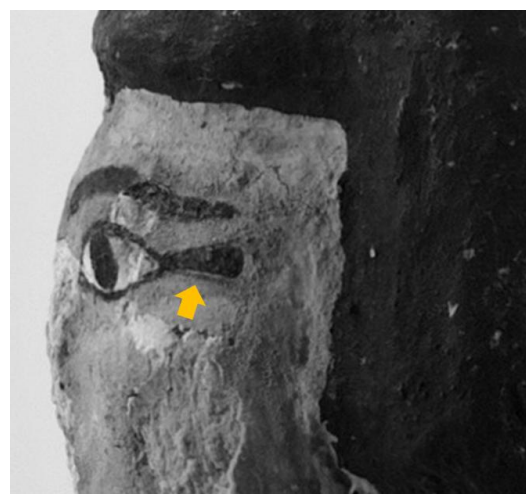


Fig. 37 - Detail of the dress strap: detail of the black painted line



Fig. 38 – Bearer A, IR image. Orange Arrow: black outline of the eye makeup



SEM-EDS stratigraphic analyses further revealed, above the calcium carbonate-based ground layer, the presence of an additional layer rich in calcium and sulphur, interpretable as a calcium sulphate-based layer. This level was observed both in the sample taken from the white garment and in that taken from the black wig, where it lies immediately beneath the black pigment layer. The black sample was collected from the hair tail, at a sufficient distance from the reworked areas at the top of the head. Therefore, although a degree of caution remains necessary, it may reasonably be considered representative of the original stratigraphic sequence and painting technique. At the current stage of investigation, this second white level is interpreted as a paint layer. However, in the absence of stratigraphic sampling from the yellow areas, its widespread presence across the entire surface cannot be completely excluded, nor the possibility that it may have served a function comparable to that of a second, thinner and carefully finished ground layer.

The black pigment is used for the rendering of the hair, facial details, and figure outlines. XRF analyses show spectra comparable to those of the white areas, without the presence of specific diagnostic elements attributable to inorganic metallic pigments. SEM-EDS analyses do not reveal characteristic elements within the black layer, reinforcing the hypothesis of a carbon-based pigment. On the basis of the available data, the black can therefore be interpreted as a carbon black.

The yellow colour was used for the skin tones and for the decoration of the basket. On the basis of the analytical and imaging evidence, the yellow pigment can therefore be interpreted as a natural earth pigment based on iron oxides. Infrared false-colour imaging shows a light green chromatic response, compatible with the use of yellow ochre (Poldi e Villa 2006, 131). This hypothesis is further corroborated by XRF analyses that, in linear mode, show significant iron peaks, accompanied by calcium attributable to the ground layer, and minor peaks of potassium and sulphur. In logarithmic mode, traces of titanium, copper, zinc, and arsenic are also detected, and may be interpreted as traces of kaolinitic minerals, which were detected by FTIR in reflection mode.

The red pigment is present exclusively on the base, with the exception of the bands of the bracelets associated with the arms attributed to the sculpture. XRF analyses show a spectrum similar to that of the yellow pigment, with the presence of iron and the absence of sulphur and potassium peaks. On the basis of the available data, the red pigment can be interpreted as red ochre.

Neither direct observation nor UV fluorescence imaging reveals the presence of original organic finishing layers applied over the paint strata. The fluorescence observed under UV light is instead attributable to later restoration materials.

The painted surface of Bearer A reveals a complex conservation history, characterised by repeated interventions of consolidation, cleaning, and aesthetic reintegration carried out at different times and not always documented. UV examination shows extensive areas of bluish fluorescence, consistent with the presence of synthetic consolidants (Es Sebar et al. 2023, 2790–91). Reflection FTIR analyses confirmed the widespread application of Paraloid B72, in some cases in layers thick enough to partially obscure the spectral signals of the underlying strata. This evidence allows at least one major intervention phase to be tentatively dated between the 1980s and early 2000s.

Reflection FTIR also identified proteinaceous materials, particularly concentrated in red and white areas. Given the age of the sculpture, these signals are more plausibly attributable to restoration treatments rather than to original binding media, although the latter possibility cannot be entirely excluded.

Comparison between the 1920s photograph and the current condition suggests that at least one cleaning phase occurred prior to the most recent restoration (2019). Among the most invasive aesthetic interventions is the repainting of the hair, applied directly over the original surface.

5.2.3. Bearer A: Displaced arms



Fig. 39 - Offering Bearer A, observation of morphological coherence through the juxtaposition of the parts, and observation of visual correspondence with the historical photograph. Green lines: comparison of silhouettes. Red lines: losses of the paint layer. Blue lines: stains

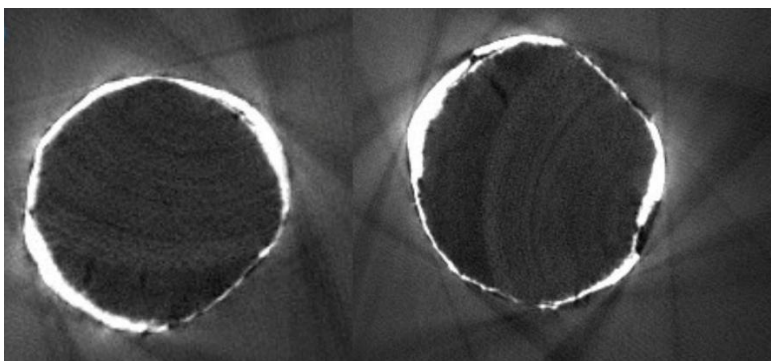


Fig. 40 – CT transversal slices of Provv. 45 and Provv. 65

The search for the arms of Bearer A was carried out on the basis of an analysis of the historical photographic documentation from the 1920s and of the material evidence still preserved *in situ*. Direct observation of the object, integrated with tomographic data, indicates that the limbs became detached from the body at an undetermined point in its conservation history, most likely following the fracture of the internal anchoring dowels.

Technical evidence shows the presence of one dowel per side at shoulder level and an additional dowel in the left hand. Of these, those associated with the left side were still partially preserved within the body. In addition, for the left arm, two fragments corresponding respectively to the shoulder and the hand were still present *in situ* and therefore had to be absent from the elements to be sought. For the reasons outlined in chapters 3.4 and 4.2, the investigation focused primarily on the Temporary Inventory (Provv.), within which two erratic arm fragments were identified that are coherent in

terms of morphology, pictorial decoration, and comparison with the photographic documentation: Provv. 45 for the right arm and Provv. 65 for the left.

In accordance with the iconography of the subject, the right arm is extended along the body, with the hand clenched into a fist and provided with a through-hole intended for the anchoring of the offering, while the left arm is slightly flexed, with the hand open and originally oriented upwards in the act of supporting the basket on the head.

An element of particular interest concerns the pictorial decoration of the arms. The skin is rendered using yellow, while bracelets are painted at the wrists, characterised by a sequence of thicker yellow and red rectangles interspersed with thinner white rectangles. The whole is defined by a fine black contour line. These decorative details were not recognisable in the historical photograph. In the case of the right arm, the area corresponding to the bracelet is affected by an extensive lacuna, while on the left arm the surface appears heavily obscured by particulate deposits which, given that the photograph is in black and white, prevented a correct reading of tonal variations and thus the recognition of the decoration (Fig. 39).

Both arms appear to have detached at an earlier stage and to have been subject to a structural intervention that saw their reattachment through the use of a particularly strong modern adhesive paste. It is still clearly visible *in situ*, applied at the interfaces of the joints between the shoulders and the arms. In the case of the left arm, the same material was also used at the junction between the hand and the basket (Fig. 41).

It is possible to observe the inadequacy of this bonding system. In the right arm, the adhesive filler caused the fracture of the original wooden material located between the shoulder and the filler itself, resulting in the extraction of the internal dowel, which remained attached to the arm. The perfect morphological correspondence between the arm and the shoulder nonetheless allows the attribution of the element to the sculpture to be proposed with a good degree of confidence. Similarly, for the left arm, the correspondence between the existing lacunae and the fragments preserved *in situ* support the attribution.

Subsequently to this intervention, a new detachment of the arms occurred. Their registration to the Temporary catalogue allows a *terminus post quem* to be identified, as this catalogue was established during the post-war period.

From a structural point of view, both erratic arms were carved from wooden blocks lacking the pith. Tomographic investigations reveal, in both cases, a difference in radiopacity between two distinct areas of the wooden support, plausibly interpretable either as a natural defect in the wood or as an intrinsic variation in the raw material (Fig. 40). Above the support, a white ground layer is present, of variable thickness but generally less than one millimetre.

An element of particular interest concerns the painting technique adopted for the execution of the bracelets, which partly diverges from the sequence observed on the rest of the sculpture. Visual investigations show that the thin black contour line of the bracelets is



Fig. 41 – Left arm Provv. 65. Red arrows: adhesive filler



Fig. 42 – Detail of the painted bracelets

uncertain and discontinuous, not solely as a result of the state of preservation. In some areas, this line appears to lie beneath the applications of yellow, red, and white pigment that define the individual decorative rectangles, whereas in other points the black line overlies the colour fields (Fig. 42). This non-univocal stratigraphic distribution suggests an executorial procedure different from that adopted for the rest of the figure, where

black generally constitutes the final colour applied. In the case of the bracelets, it is plausible to hypothesise that the black contour was initially drawn to delimit the individual fields, which were subsequently filled with the different colours. Some of these colour applications, however, appear to have been carried out with limited precision, partially covering the contour lines. This would have necessitated a localised corrective intervention, with the reapplication of black in specific areas, giving rise to the apparently “confused” stratigraphy observable today.

XRF analyses carried out on the white layers of the arms show a dominant calcium peak, accompanied by signals of silicon, sulphur, potassium, titanium, and iron, consistent with what has been observed on the main sculpture. The yellow and red layers display spectra analogous to those of the white layers, but with a marked increase in the iron signal. In the case of the yellow layers, traces of copper are also observed, whereas these are absent in the red layers. XRF spectra acquired with the Bruker ARTAX 200 on the arms and on Offering Bearer A are overall coherent, with no significant compositional differences (Fig. 43).

When assessing the coherence of the XRF data between the arms and the main figure, a cautious approach is required: the compatibility of the spectra constitutes a necessary condition for hypothesising the association of the elements, but does not in itself represent definitive proof. In other words, if the arms had shown a markedly different composition, their pertinence would have been difficult to sustain, whereas the fact that the spectra are comparable supports the hypothesis of association but is not, on its own, sufficient to demonstrate it conclusively.

Multispectral analyses and FTIR investigations in reflection mode did not produce results that were significantly different than those already observed on the main sculpture, confirming the absence of

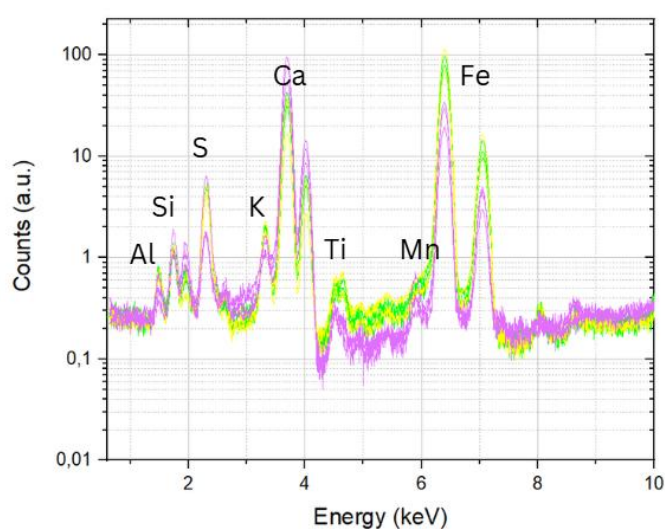


Fig. 43 – XRF spectre of yellow pigments: Bearer A (violet), Right arm (green), Left arm (yellow)

evident discontinuities, but without providing new decisive data for pertinence purposes. Overall, the available data suggest that the painting technique of the erratic arms is consistent with that of Bearer A: a calcium carbonate-based ground layer, the use of a carbon-based black pigment, and the employment of yellow ochre and red ochre as chromatic pigments. A degree of uncertainty nonetheless remains regarding the possible presence of a calcium sulphate-based layer, as no targeted micro-sampling was carried out on the yellow layers of the arms. This uncertainty is, moreover, shared with the main sculpture, for which no stratigraphic sections are available that specifically include the yellow areas of the body. A definitive verification would have required the comparative sampling of the yellow from the figure and that from the arms. However, in keeping with an approach of minimal invasiveness, it was considered that the evidence already available was sufficient to support the hypothesis of association.

Notwithstanding these considerations, a limited margin of interpretative caution remains. The possible reworkings undergone by the sculpture during its conservation history, particularly those affecting the base, suggest prudence in assuming absolute certainty of pertinence. Nevertheless, the convergence of multiple elements, such as morphological and proportional coherence, the perfect correspondence of joints and dowels, the absence of evident technical inconsistencies, and comparison with the photographic documentation from the 1920s, leads to the conclusion that the identified arms are, with a high degree of probability, those pertaining to Bearer A, at least in the configuration documented historically. The possibility that these are not the elements originally conceived for the sculpture cannot be entirely excluded, but on the basis of the current evidence it appears residual.

5.2.4. Bearer A: Displaced duck wing

With regard to the search for the poultry offering fragments, the situation proved particularly complex. Bearer A presents a through-hole in the clenched right hand, originally intended for the anchoring of the offering, now missing. Historical photographic documentation from the 1920s shows that the figure held a duck wing inserted into the hand.

The search for the fragment was initially conducted within the Temporary Inventory, but no compatible elements are currently catalogued there. The investigation was therefore extended to the Supplement Catalogue, with particular attention to materials originating from the Asyut necropolis. On the basis of morphological similarity with the element visible in the historical photograph, fragment S. 8165/32 was identified as potentially compatible (Fig. 19). A critical issue concerns the inventory data. The fragment is classified as “dispersed” material, recovered from disturbed layers and associated with the 1906 excavation campaign. Since this predates the discovery of the Tomb of Minhotep by approximately two years, a direct original association appears unlikely. If the fragment visible in the historical photograph corresponds to S. 8165/32, it would therefore represent a later pastiche, assembled in order to restore visual completeness to the figure. It cannot, however, be excluded that the original element was never recovered or was subsequently lost.

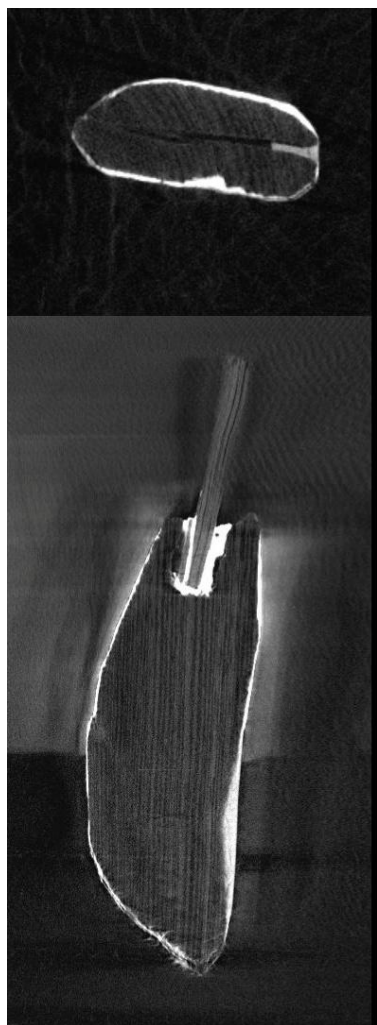


Fig. 44 – CT images of S. 8165/32 (Bearer A)

From a technical point of view, the fragment consists of a carved wooden element shaped as a wing, provided at one end with an opening into which a wooden dowel is inserted. This dowel would have been inserted into the hand of the sculpture and extended towards the second constitutive element of the duck's body¹⁸. The diameter of the dowel is smaller than that of the hole present in Bearer A's hand. Although this discrepancy argues against a secure association, it cannot be considered decisive, since the intermediate hole may legitimately be larger than the dowel without compromising the functioning of the anchoring system.

Morphologically, the element displays a convex profile. The terminal portion shows irregular edges, plausibly due to partial detachment of wooden fragments caused by poor conservation. Tomographic imaging reveals a through-going crack within the wooden matrix, a noteworthy feature given the small dimensions of the element (Fig. 44). The dowel has been secured through extensive use of paste, which does not appear fully compatible with the original technique and should therefore be interpreted cautiously as a probable conservation material.

The ground layer is homogeneous. The decoration is articulated on the two faces, delimited by a thick black contour line separating white-painted surfaces. The plumage is rendered through black and red lines. Minor irregularities in execution are observable, particularly in the uneven spacing and alternation of colours.

Analytical data indicate a calcium carbonate-based ground layer, red pigments attributable to natural iron oxide earths, and a carbon-based black pigment. The thinness and proximity of the painted lines limited the selectivity of spot analyses, preventing more refined discrimination. No diagnostic evidence allows a secure attribution of the fragment to Bearer A.

5.3. Bearer B (S. 8796)

5.3.1. Bearer B: Wooden structure and carving technique

Offering Bearer B is the smallest of the three figures ($44.7 \times 14.5 \times 20.5$ cm) and is also composed of the smallest overall number of wooden blocks, for a total of six¹⁹. A distinctive feature of this sculpture in comparison with the others is that the block from

¹⁸ As reference image of the appearance of a complete duck, see Fig. 20

¹⁹ The main figure, two arms, two for the duck (hypothetical) and one of the base

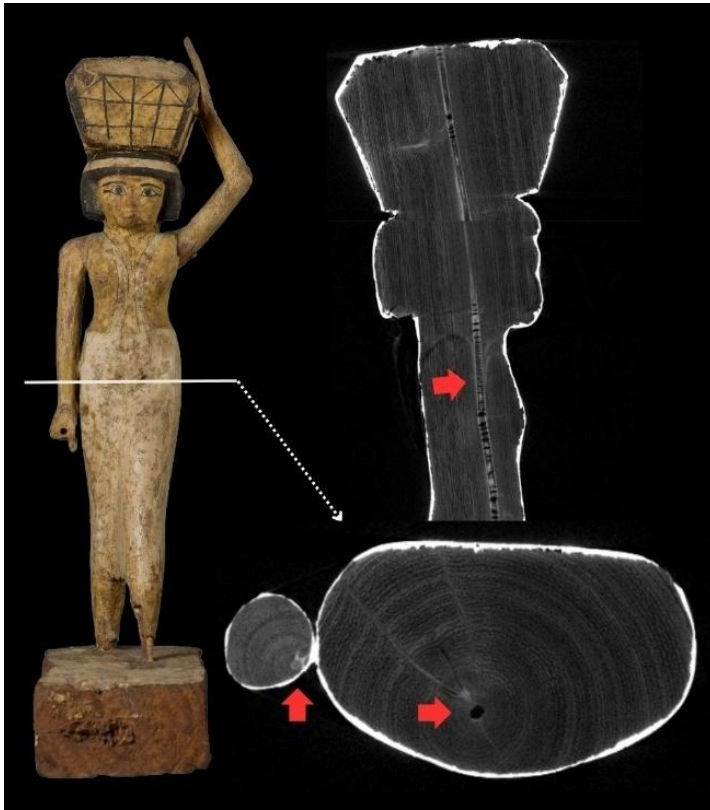


Fig. 45 – Bearer B. Red arrows: pith

which the main figure was carved includes the pith, clearly visible in tomography at approximately two thirds of the width of the figure, from the top of the basket down to the point at which the legs separate, where it was removed in order to create the void between the legs (Fig. 45). In this case as well, the wood employed appears to be a hardwood which, on macroscopic observation, is compatible with the fig genus and probably attributable to *Ficus sycomorus*. The main block is of fair quality, although it nonetheless displays widespread knots and shrinkage cracks.

From this main block, both the basket element and the back hair tail were carved. In the former case, this technical choice allows for good formal integration between the figure

and the load, as well as greater structural stability of the element. In the latter case, however, the hair element appears shorter and thinner in proportion than in the other offering bearers and is therefore potentially more fragile, although it is preserved in good condition. At the same time, precisely because of the reduced thickness of the element and its inherent fragility, the sculptor's skill in its execution is evident.

CT investigations reveal a significant difference in radiopacity between the wood of the body and that of the arms, suggesting the use of a different wood species of higher density for the latter. Both wooden elements of the arms contain the pith, in the same manner as the main block. The arms were assembled using an articulated system of wooden dowels. On the left side, corresponding to the raised arm, one dowel is present at the shoulder level and another at the left hand, anchoring it to the basket. On the right side, two wooden dowels are observed in the shoulder area, vertically aligned and inserted transversely but in an oblique manner, converging towards the interior of the body.

Although both arms are currently *in situ*, tomographic imaging demonstrates that they were subject to at least one phase of detachment followed by later repositioning. The evidence for these interventions emerges primarily from CT data (Fig. 46), as visual inspection alone only revealed the presence of retouched fillings externally visible at the joints, subsequently removed during the 2021 restoration.

In the right arm, tomography shows fractures affecting both anchoring dowels. The upper dowel is broken at the central portion of the shoulder joint, while the lower dowel is fractured, with only the half inserted into the arm preserved. These fractures indicate an initial structural failure and detachment. The arm was subsequently repositioned and

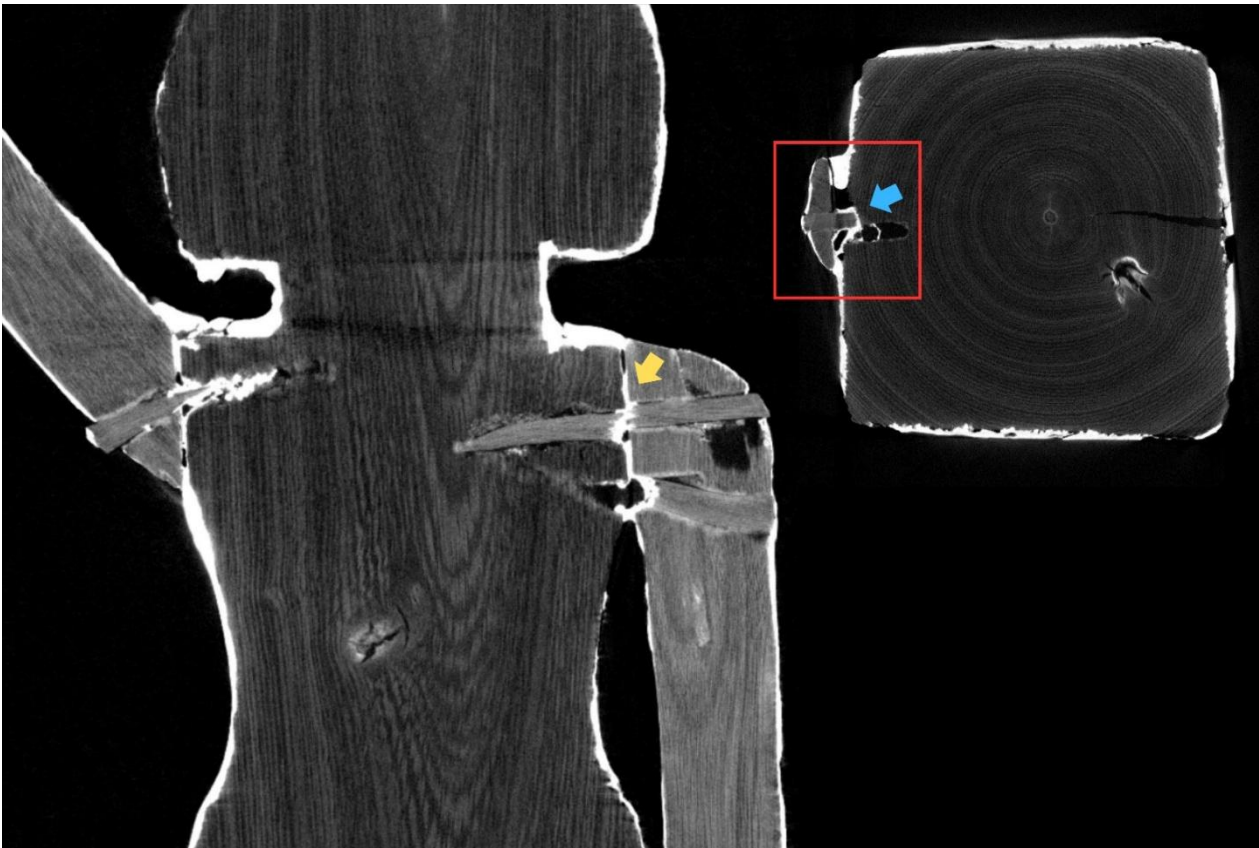


Fig. 46 – Bearer B. Left: vertical slice, dowels repositioned at shoulder level. Right: transversal slice, in the red square, dowel repositioned at basket level. Yellow arrow: misaligned dowel. Light blue arrow: misaligned dowel

stabilised through the application of an adhesive filler, clearly visible along the joint line and at the fracture surfaces of the dowels. The upper dowel was not correctly realigned during this intervention: the two fractured portions are offset, with the segment inserted into the arm positioned slightly higher than its counterpart in the body. This misalignment confirms that the current configuration results from a later reassembly rather than from the original construction.

In the left arm, the dowel inserted into the shoulder remains structurally intact. However, the distribution of restoration materials suggests that the arm was extracted and later reinserted. A significant amount of filler is present within the shoulder cavity, particularly around the dowel, whereas this material is absent on the portion embedded in the arm. This pattern indicates that the exposed segment of the dowel was immersed in filler and subsequently reinserted into its seat, pointing to a secondary intervention phase. The same material is detectable along the joint interface.

Further evidence of detachment concerns the dowel that originally anchored the left hand to the basket. This dowel is fractured: the segment inserted into the hand remains intact, while only a short and misaligned portion survives in the basket recess, insufficient to fulfil a structural function. Filler is present along the contact surfaces between the hand and the basket and within the basket cavity, but absent in the recess of the hand, confirming that this material belongs to a restoration intervention.

Overall, the tomographic data reveal a sequence of breakage, detachment, and later stabilisation affecting both arms, with adhesive fillers playing a decisive role in their current configuration.

The poultry offering was originally attached to the right hand by means of a through-hole. From the historical photographs taken in the 1920s, the complete absence of the offering is already observable at that date, indicating that it had probably been lost.

The anchoring system between the figure and the base has been significantly altered by later interventions. The base itself does not display evidence of non-functional joints comparable to those observed in the other offering bearers. However, the raw material selected for the base appears to be of inferior quality compared to that used for the carved figure, with deviated fibres and invasive knots, a choice plausibly related to its secondary structural role.

The presence of two circular seats intended to accommodate the legs and the negative outlines visible in the painted decoration on the upper surface of the base, which clearly delineate their former imprint (Fig. 19), suggests that the sculpture and base are original and structurally coherent. At some point in its conservation history, the sculpture became detached from the base, an event likely accompanied by the loss of both feet. No dowels are observed in correspondence with these areas, suggesting that the feet may have been made of paste rather than wood. This hypothesis is further supported by their complete loss, consistent with the greater fragility of such materials.

The most significant structural damage concerns the legs. The left leg lacks its terminal portion and is currently sustained by a modern wooden insert introduced into the base, probably exploiting the original cavity. The right leg, although structurally preserved, shows evidence of having been disengaged from its original seat and subsequently reinserted. The recess in the base is now oversized and irregular, indicating loss of material during detachment. Both legs are presently secured using a modern adhesive with a filling function. Tomographic imaging reveals air bubbles trapped within the adhesive matrix, while FTIR analyses identify its acrylic and epoxy components, confirming its attribution to modern restoration interventions (Fig. 47). Despite these structural alterations, the

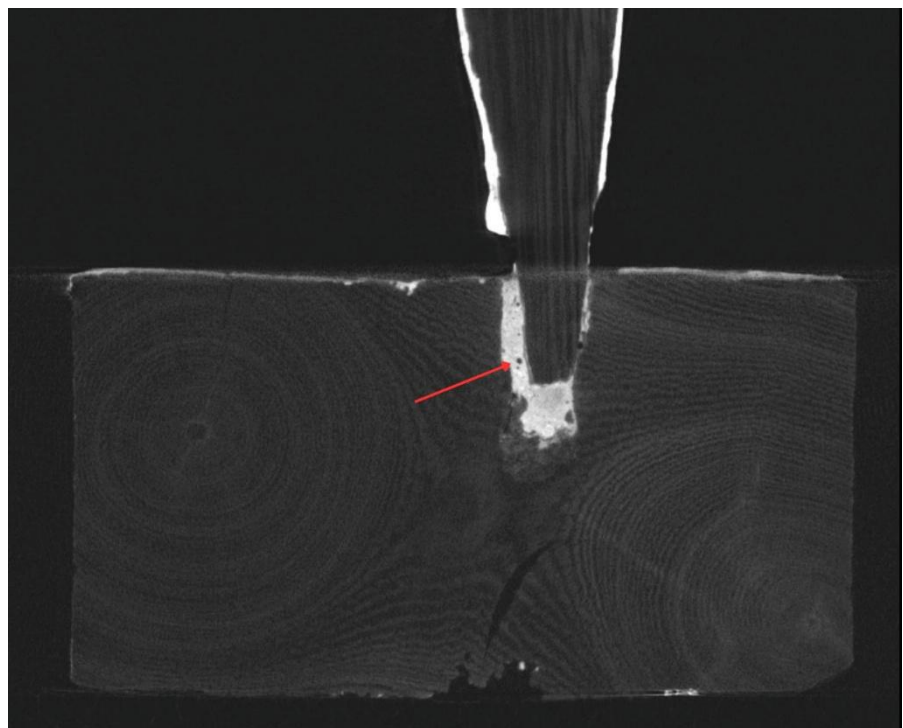


Fig. 47 – Bearer B, right foot. Red arrow: air bubbles

carving of the figure itself appears carefully executed, and the use of paste for filling purposes is minimal. This characteristic may be related both to the relatively good quality of the support material and to the technical skill of the sculptor, particularly evident in the execution of the hair tail and in the precision and symmetry of the basket.

5.3.2. Bearer B: Painted decoration



Fig. 48 – 1920's photo of Bearer B.
Red arrow: Half of the face
cleaned: cleaning test hypothesis

The painted decoration of Bearer B is structured on a white ground layer applied continuously over the surface of both the figure and the base. This layer is thin and fairly homogeneous, with an average thickness of less than 1 mm, and does not appear to play a significant role in the definition of volumes, which are instead primarily shaped by the carving. XRF, FTIR in reflection mode, and stratigraphic analyses indicate a composition based on calcium carbonate, with silicate impurities that are overall less abundant than those observed in Bearer A. SEM-EDS investigations carried out on samples taken from the white garment and the black wig likewise show that the deepest layer consists exclusively of calcium, with silicon impurities, a result compatible with a calcium carbonate-based ground layer.

The palette and the sequence of colour application are consistent with those observed in the other offering bearers: above the ground layer, an initial application of white can be identified, followed by yellow and finally black on the body of the figure, while the base displays a white field on the upper surface and red fields on the lateral faces. The application of the yellow colour appears overall rather uneven, allowing the brushstrokes to be clearly observed, as well as accumulations of pigment in certain areas, particularly on the back area of the figure. The black lines

used for the definition of details and contours are, among the three offering bearers, the thinnest, most regular, and most confident. The stroke is precisely modulated according to the elements depicted and shows only rare and minor imperfections or reworkings. In particular, the rendering of the eyes and eyebrows stands out for its accuracy and symmetry, suggesting a higher level of technical skill in the execution of the details.

Similarly to what observed in Bearer A, XRF analyses of the white areas in linear mode show a dominant calcium peak, accompanied by a minor iron signal, and the sulphur peak. In logarithmic mode, traces of manganese, zinc, and arsenic were detected. SEM-EDS stratigraphies reveal, above the ground layer, a level rich in calcium and sulphur, interpretable as a calcium sulphate-based layer. In the sample taken from the white garment, a localised aggregate of grains rich in sulphur, iron, and aluminium is also

observed, associated with silicate inclusions (Si-K and Si-Al), the interpretation of which remains open.

The black pigment, used for the wig and for details, shows XRF spectra comparable to those of the underlying areas and does not display specific diagnostic elements. SEM-EDS analyses likewise do not reveal characteristic inorganic components. These data are consistent with the use of a carbon-based black pigment.

The yellow colour, employed for the flesh tones and for the basket, shows in XRF main peaks of iron and calcium, the latter attributable to the ground layer. In logarithmic mode, traces of sulphur, potassium, titanium, manganese, and copper are present. Also in this case the pigment is interpreted as a natural earth based on iron oxides.

The red pigment, identified on the base, is applied directly onto the wood, without an intermediate ground layer. XRF analyses revealed potassium, calcium, iron, and copper, with minor traces of manganese. The predominance of iron, combined with the presence of manganese as a typical natural impurity and the absence of diagnostic elements associated with synthetic or mineral red pigments (such as mercury or lead), supports the interpretation of a natural ferruginous earth, consistent with red ochre.

Imaging investigations did not reveal the presence of Egyptian blue under VIL examination, nor evidence of fluorescent varnishes under UV illumination.

The painted surface of Bearer B exhibits conservation issues comparable to those documented for Bearer A, including the presence of synthetic consolidants and proteinaceous materials detected through FTIR analyses. Comparison between the 1920s photograph and the current condition indicates that at least one cleaning phase took place prior to the most recent restoration in 2021. In the historical image, a lighter area on the left half of the face may plausibly be interpreted as a cleaning test (Fig. 48), suggesting that selective surface interventions were already undertaken at a relatively early stage.

5.4. Bearer C (S. 8794)

5.4.1. Bearer C: Wooden structure and carving technique

Offering Bearer C is the tallest of the three (64 × 16 × 29 cm) and was carved from nine²⁰ wooden components. The main figure was carved from a single wooden block devoid of pith. As the other offering bearers, the wood appears to be a hardwood, macroscopically attributable to the fig genus and referable to a *Ficus sycomorus*. In this case, the fair quality of the wood and the absence of pith make the material selected for the execution of this sculpture the highest in quality among the three. Observable defects in the wood include knots and shrinkage cracks, some of which, particularly those close to the surface, were treated with paste to reinforce the area and regularise the surface. The basket was carved from the same block as the body, a solution that likely influenced the proportionally reduced relationship between the figure and the load, especially when compared with the other offering bearers.

²⁰ The main figure, the ponytail, two arms, two for the duck (hypothetical), two feet, and one of the base

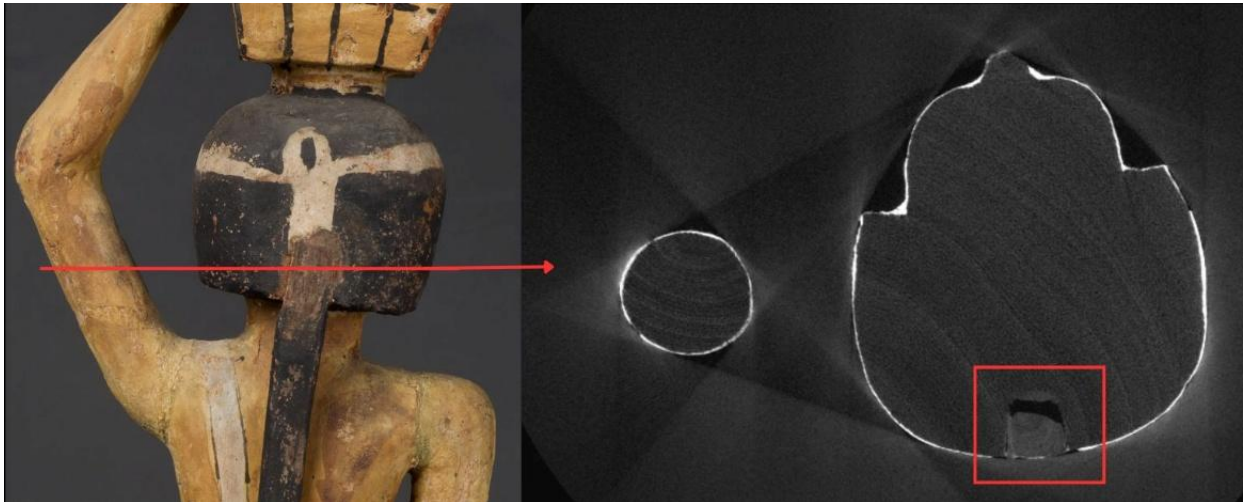


Fig. 49 – Bearer C, half lap joint of the back hair tail

The back hair tail was made from a separate wooden piece lacking the pith, inserted into the figure by means of a half-lap joint in the nape area (Fig. 49). This technical choice allowed the added block to be brought to the same level as the main block, enabling an accurate definition of the head without the need to recourse to substantial ground layer thicknesses.

The arms were presumably made from wood of the same species as that used for the body, given the marked similarity evident in tomography, and were carved from blocks without pith and assembled to the body by means of wooden dowels (Fig. 50).

In Bearer C, the anchoring system of the arms reveals a complex structural history. On the right arm, two vertically arranged dowels are present at shoulder level, while the left arm is secured by one dowel at the shoulder and another at the hand, anchoring it to the basket. Beneath the main shoulder dowel of the left arm, a second wooden insert is seated in a blind hole within the body. As this element does not contribute directly to the anchoring of the limb, it has been interpreted as a corrective insert intended to reduce the diameter of the original recess and stabilise the main dowel. Whether this represents an original executational adjustment or a later restoration remains uncertain, particularly in light of a fracture that caused loss of wood from the body and was subsequently filled with paste. Tomographic imaging also revealed, at head level within the left arm, a dense wooden area, likely corresponding to a portion of bark (Fig. 50).

The poultry offering was originally attached to the right hand. Historical photographs document the presence of a duck wing, now lost.

Photographic documentation also records the detachment of the right arm. The available images, taken in black and white from several orthogonal views, are difficult to date precisely. The typewritten identification label visible in the photographs may tentatively connect them to the post-war reorganisation of the Museo Egizio photographic archive, particularly during the 1950s. This element can only be considered a relative chronological indicator, at best providing a *terminus post quem*.

Tomographic analysis confirms that the right arm underwent significant structural damage. The upper dowel preserves only the portion inserted into the arm, while the

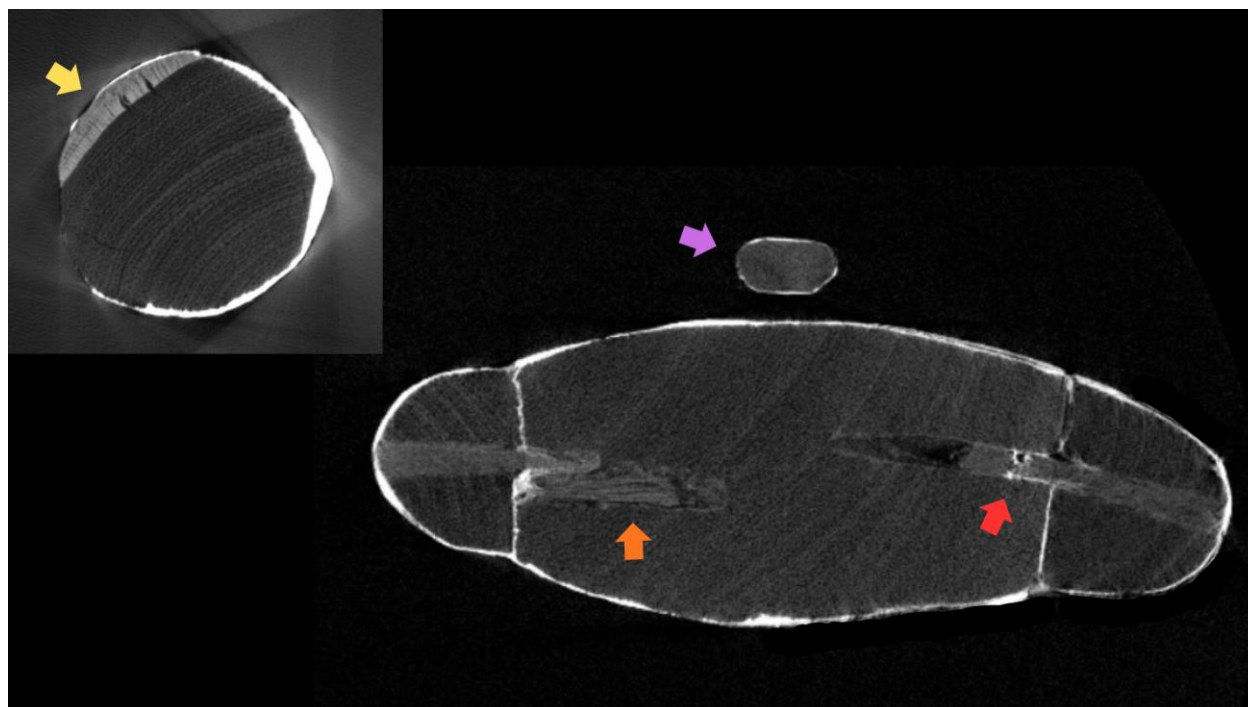


Fig. 50 - Offering Bearer C, transverse slice at shoulder level. Orange arrow: non-through dowel of the left arm. Red arrow: fracture of the upper dowel of the right arm. Purple arrow: rear hair tail. Yellow arrow: portion of bark of the left arm

segment originally housed in the body has been lost. The lower dowel appears fractured in at least two points: the portion inserted into the arm remains intact, whereas a segment corresponding to the body side was reattached using filler. The internal seat is longer than the preserved fragments, indicating the loss of additional dowel material. The arm is currently stabilised by an adhesive filler visible both between the dowel fragments and along the interface between the arm and the body.

The left arm likewise shows evidence of subsequent reassembly. Filler is present at the joint interface and around the dowel within the body cavity, while absent on the portion of the dowel embedded in the arm, suggesting that the limb was removed and later reinserted. The corrective insert described above also exhibits filler in its contact areas and at the exposed head, where it appears to serve a sealing function.

Overall, the tomographic and photographic evidence indicates multiple phases of detachment and reassembly affecting both arms, with modern filler materials playing a decisive role in their current configuration.

Bearer C is the only one to retain the terminal portions of the legs and the feet in their entirety. The legs continue with a cylindrical section into the base, where they function as anchoring elements. The feet were made separately from shaped wooden inserts and fixed to the base by means of a through-dowel inserted in the central area of each foot (Fig. 51).

The base, made of wood of lower quality than that used for the figure, shows marks on the front face compatible with saw traces. On the back underside, a non-functional mortise-tenon joint is present, allowing the hypothesis that the base was made from unwanted material or reused wood coming from other working processes (Fig. 52).

This feature is likely responsible for the relative instability of the base, as a result of which the entire sculpture tends to be unbalanced and to incline towards the right. The instability of the sculpture results from the fact that the tenon slightly protrudes beyond the lower surface of the base.

Given that the feet are still preserved *in situ*, it may be hypothesised that the use of this reused wooden element for the base already occurred during the original production of the sculpture.



Fig. 51 – Bearer C, transversal slice of the feet. Orange arrows: lower portion of the legs. Yellow arrows: dowel inserted on the centre of the feet



Fig. 52 – Bearer C, non-functional tenon-mortise joint on basement

5.4.2. Bearer C: Painted decoration

The white ground layer of Bearer C is the thinnest and most homogeneous among the three sculptures analysed, with thicknesses generally below 1 mm. Precisely because of the limited thickness of this layer, stratigraphic sampling required the joint removal of a portion of the wooden substrate in order to obtain representative and structurally intact cross-sections. XRF spectra acquired on the ground layer show a clear dominance of calcium, accompanied by a weak silicon signal and low-intensity signals of sulphur and iron. Additional elements such as chlorine, potassium, titanium, and manganese are

detectable only in logarithmic scale, indicating extremely low concentrations. SEM-EDS analyses revealed a homogeneous layer characterised by the presence of calcium, without a systematic association with sulphur, in all the three samples taken from the white area of the garment, taken from the hair, and from the yellow of the skin. FTIR analysis in reflection mode likewise allowed the identification of calcium carbonate as the main constituent of the ground layer. In light of this evidence, and in contrast to what was observed in Bearers A and B, the sulphur signals detected in the XRF spectra are interpreted as attributable to trace impurities or secondary contributions, rather than to the presence of a calcium sulphate layer applied over the ground layer.

The chromatic palette employed is comparable to that of the other offering bearers, comprising white, yellow, red, and black, and the sequence of colour application is likewise consistent. However, despite this overall coherence, the pictorial decoration of Bearer C stands out clearly for aspects related to the hand of the maker, understood as the combination of formal choices, colour handling, and level of technical control.

In particular, the application of the yellow colour shows a less careful and more irregular handling compared to the other two offering bearers. On the back of the figure, brushstrokes and accumulations of pigment are clearly visible. On the left shoulder in particular, the overlapping of two successive applications of colour can be clearly read, recognisable from the peripheral tide mark of pigment accumulation at the outer edges of the brush and from the imprecise contour (Fig. 53). On the right shoulder, a marked accumulation of yellow-brown colour is also present, distinctly darker than the surrounding skin tone and giving rise to a downward run in the lower part (Fig. 53). The matte appearance of this feature and the absence of characteristics compatible with resinous materials, as observed through analytical investigations, suggest that it should be interpreted as an excess of pigment rather than as a foreign material or a substance of organic nature.

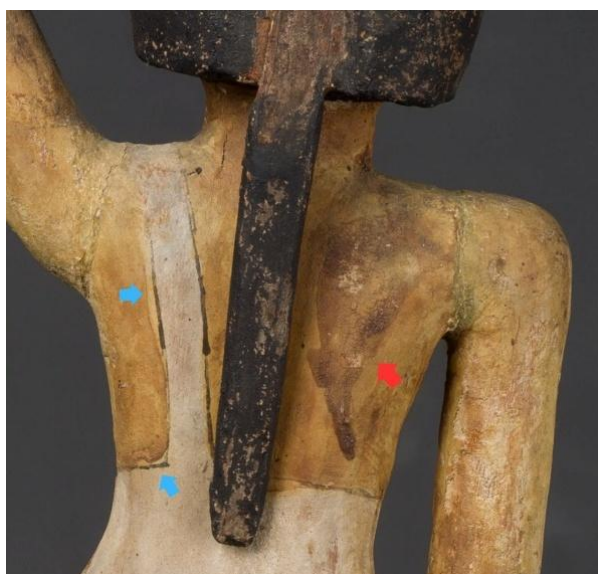


Fig. 53 – Bearer C. Light blue arrows: areas of clear overlapping of two paint layers. Red arrow: yellow-brown coloured area.

The most indicative evidence of the different level of technical control, however, emerges from the analysis of the black contour lines and details. In this sculpture, the stroke is generally more material and uneven, with a particularly variable line width within the same element. The edges of the stroke are often undulating and irregular, and imprecisions such as inaccurately reworked lines or applications carried out with an excessively loaded brush are frequent. The rendering of the gaze is also less controlled, with eyebrows set very close together, uneven thicknesses, and reduced symmetry between the two eyes, elements that contribute to clearly distinguishing this offering bearer from the other two from an executorial perspective. Finally, the precision in the

execution of the knot element is markedly poorer than that observed in the corresponding feature of Bearer B.

With regard to the nature of the black pigment, FTIR analyses in reflection mode did not provide useful diagnostic signals, while SEM–EDS observations did not reveal the presence of specific particulate phases or characteristic elemental associations. XRF spectra acquired from the black areas allows a close match with the results of those of the underlying layers (white ground layer or yellow chromatic layer), except for a slight relative increase in the potassium signal. The substantial absence of characteristic inorganic elements, together with the overlap of the XRF spectra, is therefore compatible with the use of a carbon-based black pigment, such as charcoal black.

The yellow pigment, used for the skin tones and for the basket, shows a light green response in infrared false-colour images. XRF main peaks of calcium, attributable to the ground layer, and of iron, accompanied by minor signals of silicon and aluminium and traces of copper and sulphur in logarithmic scale, compatible with the use of yellow ochre. Near the right shoulder, the colour stain there is a more pronounced copper signal detected by XRF, the nature of which remains unclear at present. SEM–EDS analyses carried out on a sample taken from the back, in an area characterised by superimposed yellow applications, show a chromatic layer composed of grains finer than those of the ground layer, sometimes aggregated into small clusters. Neither two different materials nor two distinct applications can be distinguished. It is therefore plausible that the applications were carried out using the same pigment and likely in close temporal succession, as they are well fused together. EDS highlights a diffuse distribution of sulphur, iron, aluminium, and sodium, while silicon is both distributed throughout the layer and concentrated in individual grains, a result compatible with the use of a natural earth pigment.

Bearer C, likewise for Bearers A and B, exhibits no evidence of original surface finishing layers, but instead there are many traces of consolidation treatments, including the presence of synthetic polymers identified through FTIR analysis.

Owing to the availability of a more substantial corpus of historical photographs, its conservation history can be reconstructed with greater detail. A first cleaning intervention can be identified between the 1920s photograph and a subsequent black-and-white image in which the right arm appears detached. Although the chronological sequence of the black-and-white and colour photographs cannot be established with certainty, contextual elements suggest that a further cleaning phase, responsible for the present appearance of the surface, took place after both images.

A particularly interesting element emerging from the analysis of the historical photographs of Bearer C, both black-and-white and colour, is the marked difference in the state of preservation between the front surface of the sculpture, heavily stained and darkened by deposits, and the posterior portion of the back, which is significantly cleaner. This disparity suggests that, at the time of discovery, the sculpture may have been positioned in such a way as to partially protect the back side, for example leaning against a wall or the side of the coffin. The distribution of deposits, more heavily concentrated on horizontal or upward-facing surfaces (such as the upper face of the base or the top of the

basket and the head), is more consistent with an original upright position rather than a horizontal one.

5.4.3. Bearer C: Displaced duck wing

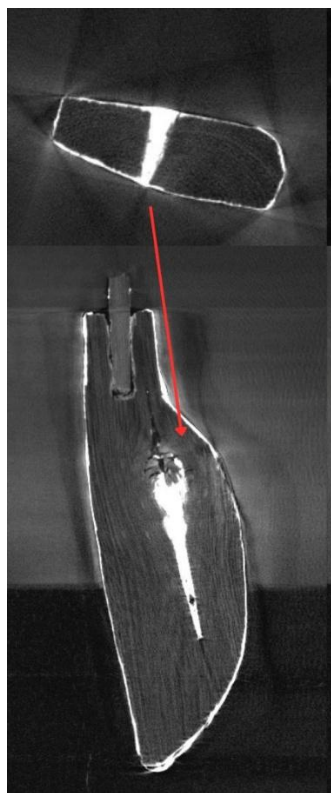


Fig. 54 – CT images of S. 8165/33 (Bearer C)

Bearer C, like the other bearers, presents a through-hole in the clenched right hand for the anchoring of a duck offering. Historical photographs from the 1920s show the presence of a wing element held in the fist.

The search within the Supplement Catalogue led to the identification of fragment S. 8165/33 as morphologically compatible with the element visible in the historical documentation (Fig. 54). As in the case of the fragment potentially associated with Bearer A, this element is classified as “dispersed” material linked to the 1906 excavation campaign. This significantly reduces the likelihood of an original association with the Tomb of Minhotep.

The fragment consists of a carved wooden wing provided with a dowel insertion system comparable in principle to that required for attachment to the hand. The dowel diameter is smaller than the hole in the hand of Bearer C, a discrepancy that, while noteworthy, cannot alone invalidate a possible association.

Morphologically, the element displays a regular geometry. A knot within the wooden matrix is visible and was stabilised through paste infiltration. The jagged edge at the end of the dowel indicates a past fracture. No paste is present within the socket, suggesting that current retention may rely on a low-radiopacity adhesive.

The ground layer is homogeneous. The painted decoration consists of black delimiting fields framing semicircular white areas. Within these, the plumage is rendered symmetrically through alternating red and black lines executed with relative precision. Brush behaviour suggests an execution proceeding from the lower towards the upper portion of the element.

Analytical results indicate materials consistent with those documented on the offering bearers: a calcium carbonate ground layer, iron oxide-based red pigments, and carbon black. However, as with the previous fragment, the analytical data do not provide sufficiently discriminating evidence to confirm a secure attribution to Bearer C.

5.5. Synthesis of the results and concluding remarks

The analysis conducted on the three offering bearers makes it possible to situate them within a coherent iconographic and stylistic framework, while at the same time highlighting internal variations (Table 4). Comparisons with other examples from Asyut confirm that the sculptures are fully integrated within a shared repertoire characterised by

recurring formal solutions accompanied by circumscribed variants. These differences do not indicate substantial typological divergences, but rather reflect executorial choices, varying degrees of refinement, and plausibly also differences in patronage and economic investment.

Within the group, however, internal relationships are not entirely homogeneous. The three sculptures differ markedly in size, with Bearer B significantly shorter than the other two. From a stylistic and iconographic perspective, particularly in the rendering of the faces, garments, and basket decoration, Bearers A and B display more pronounced affinities with one another than with Bearer C, which, although fully conforming to the type, presents a distinct formal articulation. In terms of overall body proportions, all three figures adhere to schemes that remain in continuity with Old Kingdom conventions.

A decisive contribution to the interpretation of the group derives from technological and constructive observations. Bearers A and B both exhibit an economical use of wood, albeit articulated differently. In Bearer A, this economy is expressed through a complex assembly strategy, including the addition of blocks to compensate for deficiencies in the main support and the reinsertion of a fragment detached during carving. The use of dowels of relatively large dimensions in relation to the elements they secure is also notable. In Bearer B, material economy is reflected in the presence of the pith zone within the main block and the arms, a structurally unstable area generally avoided due to its susceptibility to shrinkage cracking.

Bearer C clearly stands apart in this respect. It was carved from a single block of good-quality, stable wood, with a limited number of assembled elements. Interestingly, the arm-assembly system of Bearer B appears closer to that of Bearer C than to that of Bearer A, suggesting that pictorial affinities do not necessarily correspond to structural solutions.

Observations on pictorial stratigraphy further define internal differences. Bearers A and B share a double preparation sequence consisting of a calcium carbonate-based layer overlain by a calcium sulphate-based layer, whereas Bearer C presents a single calcium carbonate-based ground layer. Although this represents a clear technical difference, it does not in itself justify a chronological or typological separation, but rather points to variability within a coherent productive environment. The presence of a calcium sulphate-based layer represents a technically significant feature that warrants further investigation through targeted analyses of comparable sculptures, in order to assess its distribution and possible workshop or chronological implications.

The issue of the bases proved particularly complex. In Bearer A, the absence of footprints, the presence of a substantial modern addition between the legs and the base, the formal inconsistency with the sculpture, and the occurrence of non-functional joints support the interpretation of the base as a probable pastiche assembled using ancient material. By contrast, the base of Bearer B displays structural and formal coherence with the figure, confirmed by the presence of footprints, and can therefore be regarded as original. In Bearer C, the feet preserved *in situ* confirm the authenticity of the association, although the presence of non-functional joints suggests that the base itself may already have been reused in antiquity.

With regard to the erratic elements, the arms can be attributed with a good degree of probability to Bearer A, whereas the duck wings are most plausibly not associated with the group.

The differences identified within the group, apart from the carbonate–sulphate preparation sequence, are not striking and must be assessed with caution, especially in the absence of a broader, systematically analysed comparative corpus. The hypothesis of a close functional association between Bearers A and B should therefore be formulated carefully. While they share certain iconographic and pictorial affinities, they also display significant differences in dimensions and, above all, in construction. Although the possibility that Bearers A and B were conceived as a unified pair cannot be entirely excluded, a more cautious interpretation considers the three sculptures as products of the same production environment or workshop, possibly executed by different craftsmen, at slightly different moments, or for different patrons, but within a shared repertoire.

The study also highlights a complex conservation history characterised by multiple, largely undocumented interventions. In several cases, these interventions have significantly affected the legibility of the original construction techniques and anchoring systems. Discrepancies between the present condition of the sculptures and that documented in the 1920s photographs raise questions concerning the correct reassembly and attribution of certain elements, particularly those more easily detachable, such as the duck wings, as opposed to structurally integrated components like the arms. The reconstruction of the original configuration therefore requires a systematic comparison between historical documentation, inventory data, and technical–morphological analysis.

At the time of discovery, Schiaparelli's excavation journal records the note "broken" next to two of the three sculptures. Although this brief annotation does not specify which figures were concerned or in what sense they were broken, it plausibly refers to sculptures found fractured in one or more points. On the basis of present observations, it is possible that this note referred to Bearers A and B, both of which display significant structural interventions in the leg area and may have been discovered separated from their bases. Photographs from the 1920s, however, show the sculptures structurally intact, though incomplete, suggesting that at least one restoration intervention occurred between 1908 and the date of the photograph. Whether this took place in Egypt or after arrival at the museum remains unknown, as does the possibility that minor elements were added or repositioned to enhance visual completeness, a practice documented in other cases within the museum collections.

In conclusion, the study of Bearers A, B, and C demonstrates that it is the integration of iconographic, technical, material, and archival evidence, rather than isolated details, that provides the most reliable interpretative framework. In the absence of a wide-ranging systematic study of Middle Kingdom offering bearers comparable to that conducted by Harvey for Old Kingdom sculptures, the results presented here should be regarded as a first step. They nonetheless highlight the potential of an integrated approach, capable of contributing in the future to a more precise identification of production contexts and to a more nuanced understanding of internal variability within this sculptural type.

Table 4 - Synoptic table, intended to summarise the main comparative results of the iconographic, technical and scientific observation made on the offering bearers

FEATURE	BEARER A (S.8795)	BEARER B (S.8796)	BEARER C (S.8794)
DIMENSIONS	60×12.5×25.5	44.7×14.5×20.5	64×16×29
GARNMENT	Two stripes	Two stripes	One stripes
NIPPLES	/	Dots decoration	None
WOODEN ELEMENTS	≥10	6	9
MAIN WOOD	Prob. Ficus sycomorus	Prob. Ficus sycomorus	Prob. Ficus sycomorus
PITH	Absent	Present	Absent
BASKET	Separate	Main block	Main block
PONYTAIL	Separate: dowel + paste	Main block	Half-lap joint
ARMS	Shoulders: one dowel per side; left hand: one dowel	Shoulders: one dowel on the left, two on the right; left hand: one dowel	Shoulders: one dowel on the left, two on the right; left hand: one dowel
BASE	Probable pastiche	Original	Original; reused wood possible
GROUND	CaCO ₃	CaCO ₃	CaCO ₃
CASO₄	Present	Present	Absent
BLACK	Carbon black	Carbon black	Carbon black
YELLOW	Yellow ochre	Yellow ochre	Yellow ochre
RED	Red ochre	Red ochre	Red ochre

6. Study of the Boat models

6.1. Iconographic and typological profile

During the Old and Middle Kingdoms, boat navigation constitutes one of the most persistent and conceptually layered iconographic themes in Egyptian funerary art. Its presence is attested both in two-dimensional representations on tomb walls and in three-dimensional representations in the form of wooden models deposited within funerary complexes. Although the two media share analogous subjects, recent scholarship has shown that they likely respond to different representational, functional and theological logics, which prevent them from being interpreted as simple equivalents or reciprocal duplications (Barker 2022, 178–82).

Wall scenes depicting boats appear as early as the Old Kingdom and are generally embedded within articulated narrative sequences, in which the boat participates in processions, economic activities, ritual transport or moments of the deceased's funeral. In this context, the vessel is often one element within a broader visual narrative that privileges multiplicity of figures, continuity of action and, in many cases, textual accompaniment through captions and explanatory formulae (Barker 2022, 71–91). When located within the accessible spaces of the chapel, mural scenes also fulfil a public function, contributing to the construction of the deceased's social persona and to the perpetuation of the funerary cult through interaction with the living (Barker 2022, 175–78).

A different logic underlies the production of three-dimensional boat models, the diffusion of which increases markedly between the late 11th and 12th Dynasties. These models are placed within the *serdab*, or the burial chamber, in a space inaccessible to the living, and are conceived to act exclusively for the benefit of the deceased in the afterlife. In this sense, they do not aim to narrate a sequence of events, but rather to render present an action or function in a condensed and self-sufficient form (Tooley 1989, 1–3; Barker 2022, 176–78). Thus, the distinction between 2D and 3D, as also observed for offering-bearers, concerns not only the technical medium but reflects a conceptual difference in the understanding of the image's efficacy. As Barker has shown, whereas wall scenes select themes compatible with public communication and extended narration, funerary models privilege subjects that can be symbolically activated through their mere physical presence, without the need for narrative development (Barker 2022, 178–82).

Within this framework, boats assume a central role, as they allow the condensation within a single object of concepts such as movement, transport, transition and connection between ritual locations. From a theological and symbolic perspective, boats may refer to different spheres: the transport of the deceased within the funerary context, pilgrimage to sacred sites, particularly Abydos, and, in more circumscribed cases, the solar sphere. However, as Merriman has convincingly demonstrated, the majority of boat models do not display specifically solar attributes and instead reproduce functional vessels consistent with Egyptian nautical practice, adapted to the funerary context rather than conceived as divine boats in the strict sense (Merriman 2011, 102–4, 129–30). The generalised use of the

term 'solar boat' for wooden models is therefore inappropriate and should instead be assessed on the basis of the observable material evidence.

Boat models must also be understood within a broader system of functional models' characteristic of the Middle Kingdom. Within this system, the boat does not merely represent a means of transport, but constitutes an operative device, capable of enabling the ritual movement of the deceased and his symbolic participation in fundamental practices of Egyptian funerary religion (Tooley 1989, 166–68; Barker 2022, 191–92).

The adoption of three-dimensional representation therefore does not imply a replacement of wall scenes, but rather the introduction of a complementary strategy, in which representations respond to different and non-overlapping needs. Boats painted on the walls narrate and explain, wooden models, by contrast, act (Barker 2022, 91–92). It is precisely this difference in function and in the ontological status of the image that justifies the presence of boats within tombs and explains their central role within funerary assemblages.

For further clarification, Tooley draws a clear distinction between pilgrimage boats and funerary boats, attributing to each type specific iconographic and functional characteristic. The former are generally represented as autonomous vessels, upon which the owner appears still alive, often seated or engaged in recreational or ritual activities. These are interpreted as vehicles intended to enable the deceased to undertake pilgrimage to sacred sites (Tooley 1989, 142–66). Funerary boats, by contrast, are often depicted as dragged vessels, explicitly associated with the transport of the deceased now dead, sometimes accompanied by the sarcophagus or ritual figures, and are more directly embedded within the context of the funeral and the transfer to the necropolis (Tooley 1989, 129–42).

From the perspective of chronological distribution, Tooley observes that pilgrimage boats are relatively less widespread than funerary boats until the beginning of the Middle Kingdom, whereas during the 12th Dynasty a progressive reversal of this relationship can be observed, with an increasing attestation of pilgrimage vessels within funerary assemblages (Tooley 1989, 166–68). This shift is interpreted as indicative of a renewed emphasis on the ritual journey of the deceased and on his active participation in Osirian cults, rather than as a simple iconographic variation.

In both cases, however, the fundamental function of boats remains that of a means of transport for the deceased, conceived not as an illustrative representation but as an operative instrument capable of ensuring the mobility required in the afterlife. Whether pilgrimage or funerary, boats thus fulfil a central role within the system of Middle Kingdom wooden models, enabling the movement of the deceased between ritually significant locations and guaranteeing his perpetual access to sacred spaces and essential cultic practices (Tooley 1989, 173).

6.1.1. Typological framework

Over time, numerous scholars have proposed different criteria for the cataloguing and interpretation of Egyptian boat models, reflecting heterogeneous disciplinary approaches and research aims. Alongside the earliest nineteenth-century attempts at classification, based predominantly on descriptive criteria, a significant contribution was made by the

studies of Angela M. J. Tooley (1989), who, within the broader framework of Middle Kingdom funerary practices, collected and systematised a large number of wooden boat models, privileging their archaeological context and function within the funerary assemblage. More circumscribed yet methodologically relevant approaches were adopted by Dilwyn Jones in his study of Tutankhamun's flotilla (Jones 1990), and by Herbert E. Winlock in his study of the sculptures from the tomb of Meketre (Winlock 1955). In the former case, the models were catalogued on the basis of formal, decorative and functional characteristics, with a distinction drawn between functional elements and symbolic-ritual meanings. Winlock, by contrast, adopted an essentially descriptive and reconstructive approach, focusing on the formal documentation of individual examples and on their interpretation as coherent representations of operational vessels, without, however, developing a general classificatory system or a systematic reflection on the relationship between the models and funerary practices.

Although differing in scope and method, these three proposals share a tendency to interpret the models primarily through typological and interpretative categories linked to function or meaning, rather than to their constructive structure.

Within this historiographical framework, the study and classification of Egyptian boat models were long dominated by the system devised by George A. Reisner at the end of the nineteenth century, published in the catalogue *Models of Ships and Boats* (Reisner 1913), which represents the first systematic attempt to organise this category of models. Reisner's approach is based on a combination of general morphological criteria, visual and decorative attributes, chronology and, above all, the presumed function of the vessel, interpreted as though it were a direct transposition of a real boat. From this perspective, the models are implicitly read through a functional and symbolic lens, strongly conditioned by the funerary context and by the notion that they represent "ideal" categories of boats (transport, ceremonial, solar), rather than technical devices endowed with their own constructive logic. As highlighted by Merriman, such an approach tends to privilege the formal and aesthetic aspects at the expense of structural analysis.

Building upon this critical observation, Ann Merriman proposes a radical reassessment of the state of the art (Merriman 2011), introducing a new classification system based on the nautical construction attributes effectively incorporated into the models (for example deck beams, mast-step arrangements, steering systems). The rationale underlying Merriman's method is not typological in the traditional sense, but analytical and comparative: each model is broken down into its constructive attributes, systematically recorded and combined in order to define classes and subclasses, independently of the symbolic function previously attributed to it. This approach makes it possible to read the models as coherent representations of operational vessels, highlighting technological continuities and transformations on both a diachronic and geographical scale, as well as possible regional traditions. At present, Merriman's system probably represents the most effective classificatory framework for the comparative analysis of boat models, particularly regarding the reconstruction of nautical practices and constructional solutions. Nevertheless, it also presents an intrinsic limitation, linked to the strong emphasis placed on comparison with real vessels: such an approach tends to treat the models primarily as reduced testimonies of naval technology, leaving in the background their nature as

autonomous funerary objects, endowed with specific logics of selection, simplification and symbolisation within the tomb assemblage.

A further critical issue in the study of boat models concerns the question of dating, which has been addressed predominantly in an indirect manner. In her work, Tooley attempts to undertake the chronological problem by combining provenance data, contextual associations and stylistic comparisons (Tooley 1989, 169–70). However, as Tooley herself acknowledges, such criteria are applicable only to a limited portion of the corpus, namely those models with a reliable archaeological context, while they remain of limited use for the large number of unprovenanced examples. As a result, the dating of boat models continues in many cases to rely on general parameters, borrowed from other categories of artefacts or from iconographic comparisons, without the development of a chronological framework grounded in the intrinsic characteristics of the models themselves.

As mentioned above, until relatively recent times funerary models as such have rarely been the subject of a systematic study of their manufacturing techniques, having been analysed primarily in relation to their iconographic, symbolic or technological value. Consequently, elements such as assembly methods, the degree of standardisation of constructional solutions, material selection and variations in execution have long remained marginal within the debate, despite their informative potential for understanding both production dynamics and regional differences. As emerges from the comparative analysis proposed by Eschenbrenner-Diemer, attention to such elements could make it possible to move beyond exclusively iconographic or typological readings and to identify coherences and discrepancies that are particularly valuable in the assessment of artefacts lacking secure provenance contexts (Eschenbrenner-Diemer 2010, 50–51).

In the present essay, the study of boat models is deliberately restricted to vessels intended for transport and pilgrimage, since the boats from the tomb of Minhotep clearly fall within these two functional categories, as defined in the scholarship (Tooley 1989, 142–66, 1995, 51–56). Focusing on this subset allows for a more coherent engagement with issues relating to the function, placement and operative meaning of boats within the funerary assemblage, avoiding interpretative overlap with different symbolic spheres.

Although no theoretical discussion of the owners' gender exists, analysis of the best-documented archaeological contexts indicates that boat models are primarily associated with male funerary assemblages, particularly those belonging to officials and members of the Middle Kingdom elite. This trend most likely reflects differences in status and funerary representation rather than a strict gender distinction, as demonstrated by various exceptions, and the widespread use of representing the married couple (Tooley 1989, 142–66; Barker 2022, 83–84).

A recurrent feature is the presence of boats in pairs, one equipped for sail propulsion and the other for rowing, a configuration that appears with notable frequency. This binary association has been interpreted as a metaphor for the complementary modes of navigation on the Nile, in which rowing and sailing respond to different environmental and directional conditions, rather than as a simple formal duplication. This interpretation finds further support in the spatial arrangement of vessels within tombs discovered intact, where the archaeological data permit such observations. In the best-preserved cases,

rowing boats are frequently oriented northwards, while sailing boats face southwards, suggesting a symbolic relationship with the flow of the Nile and with navigational practices effectively experienced in life. Although this pattern is not universal and documented exceptions exist (for example cases in which both vessels are oriented in the same direction or in which the sail/north and oars/south orientation is reversed), its recurrence is sufficient to indicate that orientation was not accidental but responded to a shared conceptual logic (Tooley 1989, 170–73, 1995, 51).

With regard to the physical placement of boat models within tombs, the documentation reveals considerable variability. Tooley notes that boats may be found on the lid of the coffins, within the *serdab*, in niches cut into the walls, or directly on the floor of the burial chamber, sometimes in proximity to other wooden models (Tooley 1989, 170–73). This heterogeneous distribution suggests that, despite the presence of recurring patterns, no rigid norm governed the positioning of the vessels, and that their ritual efficacy did not depend upon a fixed location but upon their presence within the funerary space.

From a compositional perspective, boat models display a marked tendency towards the symmetrical distribution of figures, accompanied by a strong emphasis on collective action rather than on the individualisation of specific characters. Figures are generally arranged according to regular and repetitive schemes, organised along the longitudinal axis of the vessel or in opposing pairs, contributing to an immediate and functional reading of the scene (Barker 2022, 74–86).

In this sense, the presence of recurring and readily recognisable nautical elements, such as oars, rudders, masts, cabins and propulsion systems, offers particularly fertile ground for comparative analysis. These elements, repeated with minimal variation within coherent corpora, may be traced and compared in order to investigate not only modes of representing nautical activity but also the operative choices and conventions adopted in the production of the models themselves (Merriman 2011, 104–16; Tooley 1989, 166–67). The combination of figurative standardisation and the recurrence of constructional elements thus contribute to defining boat models as highly codified devices, in which the legibility of collective action consistently prevails over the individualisation of the represented subjects.

This compositional framework is reflected in the limited individual variability of the figures, which appear strongly standardised in both proportions and postures. The roles performed on board are nonetheless clearly legible: helmsmen, sailors, rowers and passengers are distinguished through codified gestures, recurring positions and coherent spatial placement, rather than through physiognomic traits or individualising details. Postures are predominantly functional, oriented towards making the action performed visible (Barker 2022, 74–86; Merriman 2011, 104–16).

Standardisation also affects the representation of passengers, who may include both men and women. In these cases as well, the figures are not conceived as individual portraits, but as types integrated within a coherent compositional structure, in which distinctions of gender or role are conveyed through minimal and repeated elements, such as the seated posture, the position beneath the canopy or the cabin, and the colour of the skin (Barker 2022, 74–86; Merriman 2011, 104–16).

Linked to this framework of standardisation is the hypothesis advanced by Winlock in his study of the models from the tomb of Meketre, according to which the figures were prepared in series, probably through repetitive and modular procedures, and subsequently assembled into different configurations according to the requirements of each individual model. This observation, formulated on the basis of the high degree of formal and postural uniformity of the figures, reinforces the interpretation of boat models as the product of organised production practices, in which limited individual variability responds to operative logics (Winlock 1955, 74).

6.1.2. Iconographic description



Fig. 55 - From left to right: Boat 0, Boat 1, Boat 2, and Boat 3

The boat models found in the tomb of Minhotep are four in number (Fig. 55), currently composed as follows and renamed accordingly for the purposes of this study: Boat 0 (S. 8790), a rowing vessel comprising nine figures (ten in the historical photograph); Boat 1 (S. 8791), a sailing vessel comprising two figures (eight figures and a canopy in the historical photograph); Boat 2 (S. 8792), a sailing vessel comprising six figures and a canopy (eight figures and a canopy in the historical photograph); and Boat 3 (S. 8793), a rowing vessel comprising two figures (none in the historical photograph), to which nine oars are also associated.

These models represent wooden river boats whose hulls have been carved in a crescent-like form, with the terminal areas shaped in the form of papyrus. The stern is positioned slightly higher than the prow. The base has been made flat in order to increase the stability of the object when placed on a surface (Merriman 2011, 22).



Fig. 56 - Boat 0 (S.8790), in the '20s and today

The surface of the hulls is decorated with shades of yellow, with *udjat* eyes painted on both external sides in the forward area of the vessel, serving a protective function. This decorative scheme appears to be found primarily on vessels of papyriform shape such as those under examination (Merriman 2011, 101). On the deck of the vessels, a distinctive painted decoration in red lines is visible, representing the deck

beams and the mast partner. All the figures depicted are decorated with the same palette, with minimal variations according to the following scheme: red skin, a face without a mouth, eyebrows and cosmetic eye-lines painted in black with a white sclera, short black hair with a white band across the forehead tied at the back, and a white skirt.

Similarly to the offering-bearer sculptures, although marked differences and similarities may be observed, all these boat models may be considered as pertaining to the same typological and iconographic model, also observable in other artefacts from the same context and period, as will be described in the following section.

Boat 0 constitutes, within the group, the model currently best preserved from an iconographic perspective, as it almost entirely retains the original organisation of the navigation scene (Fig. 56).

The yellow hull presents papyrus-shaped extremities, with the upper edges slightly projecting to form the bulwark, further emphasised by a continuous red band. In the forward area of the hull, on both sides, the symbol of the *udjat* eye is outlined in black within a white rectangular reserve.

The papyriform extremities are decorated with alternating red and black bands, arranged symmetrically between stern and prow. At the forward end there is an internal black line and an external red line placed transversely, together with three longitudinal petal-shaped lines, the outer ones in red and the central one in black, and finally a rosette decoration in the terminal circular portion of the element, composed of alternating red and black rays (Fig. 57). At the stern, the decoration is identical but with the position of the colours reversed.



Fig. 57 – Boat 0: rosette decoration of the prow

The deck is the same yellow colour as the hull and is decorated with red lines indicating the deck beams and the mast partner. On the deck, a series of holes are clearly visible, intended to accommodate wooden pegs for securing the figures and the superstructure elements.

The figurative arrangement is structured around a clear functional articulation of space. Eight rowers are arranged in two parallel lines of four figures each. The figures are depicted seated with bent knees and arms extended forwards. The outer hands display perforations for the insertion of the oars, which were likely further secured to the rowlocks by means of cords. The correct orientation of the figures, with their faces turned towards the stern and thus towards the

helmsman, restores an arrangement consistent with actual navigation, whereas in the historical photograph of the 1920s the rowers appear erroneously oriented towards the prow. At the stern is placed the helmsman, depicted squatting with his arms bent at ninety degrees before the torso, in the act of controlling the two steering oars. On either side of the stern are the quarter rudder oar stanchions and, nearby, the crossbeam quarter rudder

support, all painted red, which visually frame the figure of the helmsman.

At the prow, as indicated by the presence of two diagonal holes, the standing figure of the punter was originally positioned. This figure is now missing and, as can be observed in the historical photograph, was probably mounted on Boat 1.

Boat 1 appears to represent the sailing counterpart to Boat 0 (Fig. 58). As documented in the historical photograph, the model originally displayed a considerably more elaborate iconographic arrangement, while its



Fig. 58 - Boat 1 (S. 8791), in the '20s and today

present condition is markedly diminished due to the loss of a substantial number of figures and associated elements.

Like the preceding example, it features a yellow hull and deck of a hue extremely similar to that of Boat 0, with red lines painted on the deck to indicate the deck beams and the mast partner. In this case as well, the upper edges project to form the bulwark, decorated with a continuous red band, however, as this is a sailing vessel, the rowlock holes are absent. The decoration of the *udjat* eyes is similar to that of Boat 0, both in the choice of colours and in the graphic affinities of the design.

The papyriform extremities are particularly similar to those of Boat 0, both in shape and in painted decoration. The only difference concerns the arrangement of the colours. In this case as well, the decoration is symmetrical between stern and prow, but in an inverted manner in comparison with Boat 0. In Boat 1, the predominantly red decoration is located at the stern, whereas in Boat 0 it is at the prow, and vice versa. This inversion may be interpreted as a deliberate choice of differentiation within a conceptually complementary pair. Considering that paired boat models were generally arranged within the tomb facing opposite directions (Tooley 1989, 170–73, 1995, 51), it is also possible that this inversion in the decorative scheme served to maintain visual coherence once the two boats were displayed side by side.

Another significant difference in comparison with Boat 0 concerns the figures and the superstructure elements, given the different mode of propulsion of this vessel. The present configuration of Boat 1 requires a clear distinction between what is currently preserved and what can be reconstructed solely through the period documentation, owing to the present absence of a considerable number of elements.

Among the nautical elements, only the crossbeam quarter rudder survives, painted red. As regards the figures, only two are currently mounted. The first is the figure of the punter positioned at the prow, whose attribution to this vessel is doubtful, as it may in fact belong to Boat 0. The second figure is one of the central figures, with arms extended and crossed

in the act of handling the sail, which most likely corresponds to the character who appears lying on the deck in the historical photograph (Fig. 59).

The historical photograph shows a significantly more articulated composition. At the stern there was a helmsman, seated with his arms bent at ninety degrees. On either side of him were the two quarter rudder oar



Fig. 59 - Sail-handling crew member from Boat 1. Left: historical photograph of the original configuration, showing the figure lying on the deck. Right: present condition of the figure, identified on the basis of position, posture, and correspondence with the historical documentation.

stanchions. Immediately forward of the helmsman stood the canopy, composed of three vertical supports and a rectangular covering with a decorated frontal element, which may plausibly correspond to the element currently mounted on Boat 2. Beneath it was placed a seated figure, however, observation of the socket holes suggests that there may originally have been two passengers, presumably husband and wife according to the common iconography. The female figure had therefore probably been lost prior to the discovery of the model.

Proceeding along the central axis of the vessel were three standing figures engaged in handling the sail, two of whom are no longer in place, with their arms extended and crossed upwards in a position consistent with the presence of the main mast and its sail, both of which are already missing in the historical photograph.

In the prow area, three additional standing figures were finally present, arranged in a triangular configuration as visible from the deck holes, at the apex of which stood the punter, who does not appear to correspond to the figure currently mounted.



Fig. 60 - Boat 2 (S. 8792), in the '20s and today

Boat 2 constitutes the second sailing model of the group and, although it shares the general layout with Boat 1, it presents a series of formal and decorative choices that accentuate its iconographic autonomy (Fig. 60).

Similarly to the preceding boats, hull and deck are painted yellow with red decoration indicating the deck beams, the mast partner and the bulwark, which in this case as well projects beyond the deck. However, a first evident difference concerns the yellow colouring, which

here appears more intense than in the previous vessels.

The *udjat* eye, while maintaining the same apotropaic function, occupies a larger white panel extending across the full vertical height of the hull and framed on three sides by a black border line. It also displays a different graphic design from the previous examples, being more sharply defined, with accentuated curls, a thicker tail and fine red lines applied to the sclera.

The vessel, just like the others, has papyriform extremities, although it is more markedly distinguished from the previous examples by certain decorative choices. The extremities display a more complex decorative scheme than those of Boats 0 and 1. On a white

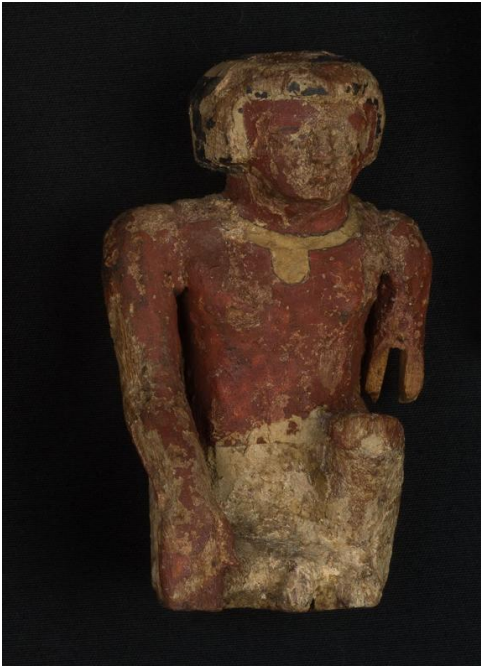


Fig. 61 – Boat 2: passenger figure

likely belongs to Boat 1, the passenger figure is still present, in this case a single individual (Fig. 61). This figure is distinguished by a seated posture with the left knee raised and an asymmetrical arrangement of the limbs, as well as by a white necklace with a semicircular pendant, a detail that characterises it iconographically. At the centre of the deck remain



Fig. 62 - Boat 3 (S. 8793), in the '20s and today

ground, contiguous transverse bands defined by black lines alternate in light yellow, black and red, with additional longitudinal petal-shaped bands following the same chromatic alternation. Traces of paint on the terminal areas suggest the presence of a rosette decoration, graphically different from that of the other vessels, apparently recalling the petal-shaped decorative motif of the extremities. Although referable to the same typological model, these decorative differences in comparison with Boats 0 and 1 would appear to suggest that this vessel was conceived as a distinct project.

The organisation of the superstructure scene follows a scheme analogous to that of the other sailing vessel. In its present state, Boat 2 retains chiefly the central nucleus of the scene, associated with the canopy area, together with part of the crew. Beneath the canopy, whose attribution remains uncertain although it most

likely belongs to Boat 1, the passenger figure is still present, in this case a single individual (Fig. 61). This figure is distinguished by a seated posture with the left knee raised and an asymmetrical arrangement of the limbs, as well as by a white necklace with a semicircular pendant, a detail that characterises it iconographically. At the centre of the deck remain two of the three figures responsible for handling the sail, which, together with the mast, was already lost in antiquity. At the prow, three standing figures are arranged in a triangular configuration, of whom the foremost should correspond to the punter.

The historical photograph makes it possible to observe the third sailor assigned to the sail, the helmsman figure and the two quarter rudder oar stanchions. These differ from those of Boats 0 and 1, which have a square section, in that they present a flatter form with a semicircular apex. The crossbeam quarter rudder is already absent in the historical photograph. The canopy documented in the 1920s appears to differ from the one

currently mounted, as it shows four supporting elements and further differences that will be discussed in greater detail below.

Boat 3 is the model that diverges most markedly from the others from an iconographic perspective (Fig. 62). Moreover, the historical photograph documents a model entirely devoid of superstructure elements, whereas in its present state two figures are mounted whose attribution appears highly doubtful. These figures, in fact, seem incompatible with the vessel: the standing figure pertains to a sailing vessel, whereas Boat 3 is a rowing boat; the second seated figure presents a jointing system that does not correspond to the matching traces on the deck.

The hull is painted in a bright yellow, while the deck and the papyriform extremities are rendered with white, creating a more pronounced contrast than in the other vessels, in which yellow tends to dominate the entire upper surface. On the deck, the representation of the deck beams is rendered through parallel red lines, similarly to the other models, although the mast partner does not share the same form as the other three examples, consisting instead of a simple rectangular panel (Fig. 63). The red decoration on a white ground would appear to be a feature introduced during the First Intermediate Period and continuing throughout the Middle Kingdom (Merriman 2011, 38). This model is devoid of a bulwark, although the rowlock holes are clearly visible along the upper edge. The sockets visible on the deck allow the original iconographic arrangement to be reconstructed with reasonable precision. Two positions for the steering oars are visible, a central hole for the helmsman, six sockets for three pairs of rowers and two diagonal holes at the prow for the punter. Of the crossbeam quarter rudder, only a trace remains, and unlike the other three models, it appears to have originally been assembled using a single dowel.

The *udjat* eyes, placed in the forward area of the hull, are inscribed within a brown panel framed by two vertical black lines. The design appears more elaborate than in the other boats. The outline of the eye seems to have been initially drawn with a preparatory red line over the white ground and subsequently reinforced in black in the principal areas,



Fig. 63 – Bow on the left. From the left the mast partner draw of Boat 0, 1, 2 and 3



Fig. 64 – Boat 3: rosette decoration of the stern

including the pupil. The sclera is white, while the eyebrow, cosmetic tail and lower

decoration are executed in blue.

The papyriform extremities differ in form from those of the other boats. The profile of the hull terminates in a trapezoidal section, upon which the smaller round-section extremities are set (Fig. 64). Their painted decoration consists of alternating red and blue transverse bands on a white ground. In the circular terminal areas of stern and prow, a rosette decoration in red and blue is present, echoing the motif already observed on Boats 0 and 1, though with a

different palette. These morphological and chromatic choices, with the explicit use of blue, constitute a distinctive element in comparison with the other models. Such differences reinforce the perception of this model as iconographically distinct from the 0–1 pair and also from Boat 2.

The oars currently associated with the boats from Minhotep's assemblage number nine (S. 8793/1–9), a figure that may also be discerned in the historical photograph, where they can be seen resting on the shelf to the right of Boat 2, allowing for a certain margin of uncertainty caused by perspective and their arrangement, which renders some of them difficult to discern. They consist specifically of seven oars and two quarter rudders.

6.1.3. Iconographic comparisons

Within the corpus of Middle Kingdom boat models, Asyut represents one of the best-documented and most coherent contexts, allowing for precise observations at both the typological and the technical-constructive levels. In her systematic study, Merriman attributes 32 boat models to Asyut, deriving primarily from the tombs of high-ranking officials and datable between the late 11th and early 12th Dynasty, including the vessels from the tomb of Minhotep (Merriman 2011, 215–45). Within this group, the boats display notable structural coherence, characterised by solid hulls, flat bottoms with a hard chine, raised bulwarks with painted bands, deck beams frequently rendered pictorially, and a standardised distribution of functional elements such as quarter-rudder stanchions and mast partners. Such homogeneity suggests the existence of shared conventions, if not relatively stabilised workshop practices, within Asyut production.

A feature that Merriman identifies as particularly recurrent, contributing to the definition of the group's local profile, is the presence of short, blunt papyriform bundle ends, often associated with thick chromatic patterns and painted rosettes at the extremities, together with lateral *udjat* eyes and painted decorative lashings along the hull. These elements

appear frequently and are indicated as local markers useful in distinguishing Asyut from other contemporary provincial contexts (Merriman 2011, 74, 95, 102; Tooley 1989, 146).

In addition to these structural and decorative characteristics, a further level of standardisation may be observed in the rendering of the crew and the superstructure elements. The arrangement of the figures, their number, their postures and their relationship to the functional elements follow recurring patterns, suggesting consolidated compositional models.

This formal coherence also contributes to the immediate recognisability of the different modes of propulsion: the presence of rowers arranged along the hull, of figures engaged in dragging, or of configurations linked to the use of mast and sail makes it possible to distinguish clearly between the various functional types within the corpus. Such recognisability does not depend solely on individual technical details, but on the overall articulation between hull, nautical equipment and crew organisation.

In her study of regional styles and characteristics, Eschenbrenner-Diemer likewise observes recurring features among the boat models from Asyut, such as the frequent use of yellow for the hull and the presence of the *udjat* eye at the prow. She also notes a certain homogeneity in the rendering of the sailors, characterised by short wigs with a white headband and a short loincloth (Eschenbrenner-Diemer 2017, 157–58).

In the interpretation proposed by Eschenbrenner-Diemer, and adopted in the present study, the possible confirmation of a correlation between the formal and functional coherence of the models and their production techniques could prove useful in identifying organised and serial spheres of production, attributable to stable craft practices rather than to episodic realisations. The standardisation of technical solutions and the limited internal variability of the models are thus read as indicators of local operative traditions, in which the repetition of compositional schemes and constructional elements responds to logics of technical efficiency and ritual efficacy. Taken together, the boats from Asyut therefore constitute a corpus highly representative of the Middle Kingdom, in which funerary function, formal codification and production practices converge in a particularly legible manner.

Although this corpus has already been the subject of thorough and systematic study, the present analysis seeks to propose a further level of investigation, to which the same criteria will be applied. In particular, it will attempt to delineate a series of defining elements which, when considered collectively, may prove useful in identifying coherent pairs of vessels, initially at the iconographic and compositional level and, in the subsequent sections, also from a technical and constructional perspective.

To this end, a number of pairs of vessels already recognised in the literature as coherent sets will be analysed, with the aim of establishing an empirical basis for the progressive formalisation of identification criteria.

In particular, the following pairs from the Asyut Necropolis will be examined.

- Tomb of Nakhti (Tomb 7); early 12th dyn.; Sailing boat JE 36293 (Grand Egyptian Museum, Cairo) - Rowing boat E 12027 (Musée du Louvre, Paris); 12th dyn.; Leader archaeologist: Charles Palanque (Fig. 65)

- Tomb of Shemes; 12th dyn.; Sailing boat S. 8657 - Rowing boat S. 8659; Museo Egizio, Torino; Leader archaeologist: Ernesto Schiaparelli (Fig. 66)
- Tomb of Minhotep; last 11th-early 12th dyn.; Sailing boat S. 8791 (Boat 1) - Rowing boat S. 8790 (Boat 0); Leader archaeologist: Ernesto Schiaparelli (Fig. 67)

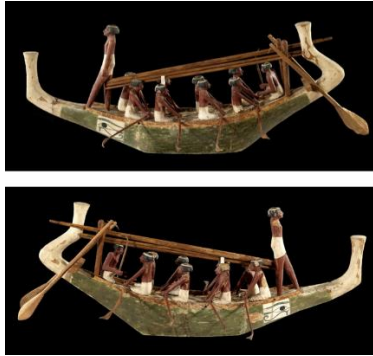


Fig. 65 - Rowing boat E 12027, (38,5 x 81 cm), Asyut, tomb of Nakhti (Tomb 7), Middle Kingdom, early XII dyn., Musée du Louvre (Paris)



Fig. 66 - Sailing boat S. 8657, (25 x 71 cm x 13,5 cm), and rowing boat S. 8659, (25 x 71 cm x 13,5 cm), Asyut, tomb of Shemes, Middle Kingdom, early XII dyn., Museo Egizio (Torino)

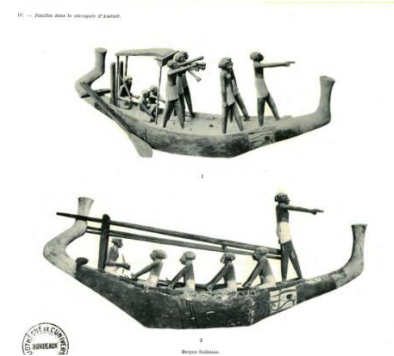


Fig. 67 - Sailing boat JE 36293, Asyut, tomb of Wepwawetemhat (Tomb 14), Middle Kingdom, early XII dyn., Grand Egyptian Museum (Cairo). Rowing boat E 12027, (38,5 x 81 cm), Asyut, tomb of Nakhti (Tomb 7), Middle Kingdom, early XII dyn., Musée du Louvre (Paris)

In all three cases, the pairs consist of rowing and sailing boats of comparable dimensions, conceived as complementary units within the same funerary assemblage. From a modelling perspective, the hull profiles display a high degree of similarity, particularly in the articulation of bow and stern, whose proportions and curvature follow closely related formal schemes. The decorative programmes are likewise consistent within each pair: identical colour schemes and painted motifs recur on the hulls and decks, reinforcing the impression of coordinated production. The only notable exception is represented by the pair from the tomb of Minhotep, where the chromatic arrangement of the decorative elements at bow and stern appears specular between the two boats.

Close observation of the paint application further reveals significant technical affinities within each pair. In the boats from the tomb of Shemes, for instance, the yellow ground layer was applied in thick, overlapping brushstrokes, characterised by a discontinuous handling that remains clearly visible in the form of pigment accumulations and pronounced brush ridges. By contrast, in the Minhotep boats the ground colour appears more fluid and homogeneous: the paint layer is thinner and more diluted, as indicated by areas where the white ground layer remains perceptible beneath the surface through partial transparency.

An additional technical feature can be observed in both the Minhotep and Nakhti pairs. In these cases, the red lateral band emphasising the bulwark was applied directly over the white ground layer, the underlying area having been deliberately reserved from the yellow or green background layers. This procedure not only reveals a controlled



Fig. 68 – From the left, boats of Nakhti, Shemes, and Minhotep. On the top line the sailing boats, on the bottom line the rowing boats

sequencing of paint application but also suggests a shared working method in the execution of specific decorative elements.

A particularly significant detail concerns the representation of the *udjat* eyes. Beyond the structural and chromatic elements discussed above, one of the most immediately recognisable features is the fact that, while the execution of this motif differs from one funerary group to another, it remains broadly consistent within each individual pair (Fig. 68). A close examination of the graphic design of the eye, such as its internal drawing, the shape and proportions of the rectangular panel in which it is inscribed, the manner in which the motif occupies this space, and the specific chromatic combinations employed, reveals recurring patterns that appear stable within each set. In this sense, the *udjat* eye may function as a sort of “signature”, contributing to the visual identity of each group of boats.

A further level of comparison involves the figures. Among the first morphological differences that can be observed is the modelling of the hands: in some cases, they are more voluminous and tend towards a squarer profile, whereas in others they appear flatter and more simplified. It must, however, be taken into account that the morphology of the hands varies according to the typology of the figure and the role it performs. For this reason, comparisons should be conducted only between figures fulfilling analogous functions. In this respect, a particularly instructive case is provided by the comparison between the sailor in charge of handling the sail in the Shemes boat and his counterpart in the Minhotep boat, whose hands, despite the similarity of their functional role, display notable differences in modelling and proportion (Fig. 69).

A further detail that deserves consideration, although it requires more systematic investigation, concerns the execution of the white headband and the rear bow painted on



Fig. 69 – Detail of the hands of the sailors. On the left a figure from Shemes sailing boat, on the right a figure from Minhotep Boat 1

the wigs of the figures. Two principal categories may be distinguished. In the first, the white band and bow are painted freehand as a negative drawing while filling in the black area of the wig, without any preliminary outlining. In the second, the painter first delineated the precise contour of the band and bow with a black line, and only subsequently filled in the surrounding wig with black pigment. The first category can be further differentiated according to the painter's level of control: in some instances, the bow is rendered with considerable precision and detail, while in others it appears schematic and approximate. The need for further analysis arises from the fact that this feature is not consistently treated within all pairs. For example, in the Minhotep group, Boat 0 presents carefully executed bows clearly defined by a black contour line, whereas in Boat 1 the same elements are rendered freehand and with less precision (Fig. 70). By contrast, in the pair from the tomb of Shemes the execution of these details, although also freehand, is markedly more coherent between the two boats. This variability suggests that, while potentially diagnostic, the feature should not be employed uncritically as a marker of paired production, since a lack of coherence within presumed pairs may itself constitute a meaningful element requiring further investigation.

An analogous approach may be extended, with due caution, to other sets from different necropolis, taking into account the specific iconographic conventions of each context. The pair from the tomb of Ini (First Intermediate Period; Sailing boat S. 13272 – Rowing boat S. 13273; Museo Egizio; excavated by Italian Archaeological Mission) provides a relatively straightforward example of a coherent set, as indicated by the close correspondence in scale, hull morphology, painted decoration, and chromatic palette.

Among the most accomplished examples are the boat models from the tomb of Meket-Re. Of particular relevance are two distinct pairs: Sailing boat JE 46720 (Boat N)²¹ – Rowing boat 20.3.1 (Boat O)²², and Sailing boat JE 46719 (Boat P)²³ – Rowing boat 20.3.2 (Boat Q)²⁴. A first indicator that these constitute two separate pairs is the difference in scale between them (to be quantified). Stylistically and technically, the two pairs can be distinguished on

²¹ Grand Egyptian Museum, Cairo. Length: 122 cm

²² Metropolitan Museum, New York. Length: 128 cm

²³ Grand Egyptian Museum, Cairo. Length: 117 cm

²⁴ Metropolitan Museum, New York. Length: 112 cm

further grounds. In the N–O pair, the figures are characterised by short wigs, and the feet are modelled in plaster. In the P–Q pair, by contrast, the figures are bald and their feet are carved in wood (Winlock 1955, 45, 75). These differences, affecting both iconographic and material aspects, reinforce the interpretation of the models as internally coherent yet distinct production units within the same funerary assemblage.

From the little comparative analysis undertaken in this section it is possible to underline that the identification of coherent boat sets cannot rely on a single diagnostic feature, but rather emerges from the convergence of multiple, interrelated criteria. Hull morphology, proportional relationships, decorative schemes, chromatic organisation, the graphic treatment of *udjat* eyes, the modelling and decoration of anthropomorphic figures, collectively contribute to defining the internal coherence of a pair. In several cases this coherence is expressed through a combination of shared scale, formal correspondences, and consistent technical procedures. At the same time, controlled variations, whether



Fig. 70 - Detail of the bows of a sailor from Boat 0 (left) and a sailor from Boat 1 (right)

chromatic inversions, differences in surface handling, or divergences in minor details, indicate that pairing does not necessarily imply absolute identity. Rather, these models appear to have been conceived as complementary units, structured around a shared visual and technical framework while allowing for minor deliberate differentiation.

6.1.4. Identifying coherent boat sets: formal parameters and application

The diagnostic parameters outlined above for the possible identification of coherent boat pairs may now be systematically applied to the comparison between Boat 2 and the Shemes model S. 8658, as the analytical observations conducted during this study have highlighted a particularly pronounced degree of formal and decorative affinity between these models (Fig. 71).

The comparison between the rowing boat S. 8658 from the tomb of Shemes and sailing Boat 2 from the tomb of Minhotep must first be framed within their archaeological context. The two models come from distinct tombs within the Asyut necropolis, and, at the best of our knowledge, their possible belonging to a single coherent set has been previously investigated. The tomb of Shemes is traditionally described as having been found intact (Kahl et al. 2019, 83). However, such a definition should be understood primarily as referring to the absence of modern looting, since it does not exclude the possibility of reopening in antiquity. Although the burial of Shemes appears to have contained only the owner and his wife, it was located within a sector characterised by multiple-use tombs,



Fig. 71 – Boat 2, tomb of Minhotep (left); Boat S. 8658, tomb of Shemes (right)

including that of Minhotep, which were periodically reopened for additional interments. While the exact spatial relationship between the two tombs remains uncertain, excavation diaries indicate that they were discovered only a few weeks apart (Shemes on 20 March 1908 and Minhotep on 13 April 1908) suggesting geographical proximity within the necropolis (Kahl et al. 2019, 209–11).

Against this background, the morphological and pictorial affinities between S. 8658 and Boat 2 warrant closer examination. From a dimensional and proportional standpoint, both models present comparable hull lengths and similar vertical development of bow and stern, articulated in papyriform terminations without a markedly accentuated bulwark. The internal arrangement of S. 8658 follows a structured and regular compositional scheme. A crossbeam quarter rudder and two quarter rudder oar stanchions, in between of whom is housed the helmsman; eight paired settings holes arranged in two lines to accommodate four couples of rowers; and two diagonal sockets at the bow associated with a standing figure. Along the bulwark, the rowlocks are clearly visible.

In terms of chromatic scheme and decorative system, both hull and deck of S. 8658 are painted yellow. However, unlike Boat 2, where the red line of the bulwark separating hull and deck is applied over the yellow ground, the red band in S. 8658 was painted directly over the white ground layer, indicating a slightly different sequencing of paint application. The paint application on the hull is likewise comparable: both models display flat, saturated colour fields executed with a confident and controlled hand. The only visible



Fig. 72 – Boat 2 (left), Boat S. 8658 (right): stern detail



Fig. 73 – Detail of the bows of a sailor from Boat 2 (left) and a sailor from Boat S. 8658 (right)

irregularity is the red drip on the right side of Boat 2, descending from the bulwark onto the eyebrow of the *udjat* eye.

The white panels containing the *udjat* eyes occupy the full height of the hull, excluding the red border, and are defined laterally by a black contour line. The graphic rendering of the eye fills almost the entire width of the panel

and is extremely close to that observed on Boat 2, with the only notable difference being the absence, in S. 8658, of the red details on the sclera. The papyriform ends are decorated in an identical manner, including the circular terminal areas with rosette motifs, which in S. 8658 are particularly well preserved and thus confirm details that are partially lacunose on Boat 2 (Fig. 72).

With regard to nautical elements, S. 8658 no longer preserves its nautical elements, and only four of the original eight rowers survive, together with the helmsman and the standing figure at the bow. The rowers are seated along the edges of the deck, arms extended forward, with two perforations in the hands for the insertion of the oars. The helmsman differs from the one of Boat 2 because his arms are extended at a right angle rather than bent, with vertical holes in the hands to receive the steering elements. The standing figure at the bow preserves only the left arm, likewise extended and perforated. The rendering of the figures introduces one of the most significant divergences: while the general modelling of bodies and poses is coherent with the Minhotep boat, the treatment of the white headband and rear bow on the wigs differs markedly (Fig. 73). In Boats 2, the bow is executed with a carefully outlined upper loop, rendered as a white semicircular band containing a black teardrop shape representing the hair, and displays a high degree of refinement. In S. 8658, by contrast, the upper loop is smaller, entirely white, and more schematic, lacking the internal black detail and executed with less precision. Differences can also be observed in the sequence employed for the execution of the faces, suggesting a distinct pictorial approach. These discrepancies will be discussed in greater detail below, where a possible explanation will be proposed. Nevertheless, even if a plausible interpretation can be advanced to account for these differences, their presence remains a weak point in the attribution and should be considered with caution.

Nevertheless, the convergence observed across proportional relationships, hull morphology, decorative scheme, chromatic palette, graphic design of the *udjat* eyes (Fig. 74), and overall painterly handling suggests a close affinity that may extend beyond coincidence. Although the two models were recovered from separate tombs within the



Fig. 74 – Detail of the udjat eye from Boat 2 (left) and from Boat S. 8658 (right)

same necropolis, the cumulative evidence raises the possibility that they originated within a shared productive background and perhaps even addressed a related commission. At present, however, such a proposal must remain cautious: no single parameter, taken in isolation, is sufficient to demonstrate common authorship or intentional pairing. It is rather the convergence of multiple indicators that lends plausibility to the hypothesis. Further integration of technical and material data, such as wood species identification, constructional features, and pigment analysis, would be essential to strengthen or refute this interpretation, and future analytical investigation of the Shemes boat in particular may provide decisive evidence regarding the nature of its relationship with Boat 2.

The comparisons therefore suggest that the recognition of sets must be grounded in a stratified reading of the objects, in which iconographic, stylistic, and material evidence are considered together. Only through the accumulation of such empirical observations does it become possible to move towards a more formalised set of criteria for identifying coherent production units within the broader corpus of Middle Kingdom boat models. The following sections will build upon this foundation by extending the analysis to the

technical and constructive level, in order to assess whether similar patterns of internal consistency can also be detected in the material structure of the models.

6.2. Boat 0 (S. 8790)

6.2.1. Boat 0: Hull wooden structure

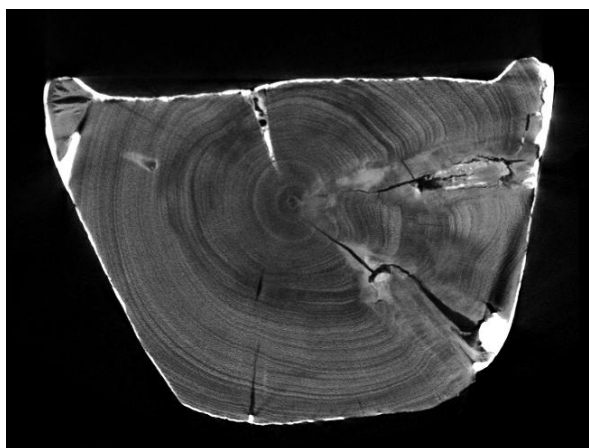


Fig. 75 - Transversal slice of the hull of boat 0

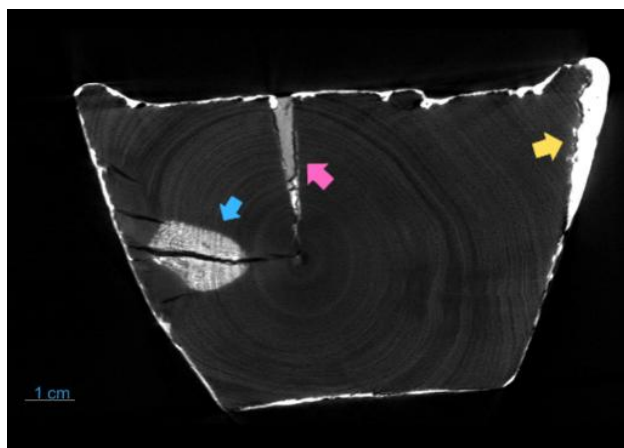


Fig. 76 - Transversal slice of the hull of boat 0: ancient filler (yellow arrow), modern filler (pink arrow) and radiopaque area (blue arrow)

Boat 0 (28 × 83 × 17.5 cm) is a rowing vessel characterised by papyriform extremities and by a distinctive carving of the hull, which creates a bulwark running along the perimeter of the deck. Computed tomography reveals that the hull was carved from a single main log, subsequently integrated with two additional wooden elements on the right and left sides, most likely in order to complete the volume required for the final shaping of the model. These lateral inserts are not only detectable in the CT data but can also be recognised macroscopically through close observation of the vessel's morphology, where subtle discontinuities in the surface orientation and in the painting layers, mark the junctions.

The principal log, which on macroscopic examination appears compatible with the genus *Ficus*, plausibly sycamore fig, retains the central pith (Fig. 75). The presence of the pith confirms that the element was obtained from a relatively small-diameter trunk or branch. The growth rings display irregular development, both in their geometry and in their radiopacity values, which presumably reflect variations in density. In particular, certain rings appear markedly darker in the tomographic images, plausibly reflecting episodes of more constrained growth, possibly associated with environmental stress affecting the tree during specific years.

The timber is notably rich in knots, some of which are particularly large and intrusive, amounting in certain cases to developed branch inclusions. These features significantly affect the internal structure of the hull and are clearly legible in the tomographic sections. In addition, several shrinkage cracks are visible, most plausibly attributable to the

seasoning phase. These are especially evident along the lower perimeter and on the right-hand side of the hull, where the stresses associated with drying appear to have concentrated. The CT examination also makes visible a number of filled areas. The distinction between original fills and those resulting from modern conservation interventions is possible on the basis of radiopacity: the latter, in particular, appear grey in the tomographic images, allowing them to be differentiated from the surrounding wooden structure (Fig. 76).

A particularly significant feature observed in Boat 0, and likewise in Boat 1, is the presence, within the wooden matrix, of regions characterised by higher X-ray attenuation (Fig. 74; Fig. 85). These areas display irregularly lenticular shapes and range in size from a few millimetres to several centimetres. The boundary between the radiopaque zones and the surrounding wood is relatively sharp yet not geometrically defined. Rather, the transition appears consistent with the continuity of the anatomical structures. Their distribution within the hull is variable, but they are consistently associated with areas of the wood affected by traumatic irregularities, such as cavities related to defects or knots. Notably, however, they do not morphologically coincide with knot tissue itself.

These high-attenuation areas exhibit a homogeneous internal structure, without visible granularity or punctiform inclusions. The growth rings remain clearly legible within them, indicating that the regions are integrated into the anatomical structure of the wood rather than constituting intrusive foreign bodies interrupting the texture. At the same time, they show a marked contrast with the surrounding matrix, appearing significantly more radiopaque. They are not bounded by a defined wall, nor do they correspond to voids, instead, they present as sectors in which the wooden tissue appears impregnated. No evident beam-hardening phenomena or imaging artefacts are observed: the increased radiopacity is uniform and compatible with a diffuse rise in attenuation within the affected portions of the wood. An anthropogenic origin can reasonably be excluded, as the majority of these areas are located deep within the matrix, with no direct access from the surface. Moreover, their internal position, combined with the presence of an intact pictorial layer, has prevented any further invasive or micro-destructive investigation.

This feature appears highly unusual and does not find clear parallels either in the prior professional experience of consulted colleagues or, to date, in published scientific literature. Given that the radiopaque zones seem to have permeated the wood fibres and are consistently located near areas affected by trauma (cavities and knots), consultation with wood technologists led to the hypothesis that they may correspond to gum exudates produced by the living tree in response to injury. Such a hypothesis finds partial analogy in a published CT study of Scots pine wood under conditions of resin impregnation, whose images display certain morphological similarities, although the comparison is proposed cautiously in view of the compositional differences between gum exudates and resinous substances. (Joevenller et al. 2025).

Indeed, the marked radiopacity of these areas would not be fully expected on the basis of gum exudates alone, suggesting that additional factors may contribute to the phenomenon, although further investigation will be required to assess this aspect more thoroughly. One possible explanation is that the exudate may contain aggregated calcium oxalate particles. Calcium oxalate is known to occur naturally within the cellular

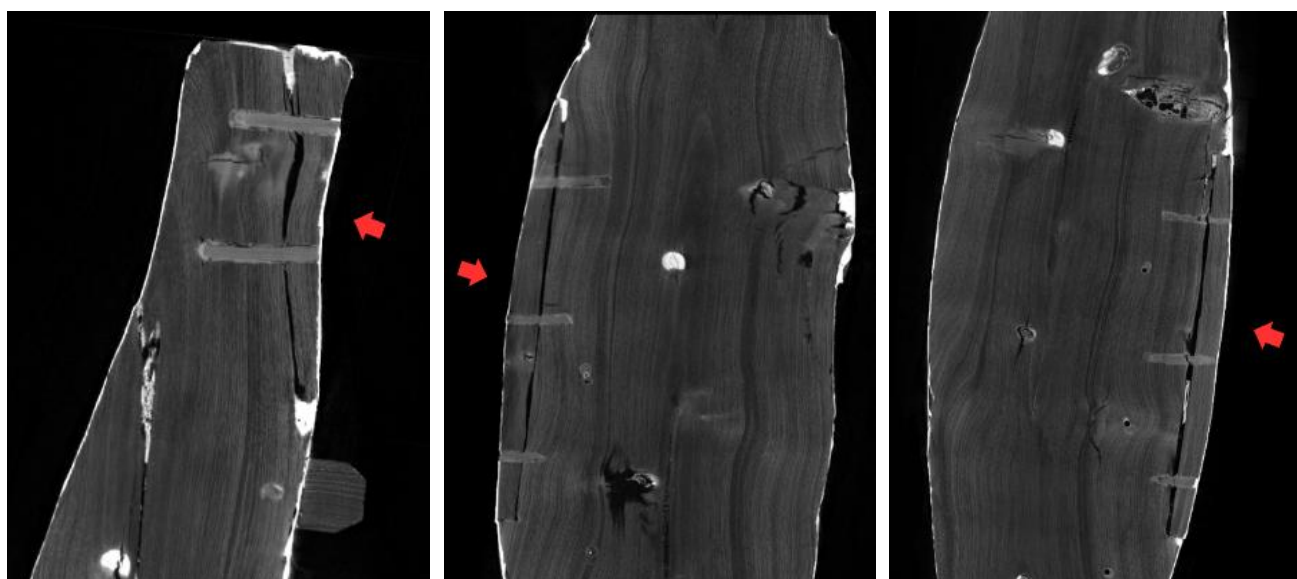


Fig. 77 – Boat 0 fragment of the stern detached

Fig. 78 – Boat 0 two additional wooden elements

structures of *Ficus* wood and may also be incorporated through water and humidity, both during the life of the tree and after felling (Ramayya et al. 1984). Actually, it is not possible to determine when, under what conditions, or by what mechanism such oxalate particles may have been incorporated into the wooden matrix and subsequently into the exudate. Nevertheless, in the absence of direct analytical confirmation, this explanation currently appears to offer the most coherent interpretation of the observed phenomenon.

It is noteworthy that this feature is visible in both boats, which are likely to form a coherent set. This recurrence may be correlated with the possibility that the wooden elements employed in their manufacture derived from the same tree, or from trees growing within a shared environmental context. While this remains speculative, it further underscores the peculiarity and potential significance of the phenomenon, which warrants future dedicated investigation.

Along the outer extremity of the stern, a detached wooden fragment is visible (Fig. 77). The fracture line follows the direction of the fibres with notable precision, suggesting that the separation most likely occurred during the carving phase as a result of some accidental mechanical stress. The fragment was subsequently repositioned and secured in place by means of two wooden dowels, which are still clearly identifiable with the CT.

The two previously mentioned additional elements are positioned along the upper extremities of the hull, in the central zone, most plausibly in order to achieve the intended width of both hull and deck (Fig. 78). They are slightly offset with respect to one another: the right insert is placed slightly closer to the bow, while the left is shifted towards the stern. Each of these elements is fastened to the central block by three wooden dowels.

The deck preserves a well-defined series of mortises intended to receive dowels anchoring both the human figures and the superstructural elements (Fig. 79). Some of these holes are now empty, while in others the lower portion of the dowels remains lodged within the cavity. Proceeding from bow to stern, the following sequence can be observed: two

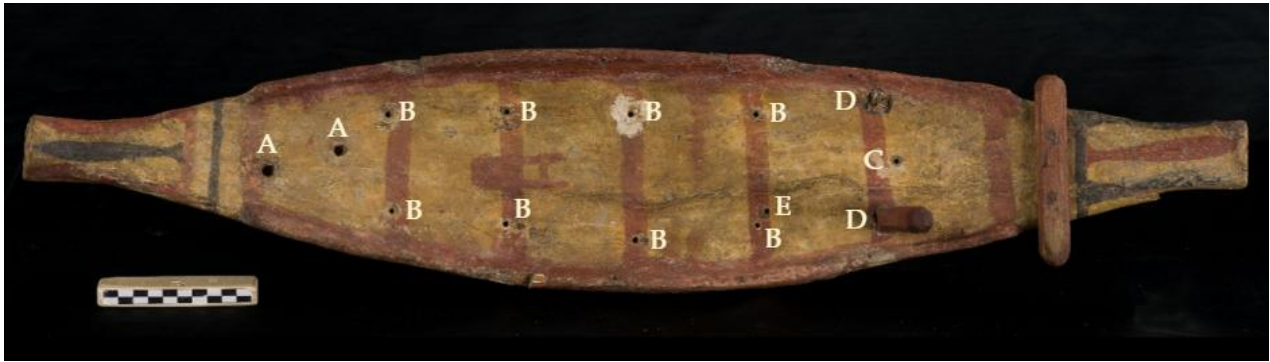


Fig. 79 – Deck of Boat 0 with details of the holes for the elements joint

diagonal holes at the bow, associated with the standing punter (A); eight holes arranged in two parallel rows designed to accommodate four pairs of rowers (B); and a central mortise for the helmsman (C), positioned between the two squared mortises for the quarter rudder oar stanchions (D). Of the latter, one stanchion remains in situ, fixed within its mortise by a tenacious modern adhesive and therefore no longer removable. The other is fractured: the lower portion remains lodged within its mortise, likely also secured with the same modern adhesive, while the detached upper fragment is presently difficult to reposition due to the nature of the break. Further behind, the element corresponding to the crossbeam of the quarter rudders is preserved. This component is anchored by two wooden dowels, of which the right one appears fractured in the CT images.

Among the eight mortises intended for the rowers, the aft-most position on the left side presents a peculiar anomaly: two closely adjacent holes are visible (B-E), although only one is functionally engaged, as the figure, when in place, covers both yet utilises only a single dowel. This duplication may plausibly reflect an initial misplacement subsequently corrected by slightly shifting the hole in order to achieve proper alignment with the other rowers.

If this interpretation is correct, it would further support the hypothesis that the mortises on the deck for the rowers and the superstructure elements were executed only after the application of the pictorial layer on the hull. Had the two adjacent holes been made prior to painting, the erroneous hole would likely have been filled with plaster and integrated into the surface before decoration. Instead, no traces of colour are observable within the mortises, nor are there chromatic smears along their inner edges. Moreover, executing the perforations after the decorative scheme had been laid out would have facilitated the precise alignment of the figures, using the painted guidelines as reference. Indeed, the rowers are consistently positioned along the red lines marking the deck beams, suggesting that the layout of the decoration preceded, and possibly guided, the placement of the figures.

Along the rubbing strake area, on both the right and left profiles, a series of smaller perforations is visible. These are more modest in diameter than the holes described above and are positioned slightly forward of the rowers' figures. They plausibly represent the rowlocks used to secure the oars during navigation.

6.2.2. Boat 0: Figures wooden structure²⁵

The figures arranged on the vessel are generally composed of a principal wooden element forming the torso and lower body, while the arms are carved separately and subsequently assembled to the body by means of wooden dowels. No significant macroscopic differences can be observed between the wood used for the bodies and that employed for the arms.

Almost all figures retain the pith within the main wooden element, with the exception of B0-4L and B0-2R. The presence of the pith indicates that the figures were carved from small-diameter branches rather than from radially converted boards.

The figure B0-2L presents a detached fragment in the lower area of the feet, currently held in place by adhesive (Fig. 80). Under UV examination, this zone appears consistent with a conservation treatment, suggesting that the reattachment is likely the result of a modern intervention rather than an original feature. More generally, shrinkage cracks and knots are observable across several figures. Where necessary, these irregularities were treated by the craftsman with a filler comparable to the ground layer, in order to regularise the surfaces prior to painting decoration.

In this case, with the exception of the standing punter, actually missing, all preserved figures are depicted in a crouching position and share the same anchoring system to the hull. Each is secured by means of two aligned perforations: one executed in the deck of the boat and one in the lower portion of the figure, joined by a wooden dowel.

A more detailed examination requires distinguishing between the rowers and the helmsman. The rowers' arms are carved as a single piece, extended forward with the hands joined. Each arm assembly is attached to the shoulders by one dowel. These dowels are notably long and generally meet at the centre of the torso. Where slightly offset, they traverse approximately two-thirds of the figure's thickness (Fig 81). The joined hands are pierced by a single perforation located in the outer hand, while the inner hand remains intact. This arrangement served to accommodate the oar and allows a clear differentiation between the four figures positioned on the right side and the four on the left side. Although the precise original placement of each individual cannot be reconstructed with absolute certainty, the orientation of the perforated hand, combined with iconographic conventions according to which the rowers face opposite the direction of travel, permits a reliable distinction between the two groups.

The helmsman (B0-H) presents a more articulated construction. His arms, positioned forward, are realised in two separate components: upper arms and forearms. The upper arms are attached to the shoulders by means of one dowel per side, again of considerable length and meeting centrally within the torso. The forearms are connected to the elbows through a fork joint. The hands are clenched into fists and pierced to receive the elements used to handle the quarter rudders.

²⁵ For clarity and consistency throughout the present analysis, the crew members have been assigned a specific alphanumeric code: the rowers are identified as B0-1L, B0-1R, B0-2L, and so forth (Boat 0; sequential number; L = left, R = right), while the helmsman is designated B0-H (Boat 0; H = helmsman)

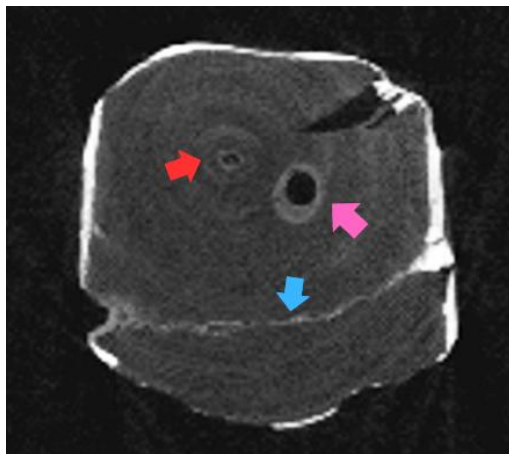


Fig. 80 – Lower area of the rower B0-2L. Blue arrow: fracture line reassembled with adhesive; Pink arrow: hole made for the assemblage with the boat deck; Red arrow: pith

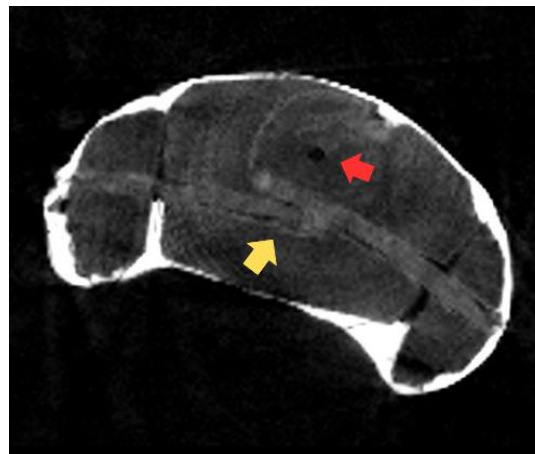


Fig 81 – Ams joints of the rower B0-4R. Yellow arrow: dowels; Red arrow pith

6.2.3. Boat 0: Painted decoration

Above the wooden support a ground layer is clearly visible, forming the base for the pictorial decoration. On the hull this layer appears generally homogeneous, although in certain localised areas it assumes a filling function and may reach thicknesses of up to approximately 5 mm. On the figures, by contrast, the ground layer is more irregular in thickness, since beyond its levelling role it also contributes to modelling the volumes, compensating for anatomical irregularities and minor defects in the wood.

The chromatic palette employed on this boat is limited to four colours: white, yellow, red, and black. The hull and deck were painted with a thin yellow layer, applied in a relatively diluted and flat manner, although individual brushstrokes remain visible. The upper perimeter band of the hull, corresponding to the bulwark, was deliberately left in reserve during the yellow application in order to receive a broad red line. This band is executed with notable precision using single, steady strokes applied with a moderately thick brush. The same red pigment defines the deck details, including the beams lines and the mast partner, again characterised by firm and controlled execution.

The papyriform extremities are decorated with alternating red and black bands arranged symmetrically between bow and stern. Each side presents two transverse bands of alternating colour, accompanied by three longitudinal petal-shaped lines. Rosettes at the tips are likewise executed through colour alternation: the dominant tone defines a central dot and a cross, while the secondary colour forms a second cross rotated by 45 degrees.

At the forepart of the hull, two white rectangular areas were left in reserve to serve as grounds for the *udjat* eyes. The surrounding yellow brushstrokes are clearly oriented so as to define the geometry of these rectangles. The eyes themselves are rendered in black with a fine brush. In width, the drawing does not occupy the entire rectangle, whereas vertically the lower contour reaches the bottom edge. Graphically, the eye presents a slightly arched eyebrow, a pronounced inner corner, a long and slender cosmetic tail, a

barely suggested curl, and a descending vertical line marked by a subtle V-shaped inflection at mid-height (Fig. 68).

Turning to the crew, the sailors are painted in a noticeably more approximate manner than the hull, as evidenced by less precise contours, minor drips, and occasional inaccuracies. Nonetheless, certain details, as the bows on the headbands, are executed with care and place these figures at a slightly higher qualitative level than other examples from the same funerary assemblage (Fig. 82). The apparent sequence of application began with the fine black outlining of the eyes and headbands, followed by the red application to the exposed skin, deliberately reserving the wigs, which were subsequently filled in black. This sequence accounts for several imperfections observable in the eyes, where the red paint curves around the black contour without fully bordering it (Fig. 83). This sequence is also supported by the fact that in this case the eyes of the figures are devoid of eyebrows, which would necessarily have had to be drawn above the red. Nevertheless, such a procedure would have allowed rapid execution without necessarily waiting for complete drying between phases. Slight blending of colours is visible in some areas, consistent with overlapping applications on surfaces not yet fully dry. The speed of handling is further evidenced by visible fingerprints, particularly on B0H, attributable to manipulation when the ground layer was still slightly soft. Red stains scattered across the white garments similarly suggest rapid working with limited attention to tool or hand cleanliness.

With regard to the white, primarily associated with the ground layer and with selected reserved areas such as the rectangular fields for the *udjat* eyes and the garments of the sailors, XRF analyses show strong peaks of Ca, accompanied by Fe and S, and minor signals of Si and Mn. FTIR detects calcium carbonate and calcium sulphate, together with kaolinitic minerals and Paraloid. The coexistence of carbonate and sulphate phases supports the hypothesis of a ground layer composed of a layer of calcium carbonate, overlapped by a layer of calcium sulphate, as observed on Bearers A and B, although stratigraphic confirmation would be required to verify this assumption.

The yellow paint layer, applied over the hull and deck, exhibits a homogeneous behaviour under infrared false colour imaging, without marked differentiation from comparable areas on Boat 1. XRF spectra acquired on yellow areas display prominent Ca and Fe peaks, accompanied by Si, S, and Mn, and minor contributions of Al and Ti. FTIR signals of



Fig. 82 – Bow and headband of B0-3R

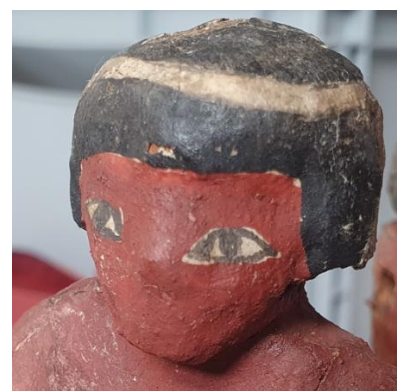
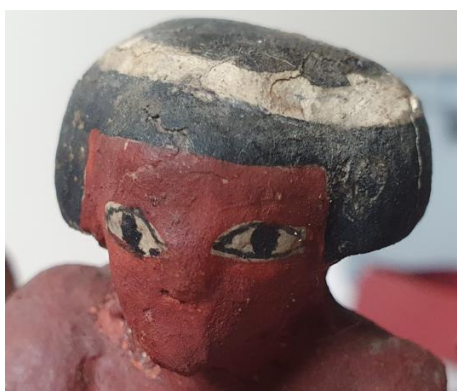


Fig. 83 - Imprecise outlines of the rowers' eyes. Left: B0-1R. Right: B0-3R

calcium carbonate, calcium sulphate, and kaolinitic minerals are consistent with the identification of a yellow ochre. The analytical data therefore support the interpretation of the yellow as an iron-based earth pigment applied over a calcium-rich ground layer.

The red pigment, used for the hull details, the nautical elements, and the exposed skin of the sailors, shows a coherent response across the various areas examined. The red of the hull and that of the figures produce comparable imaging responses, reinforcing the hypothesis of a single pigment source. XRF analyses consistently show major peaks of Ca and Fe, with minor contributions of Mn, K, S, and Si. A possible small Ti contribution is partially masked by the Fe escape peak. Measurements taken on nautical wooden elements lacking a ground layer, such as the quarter rudder oar stanchions and the crossbeam, display reduced Ca and a relatively stronger K signal, likely attributable to the wood substrate. Analyses conducted on red decorations applied over yellow areas also include contributions from the underlying pigment. FTIR data are compatible with the presence of a red ochre, coherently with the iron-rich composition indicated by XRF.

The black pigment, employed for the wigs, the *udjat* eyes, and various linear details, is clearly legible under infrared imaging, confirming the carbonaceous nature of the pigment and its strong absorption. XRF spectra largely replicate those of the underlying layers, with only a slight increase in K in certain points, consistent with a carbon-based black rather than a mineral pigment.

Imaging techniques also reveal evidence of working traces and later interventions. Infrared imaging accentuates circular marks at the points where the crouching figures rest against the deck, likely related to mechanical contact (Fig. 84). Ultraviolet examination highlights a diffuse bluish fluorescence across the deck and figures, particularly concentrated in retouched areas, suggesting the presence of a restoration-applied protective or consolidant layer. Small droplets with whitish fluorescence may correspond to adhesive residues. FTIR confirms the diffuse presence of Paraloid, consistent with modern conservation treatments.

Taken together, the imaging and spectroscopic data allow a coherent reconstruction of the palette, based primarily on calcium-rich ground materials and iron-based earth pigments, complemented by a carbon black. The identification of modern synthetic materials further clarifies the extent of modern interventions, while leaving open the need for future stratigraphic investigations to confirm the precise layering and microstructural organisation of the ground layer and paint system.

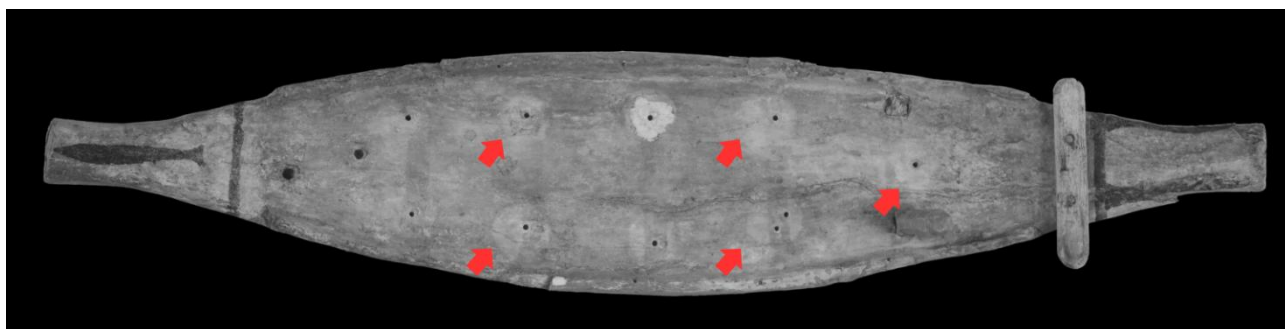


Fig. 84 – Circular marks visible in IRR image

6.2.4. Boat 0: Erratic elements and reconstruction hypothesis

The reconstruction of the original configuration of these models is severely constrained by the scarcity of excavation documentation. Schiaparelli's journal records them only in the brief note "four broken boats," without further clarification regarding their condition, degree of fragmentation, or arrangement at the time of discovery. In the absence of more detailed field records, the earliest visual testimony is the photograph taken in the 1920s, in which the assemblage appears already reassembled and displayed. That image, however, reflects a curatorial arrangement rather than a documented funerary context and therefore cannot be taken uncritically as evidence of the original disposition of the elements.

A comparison between the present state of the boat models and their appearance in the historical photograph reveals substantial discrepancies. Several elements are clearly misplaced or dispersed. In an attempt to reconstruct at least the 1920s configuration, the analysis proceeded through the systematic examination of physical traces visible on the hulls and figures, such as mortises, tenon remains, distinctive formal features, pigment accumulations, and lacunae. The compatibility between individual elements and specific hulls was assessed through a triangulation between these physical traces, the historical photograph, and the plausibility of the arrangement in light of what is known about boat model production.

This triangulation is far from straightforward. A representative example concerns the rowers of Boat 0. In their current arrangement, they are oriented toward the stern. In the 1920s photograph, however, they appear to face the bow. According to the established conventions of navigation represented in Egyptian boat models, rowers should face opposite to the direction of travel. On this basis, the present configuration appears to be the correct one.

The standing punter currently mounted at the bow of Boat 1 (B1-1) presents a more complex case. The historical photograph from the 1920s clearly shows this particular figure positioned on Boat 0, providing at least documentary support for its association with this vessel at that time. Moreover, this figure feet appears equally compatible with the corresponding position on Boat 0. As described in detail in the sections related to Boat 1, the tenon and mortise system allows the figure to fit securely also in that vessel. Such interchangeability complicates any attempt to assign elements based solely on mechanical compatibility.

Nevertheless, certain stylistic features raise doubts regarding its original pertinence. The headband and rear bow are executed in a relatively approximate manner, a treatment that does not correspond to the consistently refined rendering observed in the other figures of Boat 0. Moreover, the eyes feature the eyebrow element and have been drawn above the red layer. These technical choices are closer to what is seen on sailors related to Boat 1. Unfortunately, the punter visible on Boat 1 in the 1920s photograph is currently missing. If that figure were to be recovered and its bow and faces details examined, it would likely allow for a more definitive assessment of the issue.

Beyond these two figures, the question of the execution and stylistic variability of the white bows presents further complexities, which will be addressed in greater detail in the concluding discussion of this section.

6.3. Boat 1 (S. 8791)

6.3.1. Boat 1: Hull wooden structure

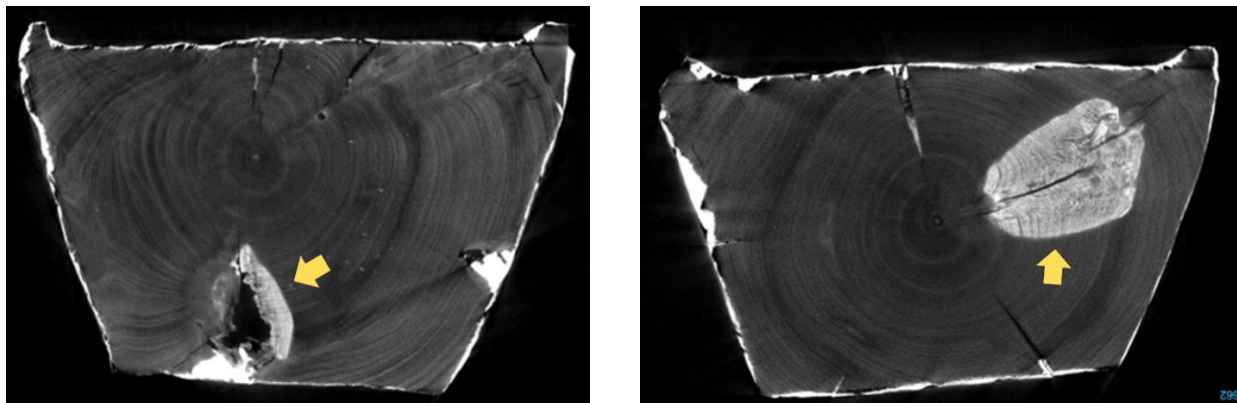


Fig. 85 – Boat 1: bright areas near a cavity (left), and a knot (right)

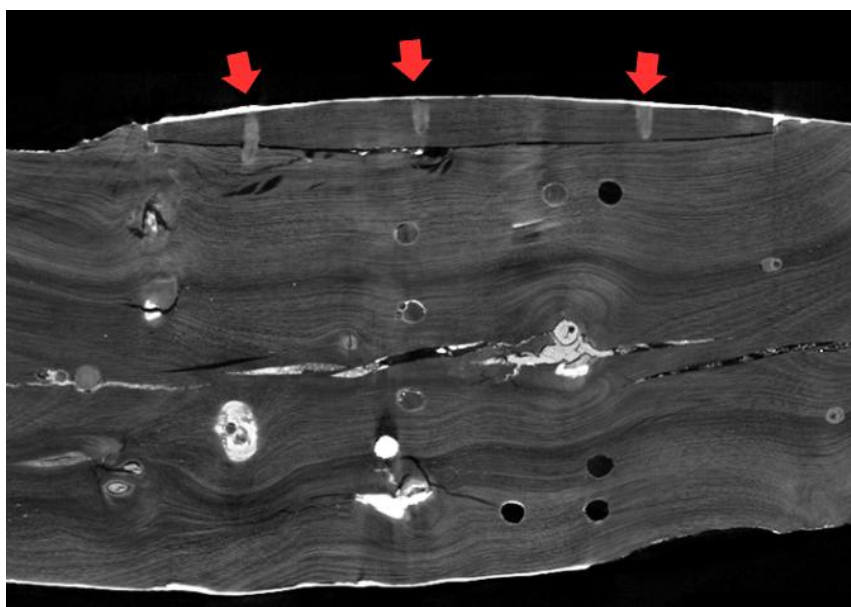


Fig. 86 – Boat 1 wooden insert. Red Arrows: dowels

Boat 1 (29.5 × 85 × 17 cm) closely corresponds, in its structural conception, to the previously described vessel, with the significant difference that it represents a sailing boat. Consequently, it lacks the rowlocks holes along the external profiles of the bulwark, and the arrangement of the mortises on the deck for the positioning of the figures and superstructural elements differs substantially.

As in Boat 0, the hull is carved from a principal log, macroscopically compatible with fig genus, supplemented by a small wooden insert on the left side, likely introduced to refine the modelling of the volumes. The main block retains the pith, which at a certain point bifurcates, probably corresponding to a branching node in the original tree. CT imaging again reveals the presence of particularly dark growth rings, indicative of variations in density and plausibly associated with years of more constrained growth. The branching condition of the trunk, combined with the high number of knots, including developed

branch inclusions, results in markedly deviated fibre orientation within the block. Numerous shrinkage cracks are visible and appear to have been superficially hidden with paste. In association with knots and with a cavity located in the lower central area, the same strongly radiopaque zones previously described in Boat 0 are observed (Fig. 85). In this case, their identification is facilitated by the presence of various particularly extensive areas, measuring several centimetres. The hypothesis regarding their nature remains consistent with that proposed for Boat 0. The possible involvement of calcium oxalate or other mineral inclusions could be supported by the presence of small, bright spots scattered randomly within the wooden matrix. Nevertheless, given the current absence of specific literature addressing such phenomena in hardwood species, these interpretations must remain hypothetical.

As also observed in Boat 0, the lateral insert is connected to the main block by means of three wooden dowels, which display slightly higher radiopacity than both the hull and the insert itself (Fig. 86).

A number of the mortises intended to receive the figures still contain the lower broken portions of the sailors tenons. This detail suggests that at some stage the figures were secured in place using strong adhesives, resulting in breakage rather than clean extraction. In the central area associated with the sailors managing the sails, a filled dowel hole is visible. Under ultraviolet examination this fill does not exhibit evidence of retouching, raising the possibility that it may represent an ancient intervention intended to conceal an unused or misaligned mortise.

From bow to stern, the following mortises are identifiable, corresponding to separately carved elements (Fig. 87):

- Three pairs of diagonally offset mortises forming a triangular arrangement in the forward area of the vessel, intended for three standing figures (A-B-C)
- A central mortise for the mast, corresponding to the painted representation of the mast partner (D)
- A single mortise positioned between the sail-handling sailors and the mast location, whose function remains unclear (E)
- Three pairs of parallel diagonal mortises aligned to accommodate three standing figures engaged in handling the sails (F-G-H)
- Two diagonal mortises located centrally within the area delimited by the canopy, likely intended to house two seated passengers (I)
- Four mortises positioned perimetrically at the corners of a square, intended to support the missing canopy structure (M). Adjacent to the two anterior mortises, an additional hole and an incipient or partially initiated mortise are visible. Their function remains uncertain, and they may represent non-functional or abandoned attempts (L)
- Two parallel rectangular-section mortises for the vertical supports of the rudders (O), now missing, accompanied by a central circular mortise for the helmsman (N)

Overall, while Boat 1 shares the same constructive logic as Boat 0 in terms of timber selection and assembly strategy, its deck layout reflects the different iconographic

programme associated with a sailing vessel, resulting in a substantially reconfigured spatial organisation of figures and superstructures.



Fig. 87 – Deck of Boat 1 with details of the holes for the elements joint

6.3.2. Boat 1: Figures wooden structure²⁶

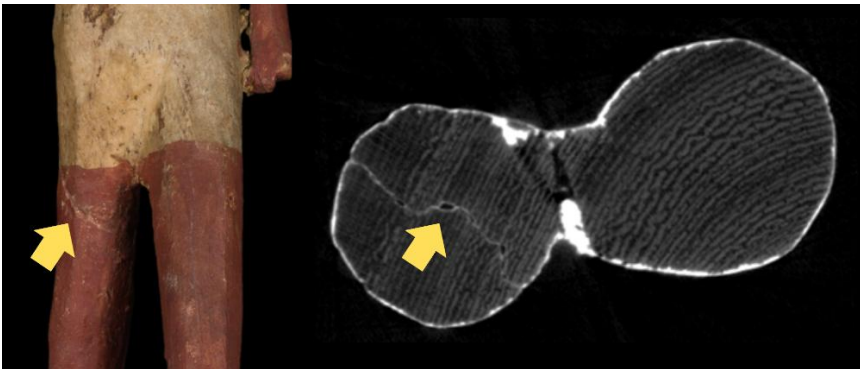


Fig 88 – B1-1 fractured leg



Fig. 89 – Head of B1-2

The sailors of Boat 1 display a degree of structural variability that reflects both the quality of the selected timber and the strategies adopted to compensate for its limitations.

Sailor B1-1 is carved from a support element devoid of pith and free from major defects. The absence of significant anatomical irregularities is reflected in the precision of the carving and in the thin, homogeneous ground layer applied over the surface. The arms are attached by means of one wooden dowel per side. However, the right arm is now missing and was already absent in

²⁶ For clarity and consistency throughout the present analysis, the crew members have been assigned a specific alphanumeric code: the figures are identified as B1-1 and so forth (Boat 1; sequential number), while the erratic elements are designated B1- E1 and so forth (Boat 1; Erratic; sequential number). The missing figures are coded as B1-M1, etc (Boat 1; Missing; sequential number). Other letters associated to these codes could be H = helmsman, or P = passenger

photographs from the 1920s. The right leg is fractured and has been reattached using a thin layer of material resembling an adhesive (Fig. 88). The nature of this material, together with the associated pictorial retouching, clearly visible both to the naked eye and under ultraviolet illumination, strongly suggests that the damage and subsequent repair occurred in the modern period.

Sailor B1-2 also lacks pith in the main wooden block, but the structural condition of the support is considerably more problematic. The upper portion of the element is heavily fissured, including a through crack extending from the head down to approximately waist level. Moreover, the original block does not provide sufficient volume to fully model the head. To compensate for this inadequacy, two additional wooden elements were inserted at the back of the head, positioned to the right and left at approximately 45 degrees, forming a V-shaped configuration (Fig. 89). Each insert is secured to the principal block by a wooden dowel placed transversely through the centre of the added piece and penetrating the head to approximately three-quarters of its thickness, the two dowels intersecting within the core.

The entire system was subsequently regularised externally with paste in order to conceal the structural complexity and restore a continuous surface.

The considerable effort invested in constructing such a small-scale figure from a structurally compromised and undersized piece of wood demonstrates the extent to which the craftsmen sought to maximise the usable yield of available timber. In other geographical or environmental contexts, a block of such limited dimensions and affected by substantial fissuring might have been discarded. Its retention and elaboration here suggest that the intrinsic value of the material outweighed the additional labour required to assemble it from multiple components. This choice constitutes further evidence of the relative scarcity and consequent preciousness of workable timber in the Egyptian context.

6.3.3. Boat 1: Painted decoration

The painted decoration of Boat 1 is executed using the same restricted palette observed on Boat 0 (white, yellow, red, and black) and follows an analogous pictorial technique. The hull and deck are covered by a thin yellow layer applied in a relatively diluted and even manner, while the bulwark is reserved to receive a broad red line. As in Boat 0, this line is executed freehand with a steady brush, although on the right side a red droplet is visible approximately halfway along the band, where the pigment has run downward. This minor flaw provides direct evidence of the fluidity of the paint and of the working process. A noteworthy variation concerns the mast partner: unlike Boat 0, where a part of the internal space of the rectangular outline is left unfilled, here the entire interior of the rectangle is completely filled with red (Fig. 63).

Regarding the figures, the white bands with the rear bows of the sailors are made freehand and approximately, unlike what can be observed on Boat 0's sailors. Likewise, also the rendering of the eyes is different, as in this case the eyebrows are present and these elements are painted last, above the red (Fig. 90). These result correspond to a different sequence in the decoration: the red colour was applied, leaving the white area of the eye to spare, then the black of the wig, also in this case leaving exposed the element of the white

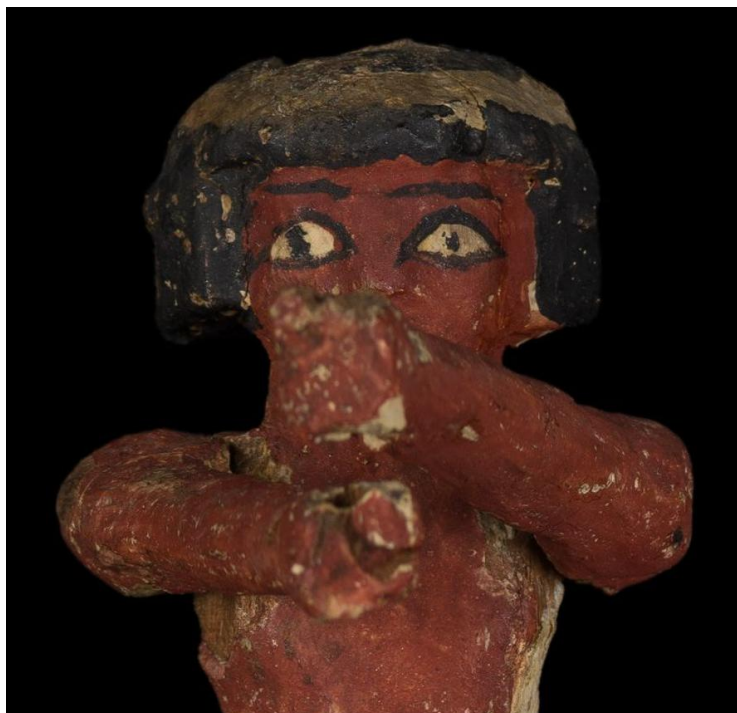


Fig. 90 – Figure B1-2

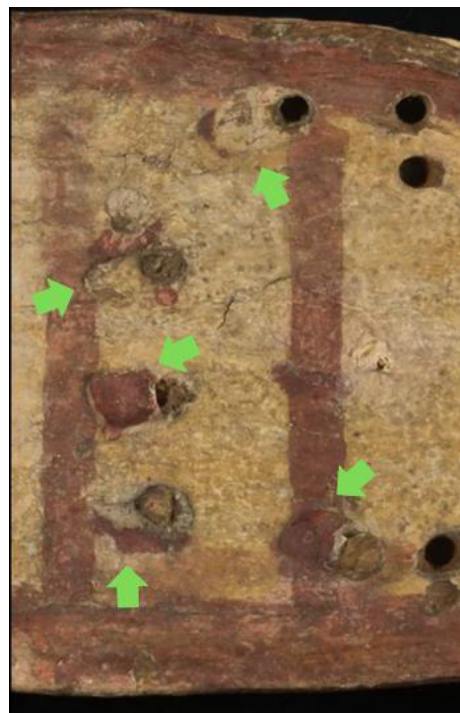


Fig. 91 – Feet on the deck of Boat 1

band, without a reference design, and finally the details of the eyes were fashioned with a small brush. This modification, though limited, suggests a different approach to the painting phase within an otherwise consistent decorative scheme.

An important observation relates to the feet of the sailors, some of which are still in situ. The red halos visible on the deck around the footprints, both in the areas where the feet are still preserved and where they are missing, indicate that the feet were coloured after the figures had been mounted on the boat (Fig. 91). The sequence of operations may therefore be reconstructed as follows: the hull and the sailors were painted first and separately, then the figures were mounted on the deck, and finally, the feet were modelled with paste and painted *in situ*. The presence of pigment overlapping the contact area between the figures and the deck strongly supports this sequence.

Under ultraviolet illumination, the deck once again appears as the most altered area. A diffuse bluish fluorescence is visible across the surface suggest the presence of a restoration-applied protective or consolidant layer. However, this fluorescence is noticeably more attenuated than in Boat 0. Retouched areas and small droplets, possibly adhesive residues, exhibit a whitish fluorescence. The same bluish response is observable on the sailors, especially in retouched zones, consistent with a protective material applied more abundantly over areas of intervention.

Infrared false colour imaging shows that the red of the sailors and that of the hull display comparable responses. More generally, the overall infrared behaviour closely parallels that observed in Boat 0, reinforcing the technical homogeneity of the two models.

Analytical results further confirm this consistency. The white, associated primarily with the ground layer, shows strong Ca peaks in XRF spectra, accompanied by Fe and S, and minor Si signals. On two sailors, a slight increase in K and Cl is detectable only in logarithmic scale. Given its low intensity, this is compatible with contamination

phenomena or degradation products rather than with the intentional addition of a distinct material. FTIR analyses reveal calcium carbonate, calcium sulphate, kaolinitic minerals, and Paraloid. As already proposed for Boat 0, the coexistence of carbonate and sulphate phases supports the hypothesis of a two-level ground layer composed of calcium carbonate overlain by calcium sulphate, although this interpretation would require stratigraphic confirmation (Fig. 92).

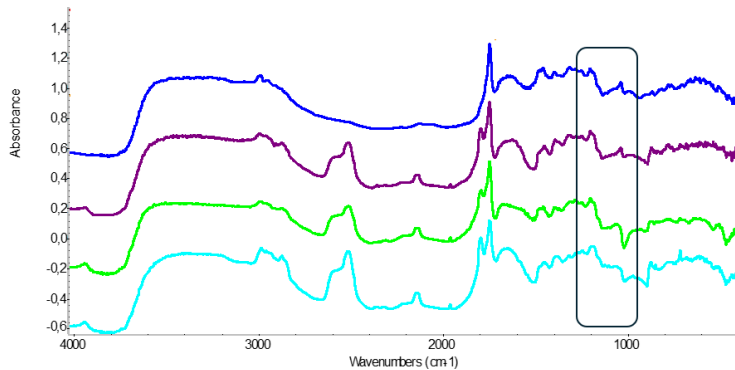


Fig. 92 – Gypsum FTIR spectrum: Bearer A/6 (light blue), Bearer B/10 (green), B0/11 (violet), B1/10 (blue). The boxed region highlights the absorption band of gypsum, corresponding to the asymmetric stretching vibration of the sulphate ion

The yellow pigment yields XRF spectra essentially superimposable on those recorded for Boat 0, with prominent Ca and Fe peaks, accompanied by Si and S and minor Mn. FTIR signals supporting the identification of a yellow ochre applied over a calcium-rich ground layer. The red pigment presents spectra broadly comparable to the yellow, with major Ca and Fe peaks and minor Al, K, and Ti

contributions. As observed on the Boat 0, the red sampled from the crossbeam of the quarter rudder, a more pronounced K signal that may reasonably be attributed to the wooden substrate. FTIR data are compatible with a red ochre, coherently with the iron-rich composition indicated by XRF.

The black pigment produces spectra largely replicating those of the underlying white or yellow layers, with only slight increases in K, Cl, and Ti, detectable primarily in logarithmic representation. Such a pattern is compatible with a carbon-based black rather than a mineral pigment.

Taken together, the technical and analytical data indicate a high degree of coherence between Boats 0 and 1, both in palette and in execution. Minor variations, such as the filled mast partner or the bows of the sailors, provide valuable insights into workshop practice without altering the overall impression of a shared technical framework.

6.3.4. Boat 1: Erratic elements and reconstruction hypothesis

Boat 1 is currently the most impoverished of the four models when compared to its condition in the 1920s photograph (Fig. 93). In its present state, only two sailors remain associated with the hull, one of whom (B1-1) is shown mounted on Boat 0 in the historical image. No superstructural elements survive in situ, with the exception of the crossbeam of the quarter rudders. By contrast, the historical photograph documents eight figures, the two quarter rudder oar stanchions, and a canopy. This implies that, at the outset of the present research, only one of the eleven originally attested elements was actually mounted on the vessel.

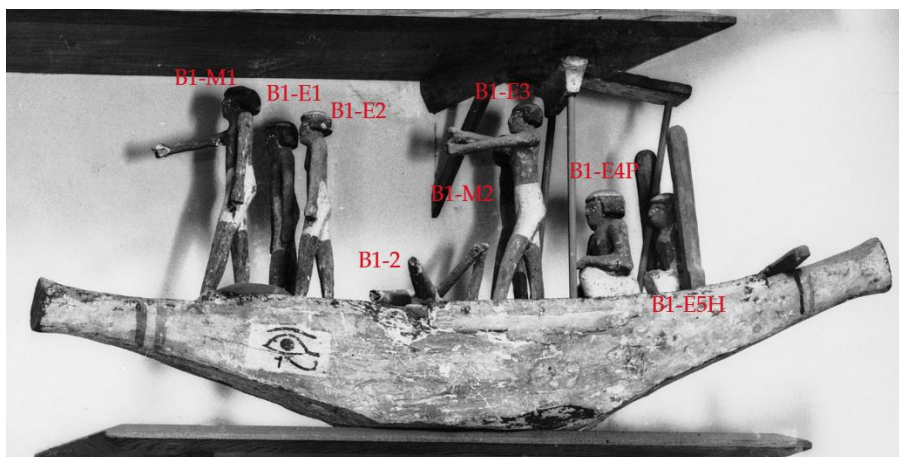


Fig. 93 - Sailors visible in the historical photograph

With the support of the Museo Egizio staff, and through a method based on the triangulation between direct observation of the objects, comparison with the historical photograph, and reference to technical literature on boat models, it was possible to identify eight

elements potentially pertinent to this vessel. Two figures visible in the historical image, however, could not be located. The first, designated B1-M1 and identifiable in the photograph as the punter, is clearly discernible in the archival image but could not be traced either among the erratic elements recorded in the *Provvvisorio* (Provv.) and *Supplemento* (S.) catalogues (although the scale of the stored material precluded a fully exhaustive survey) or among the sailors mounted on other boat models currently on display. Should this figure still be preserved within the museum collections, its eventual rediscovery would significantly clarify the reconstruction.

The second missing figure, B1-M2, corresponds to one of the three sailors engaged in handling the sails. In this case, the historical photograph does not allow reliable identification, as the figure is partially obscured between a foreground element and the wall, with the visible portion poorly illuminated and nearly black. These conditions prevent any meaningful comparison with surviving erratic figures.

From the bow, two standing sailors were positioned behind the missing punter. On the basis of the historical photograph, these have been identified as S. 14813/71 (B1-E1) on the right and S. 14813/72 (B1-E2) on the left. CT examination shows that both are carved from a principal block devoid of pith and major defects. The arms are attached by means of one wooden dowel per side, which does not extend fully to the centre of the torso. The only structural issue observed in B1-E1 is a fracture of the left leg, which presents no internal filler but only lateral paste applications. Ultraviolet examination does not reveal retouching or anomalous fluorescence attributable to modern materials. The fracture remains visible to the naked eye due to slight surface cracking of the paint layer, but there is insufficient evidence to determine whether it occurred in antiquity or in more recent times.

The three sailors standing with arms extended and crossed in the act of handling the sails are attested by the three pairs of corresponding mortises on the deck. The central figure currently visible on the hull corresponds to the individual seen lying on the deck in the historical photograph, where only the lower legs and the raised arms are discernible. As noted above, the inability to distinguish defining features of the right-hand figure in the archival image has prevented its identification. The figure on the left likely corresponds to



Fig. 94 – Figure B1-E3

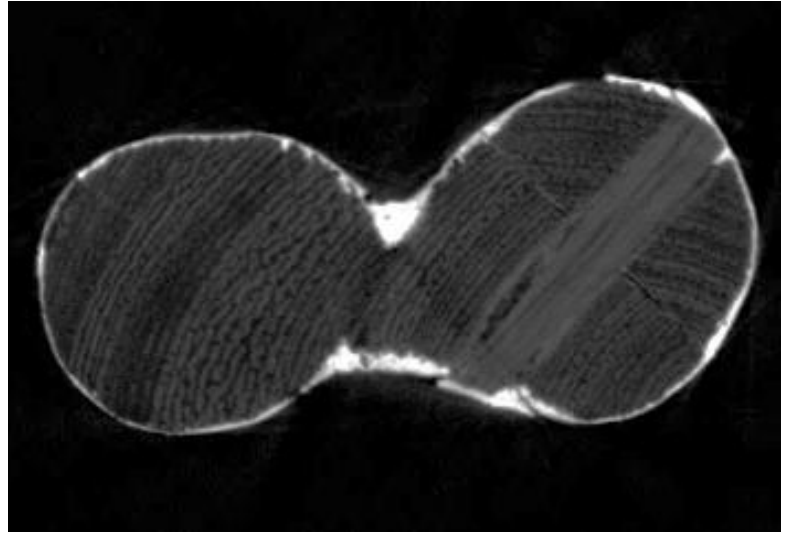


Fig. 95 – Legs of the B1-E3

S. 14813/48 (B1-E3). CT examination of this element indicates that it too is carved from a principal block without pith or significant defects. The left arm is attached with a single wooden dowel, while the right arm, currently detached, was originally secured by two dowels, one placed so externally as to emerge from the chest (Fig. 94). A further structural peculiarity concerns the addition of a separate wooden piece forming the forward left leg, attached to the principal block by a dowel passing through the thickness of the leg (Fig. 95).

Of the two figures originally seated beneath the canopy, only one was preserved and is clearly visible in the historical photograph. This has been identified as S. 14813/127 (B1-E4P), the passenger. Unlike the helmsman and sailors, this figure adopts a distinctive seated posture: crouched with the left knee drawn toward the chest and the left hand resting upon it, while the right knee is opened laterally, with the right hand placed nearby. The figure is carved from a principal block without pith, though a knot is present in the head area together with minor fissures. Owing to its posture, the straighter right arm, resting downward, was carved as a single element attached at the shoulder by a dowel. The left arm, bent at ninety degrees, was constructed in two parts: an upper arm attached at the shoulder by a dowel and a forearm joined at the elbow by means of a forked joint. Finally, the helmsman has been identified as S. 14813/132 (B1-E5H). This seated figure presents both arms bent, with two vertical perforations in the clenched fists. The main body is carved from a block devoid of pith. The left arm is missing but was originally attached at the shoulder by a dowel, as was the right arm. Of the latter, only the upper portion up to the elbow survives, while the forearm, originally assembled with a forked joint, is lost.

All erratic elements attributed to Boat 1 were subjected to non-invasive imaging, XRF, and FTIR analyses. The results do not reveal material anomalies incompatible with the technical characteristics of the vessel. However, the composition of the materials, such as ground layers based on calcium carbonate with sulphur peaks, red ochre, and carbon black, does not provide sufficiently distinctive markers to establish unequivocal correlations between specific figures and the hull.



Fig. 96 - Example of the compatibility between B1-E3 and the feet in Boat 1

It should also be noted that all the erratic figures attributed to this vessel display consistent pictorial features: the white band and the bows are rendered in a relatively approximate freehand manner, and the eyes and eyebrows are painted over the red flesh tone. This execution corresponds to the working method observed in the sailor considered pertinent to the boat, reinforcing the technical compatibility of these elements with the others. Finally, compatibility also appears to exist with the mortise sockets (Fig. 86).

With regard to the superstructural elements, the two quarter rudder oar stanchions visible in the historical photograph are no longer *in situ*. As in Boat 0, these would have been inserted into square-section mortises, and residual traces of red pigment on the deck suggest that they were painted red. The search for these elements led to the tentative identification of S. 14829/02 and S. 14829/03 as potentially pertinent supports. These pieces are morphologically compatible and fit precisely within the mortises, but in the absence of distinctive traces beyond

their general form, the proposed association rests primarily on dimensional and formal correspondence.

The canopy visible in the historical photograph appears to correspond to the structure currently mounted on Boat 2. This element is recognisable by its incomplete roof, lacking the left portion and therefore supported by only three vertical posts instead of the canonical four. A detailed description will be provided in the section dedicated to Boat 2. For present purposes, it is sufficient to note that the pertinence of this canopy to Boat 1 does not rely solely on photographic documentation. The palette and the decorative scheme, particularly the red and black striped motif on the anterior zone, are more consistent with the pictorial language of Boat 1 than with that of Boat 2, suggesting that its current placement may not reflect its original association.

6.4. Boat 2 (S. 8792)

6.4.1. Boat 2: Hull wooden structure

Boat 2 (dimensions: 19 × 84 × 17 cm) is, like Boat 1, a sailing vessel with papyriform stern and bow. In this case, however, and unlike Boats 0 and 1, the deck does not present a carved raised bulwark. Instead, the perimeter band is rendered solely through paint.

The hull is carved from a single block including the pith. The pith is positioned relatively centrally within the element and, approximately halfway along the length of the vessel, undergoes a bifurcation, likely corresponding to a branching point in the original tree (Fig.

97). Macroscopic observation suggests that the wood is compatible with the genus *Ficus*. Radiopaque areas are also visible within the wooden matrix of this boat. Several knots are visible, including developed branch inclusions, together with deviations in fibre orientation and shrinkage cracks. Some of these cracks have been partially filled at the surface with paste in order to regularise and visually homogenise the exterior.

From bow to stern, the following mortises for separately carved elements can be identified (Fig. 97):

- Three pairs of diagonally offset mortises forming a triangular arrangement in the forward zone of the vessel, intended for three standing figures (A-B-C)
- A central mortise for mast, corresponding to the painted representation of the mast partner (D)
- Three pairs of parallel diagonal mortises for three standing sailors engaged in handling the sails (E-F-G), of which two figures remain preserved
- A central mortise within the area delimited by the canopy, intended to accommodate the passenger figure (E)
- Four mortises positioned perimetrically at the corners of a square, interpreted as supports for a canopy structure (I), whose pertinence to this vessel is uncertain and will be discussed in 6.4.4.
- Two parallel mortises for the quarter rudder oar stanchions (L), and a central mortise for the helmsman (M), none of which are currently preserved in situ
- Two mortises at the stern for the crossbeam of the quarter rudders (N)

With regard to the superstructural elements, the original configuration of the vessel can be reconstructed as comprising a crossbeam of the quarter rudders, two quarter rudder oar



Fig. 97 – Deck of Boat 2 with details of the holes for the elements joint

stanchions, a mast with sail, and a canopy. Of these components, the crossbeam and the mast with sail were already missing in the 1920s. The two quarter rudder oar stanchions and the canopy, by contrast, were still mounted at that time. At present, only a canopy is associated with the model. However, its morphology appears to differ from the one visible in the historical photograph and instead seems more compatible with the canopy observed on Boat 1.

The canopy currently mounted consists of a horizontally developed wooden element carved to form the frontal portion of the structure. Two perforations are present in the lower part of the right and left extremities, intended to receive the vertical supporting

posts. The white rectangular element forming the roof, now missing its left portion, overlaps the upper face of the frontal beam and is secured to it by three wooden dowels distributed along this junction. At the rear, on the right side still preserved, the roof element presents an additional perforation for the insertion of the corresponding vertical support.

6.4.2. Boat 2: Figures wooden structure²⁷

In Boat 2, the three standing figures positioned at the stern are still preserved and correspond coherently to the arrangement visible in the historical photograph. Of the three sailors aligned behind them in the act of handling the sails, two remain. The missing figure appears to have been the one positioned in the foreground and therefore the most clearly visible in the archival image. The passenger seated beneath the canopy is likewise still in place, whereas the helmsman is currently missing.

All the figures associated with this vessel are carved from wooden blocks that retain the pith. Additional wood defects, including knots and shrinkage cracks, are widely distributed among the figures. In particular, sailor B2-3, exhibits a support matrix especially affected by peripheral radial checks caused by drying shrinkage (Fig. 98). Sailor B2-1, by contrast, presents a ring shake at abdominal height.

All the standing figures originally had their arms attached to the torso by means of one wooden dowel per side at shoulder level. These dowels are relatively long, reaching or exceeding half the thickness of the figure. At present, only B2-3 retains both arms; B2-1 and B2-2 preserve only the right arm, while figures B2-4 and B2-5 are entirely deprived of their arms.



Fig. 98 – Wood support of figure B2-3



Fig. 99 – Passenger B2-5P

The passenger seated beneath the canopy (B2-6P) is, from a constructive standpoint, closely comparable to the passenger attributed to Boat 1 (B1-E4P). In both cases, the arms are attached at the shoulders by means of one dowel per side, and the left forearm was originally assembled using a forked joint. In the present case, however, the left forearm is missing, allowing the forked joint to be clearly observed with the naked eye (Fig. 99).

6.4.3. Boat 2: Painted decoration

²⁷ For clarity and consistency throughout the present analysis, the crew members have been assigned a specific alphanumeric code: the figures are identified as B2-1 and so forth (Boat 2; sequential number), while the erratic elements are designated B2- E1 and so forth (Boat 1; Erratic; sequential number). Other letters associated to these codes could be H = helmsman, or P = passenger

On Boat 2, the painted decoration follows the same restricted palette but presents several noteworthy variations in both execution and stratigraphic interaction.

The yellow colour of the hull and deck is markedly more saturated and thicker than in the previous boats, although the brushstrokes remain clearly legible. In this case, the yellow layer was applied continuously across the entire surface, without reserving the bulwark band. Only the rectangular fields of the *udjat* eyes and the two papyriform extremities were left in reserve. The deck beams are rendered with thick red brushstrokes, applied decisively over the yellow ground. The execution of the red line along the right bulwark reveals that the paint was excessively diluted. A conspicuous drip descends onto the *udjat* eye, with additional, though less evident, runs visible elsewhere along the same band. The interaction between this drip and the eye decoration provides valuable insight into the sequence of execution. The red flow appears to have halted upon encountering the black eyebrow and to have partially merged with it, suggesting that the eye had already been painted when the red band was applied. However, the upper black line delimiting the rectangular frame of the eye clearly passes over the red in certain areas, indicating that it was subsequently reinforced or redrawn after the incident. On the opposite side as well, the red partially overlaps the upper black line of the rectangle. The most plausible sequence therefore appears to be: application of the yellow layer leaving the white rectangle in reserve, execution of the eye decoration, application of the red bulwark line, and finally, partial redefinition of the black frame lines where necessary.

The eye itself is inscribed within a white rectangle bordered in black along the upper and lateral edges. On the right side, however, one lateral line is drawn too far inward and does not correspond precisely with the transition between yellow and white. Unlike Boats 0 and 1, the eye here occupies the entire rectangle both vertically and horizontally. The eyebrow is slightly S-shaped, and the cosmetic tail is rather elongated. Some fine red diagonal lines are painted across the two sides of the sclera. The lower element of the eye is executed as a single unit, slightly detached from the main contour. The straight descending line is not perfectly aligned with the pupil but set slightly forward, and its upper portion is marginally thinner than the lower one, creating a subtle step. In contrast to the other boats, the curl is shorter and does not extend across the full width of the eye.

At the stern, the decoration comprises three alternating bands of yellow, black, and red, accompanied by petal-shaped motifs. All decorative elements are normally enclosed by a black contour line. However, the black outline surrounding the final red petal on the right was omitted, an oversight that further attests to the rapidity of execution.

The execution of the sailors is technically coherent with that observed on Boat 0. The overall quality of decoration is slightly lower, particularly in the rendering of the flesh tones, where the red is not applied with precision around the eyes and tends to curve irregularly around the black contours. This is because, also in this case, the characters have no eyebrows, and the eyes were created before applying the skin color. Nevertheless, as in Boat 0, the headbands and bows are carefully drawn, suggesting particular attention to these details.

Two figures deserve specific mention. The sailor B2-5 is the only individual within the entire group of boats to display a black contour line separating the abdomen from the upper edge of the kilt. This additional graphic element is not present in the other sailors

and therefore constitutes a distinctive feature within the corpus. Moreover, under ultraviolet illumination he exhibits a distinctly yellowish fluorescence, differing from the other figures (Fig. 100). These features suggest a possible difference in his conservation history, possibly suggesting a misplacement of the element.

The passenger B2-4 is executed with greater care and refinement. On the front, he wears a white necklace outlined by an extremely fine black contour line. At the back, the ornament narrows and closes into two crossed white ties. Although the face is heavily damaged by gaps, it is noticeable that this is the only character to have eyebrows drawn on. The presence of this additional decorative element, together with the more meticulous execution, sets this figure apart from the rest of the crew, and underlines its iconographic importance

With regard to the individual pigments, the white associated with the ground layer and reserved areas displays XRF spectra characterised by strong Ca peaks, accompanied by Fe and S, and minor Si and Ti signals. No significant differences are observed between boat and sailors. FTIR analyses consistently detect calcium carbonate, calcium sulphate, kaolinitic minerals, and Paraloid. As in the previous boats, the co-presence of carbonate



Fig. 100 - Difference in fluorescence response observed in Sailor B2-3, positioned between Sailors B2-1 and B2-4

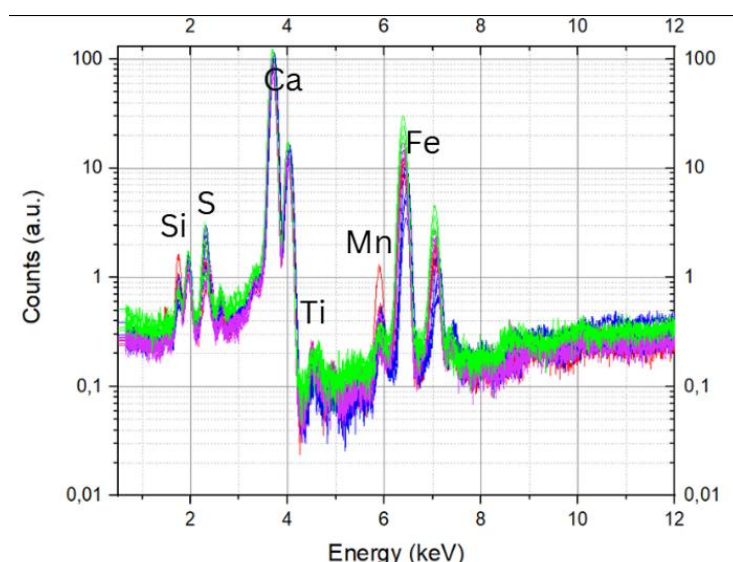


Fig. 101 - XRF spectre of yellow pigment: Boat 0 (red), Boat 1 (blue), Boat 2 (violet), Boat 3 (green)

and sulphate phases represent an interesting feature that needs further future stratigraphic analysis.

Infrared false colour imaging of the yellow pigment shows a behaviour analogous to that observed in Boat 0 and 1, and no substantial deviation is noted in the response of the yellow layer (Fig. 101). This pigment yields XRF spectra with prominent Ca and Fe peaks, accompanied by minor Si, Mn, Ti, S, and K. Lighter yellow areas on the stern and bow decorations produce spectra comparable to the more saturated yellow, suggesting that they likely correspond to the same pigment rather than to a distinct material. FTIR data are compatible with a yellow ochre applied over the calcium-rich ground layer.

Infrared false colour imaging confirms the coherence between the red used on the hull and that on the figures, reinforcing the hypothesis of a shared pigment source across the assemblage. The red pigment, used for structural details, decorative bands, and the sailors' skin, produces XRF spectra with strong Ca and Fe peaks and minor Si, Mn, Ti, S, and K contributions, consistent with the iron-based earth pigments identified on the other boats. In some points, a small Cl peak is detectable, but given its limited intensity, this may reasonably be attributed to degradation processes or contamination. Notably, visible-induced luminescence (VIL) imaging reveals luminescence in correspondence with the lower legs of certain sailors, specifically in retouched areas (Fig. 102). This behaviour is compatible with the possible use of cadmium red in conservation treatments.

Under infrared imaging, the black contour lines defining the headbands and bows are particularly accentuated, confirming their strong absorptive behaviour. The black pigment produces XRF spectra largely replicating those of the underlying layers, with only slight increases in K in some areas, consistent with a carbon-based black.

Under ultraviolet illumination, are visible some retouchings appear with a black or a bluish tone on both hull and figures. Yellowish areas visible within the white zones may correspond to uneven removal or application of a protective layer, although the interpretation remains uncertain. A faint bluish fluorescence, particularly noticeable in white areas, is likely attributable to later-added materials. Across multiple analysed areas, FTIR consistently identifies the presence of Paraloid.

Overall, Boat 2 confirms some technical coherence observed in Boats 0 and 1 while introducing subtle variations in execution, layering sequence, and decorative details. At the same time, imaging techniques reveal targeted modern interventions, highlighting the complex stratigraphy of original materials and later additions.

6.4.4. Boat 2: Erratic elements and reconstruction hypothesis

With regard to the superstructural elements, as noted previously, the comparison with the historical photograph indicates that Boat 2 originally included the quarter rudder oar



Fig. 102 - Retouched areas on sailors B2-1 and B2-4. Visible, UV, and VIL images

stanchions, which are no longer preserved *in situ* and have not yet been identified within the museum collections. Although only the circular mortises remain visible on the deck, the stanchions are clearly discernible in the historical image and differ morphologically from those of the other two vessels, appearing comparatively flat with a semicircular apex. The canopy currently mounted on Boat 2 raises questions regarding its actual pertinence. In the historical photograph, the canopy associated with this vessel appears more compatible with the one mounted on Boat 1. A systematic search among the unassociated canopies preserved in the Museo Egizio led to the identification of S. 14828/16 as a potential candidate for Boat 2.

The proposed identification is based primarily on the limited morphological features visible in the historical photograph, where only the right profile of the canopy can be clearly observed. Structurally, S. 14828/16 follows the same constructive logic as the other canopy: it consists of a horizontal frontal beam with two lower perforations intended to receive the vertical supports, and an upper surface joined to the rectangular roof element by means of three wooden dowels. The roof itself presents two perforations at the rear corners, intended to accommodate the posterior vertical supports.

Beyond this general morphological correspondence, which, as already noted, remains insufficient in itself, the decorative scheme appears particularly significant. The flat upper roof is painted white, with the edges decorated in red, a solution differing from the other canopy, whose roof is entirely white. The decisive element, however, lies in the decoration of the frontal beam: on a white ground, a band composed of alternating black, yellow, and red petal-shaped motifs is framed by thin black contour lines, with the two terminal zones painted red. This decorative pattern corresponds exactly to that of the papyriform extremities of Boat 2 (Fig. 103).



Fig. 103 – Canopy S. 14828/16

Dimensional correspondence between S. 14828/16 and the holes on Boat 2 was also considered. As in the case of the sailors, dimensional compatibility alone cannot establish definitive pertinence, but it does not contradict the proposed association. Similarly, non-invasive scientific analyses conducted on the painted surface

reveal materials fully consistent with those identified elsewhere in the corpus. Again, while such data cannot confirm attribution, they equally fail to exclude it.

If assumed that the frontal decorative band of the canopy was conceived to harmonise with the decorative programme of the hull extremities, it becomes plausible that the canopy currently mounted on Boat 2 may in fact pertain to Boat 1, whereas S. 14828/16 would be more coherently associated with Boat 2, an interpretation that also aligns with the configuration documented in the historical photograph.

With regard to the figures, the missing sailor among those handling the sails has been identified as S. 14813/134 (B2-E1). This figure is carved from a wooden block retaining the

pith, and the arms are attached at the shoulders by means of one wooden dowel per side. The pictorial technique corresponds to that observed in the sailors of Boat 2: the white headband and bow are first outlined with a fine black line, while the eyes are executed prior to the application of the red flesh tone and lack eyebrows.

The helmsman has been identified as S. 14813/131 (B2-E2H) and is structurally analogous to the other helmsmen previously described. The main body is carved from a block devoid of pith. The upper arms are attached at the shoulders by means of one dowel per side, and the forearms were originally assembled to the elbows by forked joints.

In this case, however, the pictorial execution diverges from the technique observed on the sailors associated with Boat 2. The headband and bow are rendered freehand in a comparatively approximate manner, and the eyes, complete with eyebrows, are painted over the red flesh layer.

As with the canopy, non-invasive scientific investigations indicate full material coherence with the rest of the corpus but do not provide diagnostic elements sufficient to establish certain pertinence.

6.5. Boat 3 (S. 8793)

6.5.1. Boat 3: Hull wooden structure

Boat 3 (14.5 × 62 × 12.5 cm) is the smallest and, from a structural perspective, the most distinct of the four boat models under examination. It represents a rowing vessel with papyriform extremities whose dimensions are slightly narrower than the point at which they join the hull. Unlike Boats 0, 1 and 2, no bulwark band is present, however, the holes corresponding to the rowlock positions are clearly visible along the upper edges.

Macroscopic examination suggests that the principal trunk from which the hull was carved is compatible with the genus *Ficus*. The main block retains the pith, located in the lower portion of the hull. Notably, the pith does not follow the longitudinal axis centrally but runs diagonally through the element, positioned toward the right in the anterior area and toward the left in the posterior zone. Due to this configuration, the pith is confined to the central body of the hull and does not extend into the wooden matrix forming the extremities.

The timber displays several significant defects, including large knots with developed branch inclusions. In certain areas, the growth rings appear locally denser, possibly corresponding to tension wood. As in the other vessels, zones of increased radiopacity are

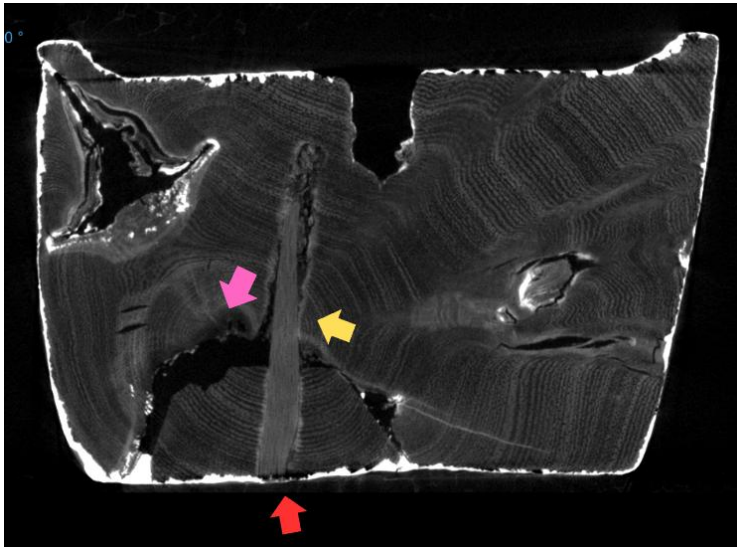


Fig. 104 - CT slice of the bow area of Boat 3: Red arrow: wooden insert; Yellow arrow: dowel; Pink arrow: pith

observable in proximity to knots. The hypotheses regarding their nature have been discussed in detail in section 6.2.1 and are not repeated here.

Toward the bow, in the lower area, the piece containing the pith is absent and has been replaced by a wooden insert (Fig. 104). Since the missing pith is limited to this circumscribed zone, it is plausible that its absence does not result from a deliberate selection of timber but from an accidental detachment. This interpretation is supported by the presence, in the same area, of

cavities that appear to correspond to intrinsic wood defects. The insert, of modest dimensions, is secured to the hull by means of two wooden dowels that appear slightly more radiopaque than the surrounding timber and are proportionally oversized relative to the element they stabilise.

The mortises visible on the deck, observed from bow to stern, comprise (Fig. 105): two diagonal mortises at the bow corresponding to a standing figure (A); six mortises arranged in two parallel rows to accommodate three pairs of rowers (B); two parallel mortises for the quarter rudder oar stanchions (C), with a central circular mortise for the helmsman (D); a seat for the dowel of the crossbeam of the quarter rudders, now lost (E).

Historical photograph shows this model devoid of all figures and superstructural elements, consisting solely of the hull. At present, two figures are mounted, but they have not been considered pertinent either to this vessel or to the other boats of the assemblage and were therefore excluded from further scientific investigation. The standing figure is clearly inconsistent with the type of vessel represented, as it adopts the posture of working a sail on what is unequivocally a rowing boat. The second figure likewise does not correspond iconographically to any of the original crew members documented in the other models. Furthermore, the original helmsman and rowers left visible impressions on the

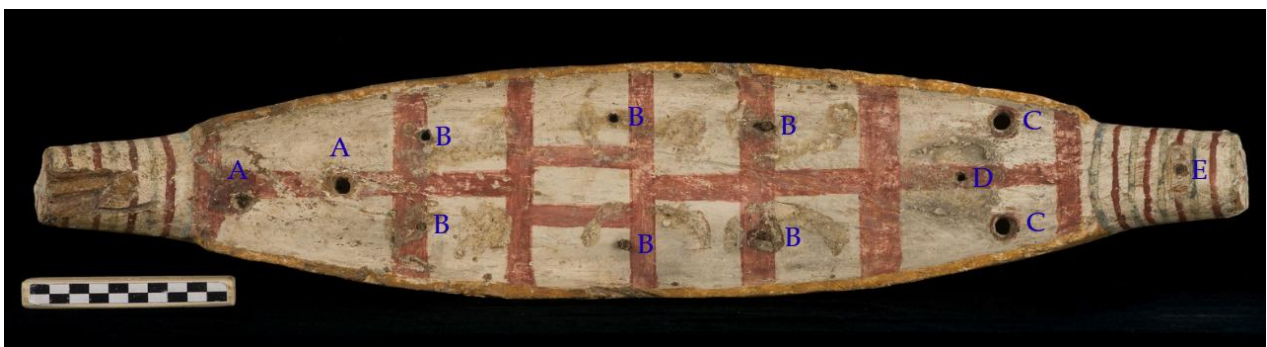


Fig. 105 – Deck of Boat 3 with details of the holes for the elements joint

deck surface. These shallow negative traces likely result from the application of a layer of paste at the back of the figures during assembly, intended to improve adhesion and which left clearly defined residual contours marking the occupied areas. A comparison between the currently mounted figure and these traces, particularly in relation to the position of the dowel and the spatial volume occupied, reveals no correspondence. This mismatch strongly supports the conclusion that the present figures are not original to Boat 3.

6.5.2. Boat 3: Painted decoration



Fig. 106 – *Udjat* eye of Boat 3

In Boat 3 the chromatic palette is expanded and includes white, yellow, red, black, brown, and blue, making it very different from a pictorial standpoint. The hull is painted in a bright, saturated yellow, whereas the deck is entirely white. Unlike the other boats, no red band is present along the bulwark. The decoration of the deck beams was executed by first tracing the red contour lines with a fine brush and subsequently filling them in with the same pigment. The mast partner, as noted previously (Fig. 63), differs significantly in form, being rendered as a simple rectangular element.

The *udjat* eye is framed within a rectangular field defined by two black lateral lines and internally filled with a

brown tone. The eye is centred within the rectangle but does not occupy its entire surface. The sclera corresponds to the white of the ground layer, the contour and pupil are black, while the eyebrow, cosmetic tail, and lower element are made in blue. The eyebrow is relatively thick at its front end and gradually narrows. The inner corner of the eye is accentuated, and the curl of the lower element is only lightly suggested.

The stratigraphic sequence of colours can be reconstructed with some precision. After the application of the yellow ground, a preparatory drawing of the eye was executed in red, likely an ochre (Fig. 106). The brown tone was then applied within the rectangular field. Infrared imaging clearly shows that the brown layer was laid over the red preparatory drawing but deliberately painted around it, leaving the lighter silhouette of the eye visible beneath; the brown does not uniformly cover the entire area, and the underlying red design remains legible. Subsequently, the blue elements were applied, and finally the black details were added. In the rosettes at bow and stern, the sequence appears to have involved the application of blue first, followed by red.

Analytical results further clarify the material composition of this more complex palette. The white associated with the ground layer yields XRF spectra characterised by strong Ca

peaks, accompanied by Fe and S, and minor Si signals, consistent with the calcium-rich ground already identified in the other boats. Also, FTIR analyses are consistent with the other boats, detecting calcium carbonate, calcium sulphate, kaolinitic minerals, and Paraloid.

The yellow pigment produces XRF spectra with prominent Ca and Fe peaks and minor Si, S and Mn signals, suggesting a relatively pure yellow ochre with limited trace element contributions. FTIR data are compatible with an iron-based earth pigment applied over the calcium-rich ground.

The brown tone used within the eye rectangle presents spectra largely comparable to the yellow, with the exception of the absence of Mn and the presence of K, Cu, and Al (Fig. 107). The combination of K and Cu is consistent with the presence of Egyptian blue, while the overall similarity to the yellow suggests that the brown may result from a mixture of yellow ochre and Egyptian blue. The presence of Al, however, complicates this interpretation. Since the red pigment shows a slight Al contribution, not present in the yellow, it is possible that a small amount of red was also incorporated into the mixture. Imaging supports this hypothesis: VIL and VIL false colour confirm the presence of Egyptian blue, and within the brown areas of the eye numerous small luminescent particles are observable, likely corresponding to dispersed grains of Egyptian blue (Fig. 108).

The red pigment yields XRF spectra with strong Ca and Fe peaks, accompanied by minor S and Si signals, consistent with the yellow ochre composition but with a more pronounced K contribution and a small Al peak. These data are compatible with a red ochre similar to those identified on the other boats.

The black pigment presents an interesting case. The spectrum acquired from the pupil of the eye does not correspond to that of the brown layer but instead matches the red spectrum, consistent with the observation that the brown was applied around the red preparatory drawing and that the black was laid directly over it. Apart from a slightly more pronounced Cu peak, possibly reflecting minor contamination from adjacent blue

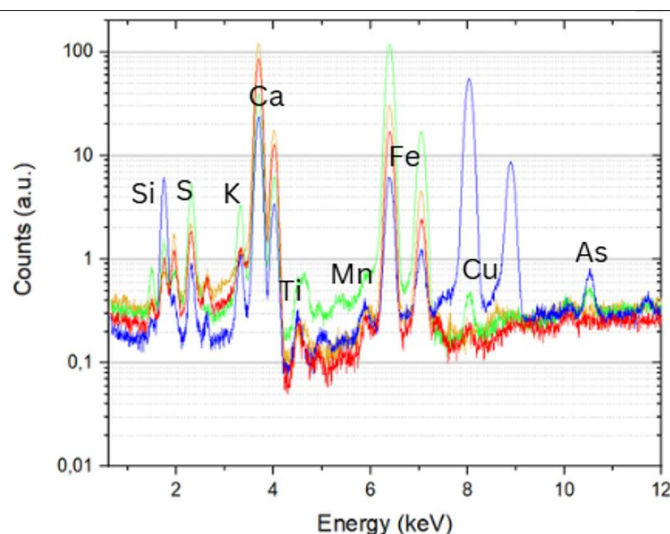


Fig. 107 - Boat 3 pigments XRF spectra: Blue (blue); Red (red); Yellow (yellow); Brown (green)



Fig. 108 - VIL image of udjat eye decoration

areas, the spectrum does not display characteristic mineral markers of an inorganic black. In the absence of diagnostic elemental peaks, a carbonaceous black is therefore hypothesised.

Infrared false colour imaging shows the characteristic violet-pink response of Egyptian blue, further corroborated by VIL and VIL false colour imaging, and from the other analytic techniques.

Under UV illumination, a diffuse bluish fluorescence is visible across the surface, suggesting the presence of a modern-applied protective or consolidant layer, and FTIR detect the presence of Paraloid. Retouched areas are also detectable.

Overall, Boat 3 maintains continuity with the previous examples in the composition of its ground layer and the use of iron-based earth pigments but introduces a more complex chromatic programme through the incorporation of Egyptian blue and mixed tones. The analytical and imaging data collectively support a stratified and carefully sequenced execution process, while also confirming the presence of modern conservation materials detected through FTIR and ultraviolet examination.

6.6. Synthesis of the results and concluding remarks

Taken together, the four boat models reveal a formal coherence, which show their relevance to the same typology, combined with significant internal differentiation, both structural and pictorial (Table 5).

All vessels are carved from single blocks retaining the pith and display recurrent wood defects, such as knots, fibre deviation, shrinkage cracks, generally compensated through paste applications. The recurring presence of radiopaque zones in proximity to knots, discussed in section 6.2.1, further reinforces the impression of shared material characteristics and possibly comparable sourcing strategies. This impression is particularly strong with regard to Boats 0 and 1. At the same time, variations in deck organisation, superstructural layout, and decorative execution reflect distinct typological functions and, potentially, differentiated workshop practices.

From a chromatic perspective, Boats 0, 1, and 2 share a closely aligned palette based on a calcium-rich ground layer and iron-based earth pigments, complemented by carbon black, while Boat 3 introduces Egyptian blue and mixed tones. Within this shared framework, subtle but meaningful differences emerge. The yellow of the hulls appears more saturated and opaque in Boat 2, and distinctly brighter in Boat 3, compared to the more diluted application observed in Boats 0 and 1. The bulwark rendered as a raised and red-painted band is present in Boats 0, 1, and 2, but absent in Boat 3. However, the method of execution differs: in Boats 0 and 1, the red band was applied directly over the ground layer, the area having been left in reserve during the yellow application, while in Boat 2, by contrast, the entire hull was first painted yellow, and the red band was subsequently superimposed. This seemingly minor variation points to a difference in procedural sequence that may reflect either individual preference or workshop convention.

The construction of the figures also presents consistent technical markers. In particular, the helmsmen, and the left arm of passengers systematically display a forked joint at the elbow for the attachment of the forearm. A recurrent solution that may represent a useful

indicator of workshop habit or technical trend. Such repeated constructive features, observable across different vessels, suggest continuity in constructive practice even where stylistic nuances vary.

On the basis of structural layout, iconographic coherence, and technical comparison, the present study supports the identification of three original sets within the corpus: one composed of Boat 0 and Boat 1, a second composed of Boat 2 and the vessel S. 8658 from the Tomb of Shemes, and Boat 3 as an unpaired model. This grouping is further complicated by the issue of figure displacement, which emerges as one of the most problematic aspects of the reconstruction.

The treatment of the headbands and bows provides a particularly revealing case. The bows of Boats 0 and 2 are carefully rendered after a previous drawing phase, while those of Boat 1 and the Shemes boat appear more approximate. A parallel distinction can be observed in the execution of the eyes: in Boats 0 and 2, the eyes were drawn prior to the application of the red flesh tone and, probably for this reason, lack eyebrows. In Boat 1 and the Shemes vessel, the eyes were executed over the red skin tone and include eyebrows. This mirrored distribution raises the possibility that sailors may have been interchanged at some point. If the figures of Boats 1 and 2 were inverted, the stylistic coherence between bows and eye execution would align more convincingly across the sets. While the alternative hypothesis, namely, the presence of two painters operating within the same workshop, each with distinct habits, cannot be excluded, the hypothesis of post-excavation inversion appears more plausible. The extensive displacement and remounting documented since the 1920s, together with the “perfectly inverted” stylistic pairing between Boats 1 and 2, strongly suggest that at least part of the 1920s and of the current configuration results from later rearrangements. Moreover, since the two rowing boats derive from different archaeological contexts, it is unlikely that their crews were interchanged in antiquity. It therefore seems reasonable to propose that the rowing boats are closer to their original configurations, and that the inversion may have occurred between the two sailing vessels before the 1920s photo. On this basis, the most coherent reconstruction, although not implemented physically, as no intervention on the Shemes boat was undertaken, would place the sailors currently associated with Boat 1 on Boat 2, and vice versa.

Despite this hypothesis, two figures documented in the 1920s photograph remain problematic. The first is the punter formerly mounted on Boat 0 and now associated with Boat 1 (B1-1). In the absence of the corresponding punter visible on Boat 1 in the historical image (B1-M1), any definitive attribution remains speculative. If the inversion hypothesis between Boats 1 and 2 is accepted, further complexity arises, as the possible counterpart on Boat 2 (B2-1) would also need to be considered. The same uncertainty applies to the erratic helmsman attributed to Boat 2 (B2-E2H), whose approximate bow execution and eyes painted over the red flesh tone with added eyebrows do not correspond to the features of the figures currently associated with that vessel.

A different conclusion may be drawn regarding the canopies. When considered in light of the historical photograph and, above all, of the coherence between the decorative band of the frontal beam and the papyriform extremities of the corresponding hull, the canopy associations appear more stable. The chromatic and ornamental correspondence between

frontal band and stern/bow decoration provides a stronger criterion of pertinence than dimensional compatibility alone.

In conclusion, the four boats testify to a shared technical culture operating under similar material constraints, yet marked by subtle procedural and stylistic divergences. The interplay between structural evidence, pictorial analysis, archival documentation, and material investigation underscores both the potential and the limits of reconstruction. What emerges is not a static set of isolated artefacts, but a dynamic workshop production shaped by scarcity of timber, technical originality, and a post-excavation history that has profoundly affected their present configuration.

Table 5 – Synoptic table, intended to summarise the main comparative results of the iconographic, technical and scientific observation on boats

ANALYTICAL FEATURE	BOAT 0 (S. 8790)	BOAT 1 (S. 8791)	BOAT 2 (S. 8792)	BOAT 3 (S. 8793)
PROPULSION	Rowing boat	Sailing boat	Sailing boat	Rowing boat
DIMENSION	28 × 83 × 17,5	29.5 × 85 × 17	19 × 84 × 17	14.5 × 62 × 12.5.
DECK COLOUR	Yellow	Yellow	Yellow	White
BULWARK	Carved, and painted with a red band on the ground layer	Carved, and painted with a red band on the ground layer	Painted with a red band on the yellow layer	Absent
ROWLOCK HOLES	Present	Absent	Absent	Present
DECK BEAM AND MAST PARTNER DECORATION	Red painted lines	Red painted lines	Red painted lines	Red painted, the mast partner design is clearly different from the other models
UDJAT EYE: BACKGROUND PANEL	White rectangular reserve	White rectangular reserve	White panel extending across the full height of the hull, framed on three sides by a black line	Brown panel extending across the full height of the hull, framed by two vertical black lines.
UDJAT EYE: GRAPHIC STYLE	Graphic treatment compatible with Boat 1	Graphic treatment compatible with Boat 0	The graphic treatment compatible with the Shemes boat S.8658	More elaborate and autonomous treatment: blue details and a red preparatory outline
PAPYRIFORM EXTREMITIES: MORPHOLOGY	Papyriform extremities	Papyriform extremities	Papyriform extremities	Trapezoidal hull termination with smaller round-section extremities

PAPYRIFORM EXTREMITIES: DECORATION	Alternating red and black bands	Alternating red and black bands. Specularly inverted in relation to Boat 0	Black-defined transverse bands alternating in light yellow, black and red	Alternating red and blue transverse bands on white ground
QUARTER- RUDDER STANCHIONS	Present and painted red	Visible in historical photograph, currently lost	Visible in historical photograph, currently lost	Not preserved
CROSSBEAM QUARTER RUDDER	Present and painted red	Present and painted red	Not preserved	Not preserved
RELATIONSHIP WITHIN THE GROUP	Forms a coherent decorative and functional counterpart to Boat 1	Forms a coherent decorative and functional counterpart to Boat 0	Form a coherent decorative and functional counterpart to Shemes boat S.8658	Decoratively and chromatically autonomous
CURRENT ARRANGEMENT	Nine figures	Two figures	Six figures and a canopy	Two figures
HISTORICAL ARRANGEMENT	Ten figures	Eight figures and a canopy	Eight figures and a canopy	No figures
ORIGINAL CREW ARRANGEMENT	Eight rowers in two parallel rows plus helmsman and a punter	A punter and other two figures at bow, three sail-handling sailors, one passenger under the canopy, and one helmsman	A punter and other two figures at bow, three sail-handling sailors, two passengers under the canopy, and one helmsman	Six rowers in two parallel rows plus helmsman and a punter
CREW ATTRIBUTION AND DISPLACEMENT	The rowers are now correctly oriented toward the stern; the punter may have been displaced and possibly mounted on Boat 1	The punter currently mounted may belong to Boat 0; the original canopy is possibly mounted on Boat2; other elements related could be: S.14813/71, S.14813/72, S.14813/48, S.14813/132, S.14813/127, S.14829/1-2	The current canopy attribution possibly belongs to Boat 2, and the original one could be S14828/16; other elements related could be: S.14813/134; S.14813/131	The two figures do not pertain to this boat
CREW EXECUTION	Figures show headbands and rear bows defined by black contour lines, eyes painted prior	Headbands and rear bows were freely executed; eyes painted after the flesh tones	Figures show headbands and rear bows defined by black contour lines, eyes painted prior to the flesh	/

	to the flesh tones		tones	
COLOURS PALETTE	Calcium-based ground layer, uncertain presence of calcium sulphate, yellow ochre, red ochre, carbon black	Calcium-based ground layer, uncertain presence of calcium sulphate, yellow ochre, red ochre, carbon black	Calcium-based ground layer, uncertain presence of calcium sulphate, yellow ochre, red ochre, carbon black	Calcium-based ground layer, uncertain presence of calcium sulphate, yellow ochre, red ochre, carbon black, Egyptian blue. The brown colour may result from a mixture of yellow, red, and blue pigments

TOPIC	INTERPRETATIVE POINT
BOAT 0-1	The rowing Boat 0 and sailing Boat 1 form the most coherent internal pair. Their compatibility is based on hull morphology, yellow surface treatment, red deck and bulwark decoration, related udjat-eye rendering, and the specular organisation of the bow/stern decorations.
BOAT 2	Boat 2 should be kept distinct from the Boat 0-1 pair. Its udjat eye is compatible with the S. 8658 Shemes comparison.
BOAT 3	Boat 3 is the most autonomous object in the group. Its white deck, absence of bulwark, different papyriform extremities, blue decorative details and incompatible current figures indicate that the present configuration cannot be treated as original.
FIGURES	Stylistic pairing of eyes and white headband bows suggests possible post-excavation interchange of sailors between Boats 1 and 2

7. Conclusion

The present research originated from a methodological concern: the need to address the persistent imbalance within the study of ancient Egyptian wooden funerary sculpture, where stylistic and iconographic approaches have long predominated over the systematic investigation of constructional and technical practices. By focusing on the material and operative dimensions of a defined group of artefacts, this study sought to contribute, albeit on a limited scale, to the gradual filling of these lacunae. The technical examination of construction processes was here considered as a primary tool for reconstructing production dynamics and for refining historical interpretation.

At the same time, the research aimed to extend and consolidate a multidisciplinary approach, integrating iconographic study, typological comparison, imaging techniques, and archaeometric analyses. Even within the relatively small corpus examined here, the convergence of these perspectives has proven essential in framing the objects not merely as isolated artistic products, but as the outcome of coordinated technical and cultural practices. The adoption of multiple analytical lenses has made it possible to observe the same phenomena from different vantage points, thereby encouraging a broader and more nuanced interpretative framework.

A central issue emerging from the investigation concerns the coherence of the funerary assemblage of Minhotep and its implications for understanding local production systems. The comparative analysis conducted both within the corpus and against other works of similar chronology and provenance demonstrates a marked degree of formal and technical consistency. The offering-bearers and boat models examined here conform closely to the artistic conventions attested at Asyut during the early 12th Dynasty. In this respect, the results corroborate earlier observations in the literature concerning the existence of a recognisable Asyut production tradition, or “school”, characterised by recurring formal solutions and a relatively stable iconographic repertoire.

The shared provenance and chronological homogeneity of the sculptures analysed have provided favourable conditions for direct comparison. The study indicates that the objects were conceived according to common typological models and that they adhere to a coherent visual grammar. Among the offering-bearers, the proportional system follows the canonical scheme already documented in earlier wooden sculpture, while the figures, both female bearers and male sailors, display consistent morphological traits: elongated and slender bodies and limbs, rounded faces with pronounced cheeks, short wigs articulated in a bowl-shaped form, and the recurrent presence of a white headband tied at the back. In the case of the offering-bearers, the addition of a long posterior hair tail further differentiates the female type without disrupting the underlying stylistic coherence.

Such recurring features, observed across different object categories within the same assemblage, suggest adherence to a shared visual and technical framework. While caution remains necessary in associating stylistic coherence with workshop identity, the convergence of typological, iconographic and technical evidence supports the hypothesis

that these artefacts were produced within a closely connected production environment, likely embedded within the local craft traditions of Asyut.

Beyond formal and iconographic coherence, the investigation of materials and construction techniques reveals an equally significant level of convergence. The sculptures examined display a striking similarity in the selection of raw materials. Macroscopic identification indicates a predominant use of fig wood, while the pictorial palette remains largely consistent across the corpus. Calcium-based preparatory layers composed of calcium carbonate and calcium sulphate, red and yellow ochres, carbon black, and, in the specific case of Boat 3, Egyptian blue, constitute the recurrent chromatic and material components.

This restricted and repeated palette suggests a degree of standardisation in material practice. At the same time, decorative variability remains substantial, indicating that standardisation did not entail rigid uniformity in visual outcomes. Rather, the data point towards a controlled range of materials within which aesthetic and compositional variation could operate.

From a constructional perspective, a recurrent tendency towards material economy becomes evident. The extensive use of wood with visible defects, including knots, fibre deviation and shrinkage cracks, indicates that the craftsmen sought to maximise the yield of available timber, even when working with pieces of limited size or irregular quality. The reuse of previously worked elements, as observed in the base associated with the Bearer C, further supports this pragmatic approach. In addition, the frequent presence of pith within structural elements suggests a preference for working with trunk sections or branches rather than carefully selected radial cuts.

Carving practices also display recurring operative strategies. The heads of the figures, facilitated by the geometry of the short wig, were often conceived from an initial block approximating a square or rectangular volume, subsequently rounded and refined. In several instances, the ground layer plays a compensatory role, not merely as a preparatory surface but as a modelling medium used to regularise volumes and mask structural discontinuities.

The dominant assembly system throughout the corpus is the use of wooden dowels. Although applied in varying configurations, dowel joints recur systematically in the attachment of limbs, superstructures and secondary elements. In some cases, the dowels are proportionally oversized in relation to the elements they secure, a feature that may reflect either precautionary reinforcement or a lack of fine calibration in the carving phase. A notable pattern emerges in the recurrent number and placement of dowels for specific components, for example, single lateral dowels at the shoulders of certain sailor figures, triple dowels anchoring canopy elements, or paired dowels securing the right arms of the offering-bearers, although exceptions prevent this observation from being elevated to a rigid rule.

Particularly significant is the consistent use of forked joint for the construction of arms bent at ninety degrees. This solution represents a mechanically sophisticated choice. The forked joint adopted for this elbow configuration provides a mechanically advantageous solution, as the two elements interlock tridimensionally rather than merely abut along a single transverse surface. This configuration increases the contact area, distributes bending stresses across multiple planes, and partially converts tensile forces into lateral compression within the fork walls. Consequently, the stability of the joint on geometric interlocking, ensuring improved resistance to mechanical stress. The recurrence of this solution across different objects may suggest a consolidated practice within the production sphere.

Similarly functional considerations appear to underlie the use of a half-lap joint for the attachment of the offering-bearers' hair tail. This choice ensures both structural stability and a plain surface suitable for carving and finishing, demonstrating attention to both mechanical performance and aesthetic continuity.

Despite these convergences, the technical evidence does not allow the identification of distinct "hands" responsible for separate groups of sculptures. Variations in execution appear more closely linked to the constraints imposed by raw material quality and structural requirements than to clearly individualised technical preferences. In contrast, certain differences in pictorial execution suggest that painting may have involved differentiated operative phases or practitioners. The absence of unequivocal markers of individual carving styles cautions against attributing the objects to separate workshops solely on the basis of technical variability.

However, the general consistency of the objects could imply shared purchasing networks or at least access to similar sources of raw materials within the local production environment. For instance, it is particularly noteworthy that all the boat models display areas of increased radiopacity, possibly resulting from gums exudation. To the best of our knowledge, this feature is not especially common and may therefore be related to specific patterns in the locating of the raw material.

While the carving and assembly techniques reveal a substantial degree of procedural coherence, the pictorial finishing displays greater internal variability. Differences in brush control, line precision and chromatic handling suggest uneven levels of technical competence. Of relevance is the widespread presence of minor executional errors, drips, pigment accumulations, imprecise contours, incomplete passages and occasional omissions. These features, recurrent across several objects, are unlikely to be purely accidental anomalies and instead point towards a relatively rapid execution process.

Although the available evidence does not allow definitive conclusions, such elements may reflect aspects of the relationship between commission and manufacture. On the one hand, the need for rapid production, potentially in response to funerary urgency, cannot be excluded. On the other hand, these traces may equally reflect an established production logic in which efficiency and speed formed part of the normal workflow, particularly for

objects that, while conceptually important, were not intended for prolonged public display. In either case, the pictorial evidence introduces an economic and organisational dimension into the interpretation of the corpus.

A closer examination of specific painted elements further supports the hypothesis of differentiated operative phases. In the boat models, the execution of the sailors' eyes and the white headbands tied at the back of the wigs reveals at least two distinct approaches.

In some instances, the painter defined the contour of the white band and bow with a preliminary black outline before filling in the surrounding black wig. In others, the white element was left as a negative reserve while the black pigment was applied freehand around it, resulting in varying degrees of precision. A comparable variation, also linked to the sequence of execution, can be observed in the rendering of the sailors' eyes. These procedural differences suggest the intervention of at least two painters employing distinct working methods.

A similar situation may be hypothesised for the offering-bearers. Variations in stylistic quality, together with differences in the use of calcium sulphate within the ground layer, indicate that possibly different individuals were involved in the finishing of these sculptures. The technical and stylistic disparities are more readily attributable to differentiated pictorial hands than to distinct carving workshops. This distinction is significant: while the carving techniques display strong structural convergence, the painting stage appears to allow greater individual variability.

The decorative patterns observed both in the boat pairs and in the offering-bearers raise further interpretative questions. Variations in basket motifs, papyriform decorations, colour inversions and secondary details could, in principle, represent workshop-specific signatures. However, an alternative explanation appears equally, if not more, plausible. Within a shared canonical framework, these objects may have been conceived as custom-made commissions, adjusted for each patron while adhering to established visual conventions. Decorative differentiation could therefore reflect degrees of personalisation, possibly correlated with economic factors, rather than rigid workshop divisions.

The question of serial production must also be addressed. Despite the evident technical standardisation and the high degree of similarity among figures and structural elements, the present study has not identified unequivocal evidence for the preparation of components in stock for later assembly. No elements display such exact correspondence as to imply batch production in advance. Nonetheless, the organisation of labour likely followed a sequential and structured workflow. For instance, in the case of the sailors, it is plausible to envisage the carving of multiple central bodies, followed by the preparation of arms, subsequent assembly, and finally the addition of secondary details. Similarly, the painting stages appear to have been conducted in successive phases, such as the application of the preparatory layer, followed by the systematic laying of red, then black, and finally secondary details, suggesting a process-based organisation rather than isolated execution.

Particularly revealing is the interface between carpentry and painting in the assembly of the boat crews. The insertion of figures into the hulls, plausibly only after the execution of their painted decoration demonstrates an interdependence between structural and decorative phases. As observed in Boat 1, the modelling and painting of the feet appear to have been completed only after the figures were secured to the deck. This indicates that the production process was not strictly linear but involved moments of overlap and adjustment.

Taken together, the evidence points towards a production system characterised by established canons and a substantial degree of technical standardisation. At the same time, variability in decorative choices and executional detail operates within this framework, providing potentially meaningful indicators for associating objects that share a common production history. Standardisation and flexibility thus coexist, reflecting a craft environment in which repetition ensured recognisability and ritual efficacy, while controlled variation allowed adaptation to individual commissions.

A further and particularly productive level of investigation concerned the reconstruction of the conservation history of the objects and of the successive transformations they underwent from the moment of deposition to their present museum configuration. Although documentation regarding their discovery is fragmentary, the integration of archival photography, structural analysis and technical observation has made it possible to advance a cautious reconstruction of their post-depositional trajectories.

The tomb of Minhotep is known to have been a multiple burial, periodically reopened over time. If it is assumed as true the predominantly association between pairs of boats and male burials, considering that the tomb contained the remains of several individuals, the presence of vessels attributable to at least three distinct sets appears broadly consistent with such a scenario. Within this framework, it may be hypothesised that during one of the periodic reopenings a boat originally belonging to the Minhotep tomb was displaced and ultimately deposited in the tomb of Shemes, where it was later discovered and interpreted as part of an intact context. While such a reconstruction remains hypothetical, it offers a coherent explanation for the anomalous distribution of certain vessels across closely related Asyut contexts.

The condition of the sculptures at the moment of excavation is insufficiently documented. Schiaparelli's descriptions refer to the models as "broken", with the exception of Bearer C, yet the precise nature of this damage is unclear. The hulls of the boats do not display significant structural fractures, suggesting that the term may have referred primarily to the displacement, detachment or loss of figures and superstructure. In the case of the offering-bearers, for what concern Bearer B was likely recovered in at least two separate portions, divided between the base and the legs. Bearer A instead may have been found detached from its base and partially damaged in the right leg area, which requested to a reattachment of originally associated base, or devoid of its original base leading to the creation of a composite arrangement with an ancient but non-corresponding base.

Archival photographs from the 1920s reveal misplacements already present at that time, including the inversion of the rowers' orientation in Boat 0 and the possible interchange of sailors between the two sailing vessels. Subsequent decades appear to have witnessed further internal displacements and inappropriate associations, as illustrated by the doubtful attribution of figures currently mounted on Boat 3. The cumulative effect of these interventions has progressively obscured the original coherence of the assemblage.

Several erratic elements potentially associated with the models have been identified. Some remain problematic. The duck-wing offerings tentatively associated with Bearers A and C resemble those visible in historical photographs. However, their cataloguing history raises doubts regarding their secure attribution, leaving open the possibility that they too may represent later composite insertions. In other cases, such as the punter currently designated B1-1, the correspondence with the historical photo appears stronger, yet uncertainty persists regarding the original vessel to which the figure belonged. The helmsman B2-E2H similarly diverges from the decorative scheme of the sailors with whom he is presently associated, reinforcing the need for caution.

Building from these uncertainties, a prudent approach could involve restoring the arrangement observable in the earliest photographic documentation, with the exception of the two figures whose identification remains unresolved. Such a solution would not claim to reconstruct the original funerary display, but would at least eliminate demonstrably later inconsistencies.

The reconstruction proposed here must be evaluated in light of significant limitations. The corpus under examination is numerically restricted, and the number of micro-invasive analyses necessarily limited. Further investigations, particularly refined wood-species identification, a more detailed study of the zones of anomalous radiopacity observed within the boat hulls, and the study of the models from Shemes tomb, would undoubtedly contribute to clarifying unresolved aspects of the production and alteration history.

The restricted scope of the present corpus also constrains the possibility of generalising the observations beyond the Minhotep assemblage. While several patterns of technical standardisation and procedural coherence have been identified, their representativeness for Asyut production as a whole, or for Middle Kingdom wooden sculpture more broadly, cannot be assumed without comparative expansion.

Future research would benefit from extending this integrated methodological framework in multiple directions. First, the systematic application of similar technical analyses to other wooden models from the Asyut necropolis would allow for more robust comparative evaluation. Second, the inclusion of other categories of wooden funerary artefacts, such as coffins, could illuminate whether the production logic observed here operated across different object types within the same local craft environment. Such expansion would help determine whether the patterns identified represent isolated phenomena or components of a broader regional production system.

Although the present study contributes an additional element to the current body of knowledge, it should be understood as part of a wider and still developing shift towards the technical study of ancient Egyptian wooden sculpture. The path forward remains extensive, with numerous directions open for further exploration.

Moreover, beyond its specific case study, the research also demonstrates the value of integrating technical examination, archival sources and scientific analysis in the reassessment of museum-held assemblages whose original contexts have been partially obscured. The issues encountered in the Minhotep corpus are not unique to the Museo Egizio but reflect a broader condition affecting many early excavated collections. When archaeological context has been compromised by displacement, reassembly or incomplete documentation, the objects risk becoming deprived of interpretative potency. An integrated approach such as the one proposed here may offer a means of restoring part of that lost contextual coherence and of reactivating the historical significance of displaced elements.

Finally, from a scientific perspective, the study has opened up promising avenues for future research, particularly with regard to tomographic investigations of wooden artefacts, especially in relation to the non-invasive identification of wood species.

Bibliography

- Abdelrahiem, Mohamed. 2020. *The Northern Soldiers-Tomb (H11.1) at Asyut*. The Asyut Project, v. 13. Harrassowitz Verlag.
- Abdrabou, Ahmed, Medhat Abdalla, Islam A. Shaheen, e Hussein M. Kamal. 2018. «Investigation of an Ancient Egyptian Polychrome Wooden Statuette by Imaging and Spectroscopy». *International Journal of Conservation Science* 9 (1): 39–54.
- Amenta, Alessia. 2014. «The Vatican Coffin Project». In *Thebes in the First Millennium BC*, di Elena Pischikova, Julia Budka, e Kenneth Griffin. Cambridge scholars.
- Arbuckle MacLeod, Caroline. 2023. «The Significance of Coffin Construction Practices in the Old and Middle Kingdoms». *Claroscuro. Revista del Centro de Estudios sobre Diversidad Cultural*, fasc. 22 (dicembre): 1–35. <https://doi.org/10.35305/cl.vi22.136>.
- Arbuckle MacLeod, Caroline Joan. 2018. «A Social History of Coffins and Carpenters in Ancient Egypt». Ph.D. thesis, University of California UCLA.
- Asensi Amorós, María Victoria. 2003. «L'étude du bois et de son commerce en Égypte : lacunes des connaissances actuelles et perspectives pour l'analyse xylologique». In *Food, fuel and fields : progress in African archaeobotany*, a cura di Stefanie Kahlheber, Katharina Neumann, e Ann Butler. Heinrich-Barth-Institut. <https://doi.org/10.18716/HBI/AP15>.
- Auenmüller, Johannes. 2025. «A “New” Sekhmet Statue in Turin: Fragment Provv. 3864». *Rivista del Museo Egizio* 9 (maggio). <https://doi.org/10.29353/rime..6967>.
- Baines, John. 1985. *Fecundity Figures: Egyptian Personification and the Iconology of a Genre*. Modern Egyptology. Aris and Phillips Bolchazy-Carducci.
- Baines, John. 2009. *Visual and Written Culture in Ancient Egypt*. Oxford University Press.
- Barbotin, Christophe, a c. di. 2007. *Les statues égyptiennes du nouvel empire. 1 2: Statues royales et divines Planches*. Éditions du Musée du Louvre.
- Barbotin, Christophe, a c. di. 2024. *Les statues égyptiennes du nouvel empire. 2 2: Statues privées Planches*. Éditions Khéops.
- Barker, Georgia. 2022. *Preparing for Eternity: Funerary Models and Wall Scenes from the Egyptian Old and Middle Kingdoms*. BAR 3070. BAR Publishing.
- Barker, Georgia. 2023. «Developments in Serving Sculptures and Their Change in Location from the Serdab to the Burial Chamber». *Claroscuro. Revista Del Centro de Estudios Sobre Diversidad Cultural*, fasc. 22 (dicembre): 1–33. <https://doi.org/10.35305/cl.vi22.134>.
- Bárta, Miroslav. 1998. «Serdab and Statue Placement in the Private Tombs down to the Fourth Dynasty». *Mitteilungen Des Deutschen Archäologischen Instituts, Abteilung Kairo* 54: 65–75.
- Beck, Tina. 2023. *Taking the Archaeological Record Seriously: New Thoughts Concerning the*

- Statue Arrangement in the Burial of Khnumnakht and Nakhtankh at Deir Rifeh*. dicembre.
<https://doi.org/10.18452/28020>.
- Beck, Tina. 2024. «Made of Many Pieces, Protected by Deities and Fallen Apart: Studying Wooden Statue Fragments from Ancient Egypt». In *Excavating the Extra-Ordinary 2*. Propylaeum. <https://doi.org/10.11588/PROPYLAEUM.1382.C19770>.
- Brancaccio, R., M. Bettuzzi, F. Casali, et al. 2011. «Real-Time Reconstruction for 3-D CT Applied to Large Objects of Cultural Heritage». *IEEE Transactions on Nuclear Science* 58 (4): 1864–71. <https://doi.org/10.1109/TNS.2011.2158850>.
- Breasted, James Henry Jr. 1948. *Egyptian Servant Statues*. Bollingen Series, XIII. Pantheon Books; Bollingen Foundation.
- Bresciani, Edda, a c. di. 2007. *Letteratura e poesia dell'antico Egitto: cultura e società attraverso i testi*. ET biblioteca 36. Einaudi.
- Chassinat, Émile Gaston, e Charles Palanque. 1911. *Une campagne de fouilles dans la nécropole d'Assiout*. Mémoires publiés par les membres de l'Institut français d'archéologie orientale du Caire (MIFAO) 24. Institut Français d'Archéologie Orientale (IFAO).
- Connor, Simon. 2017. «Le torse de Ramsès, le pied de Mérenptah et le nez d'Amenhotep : observations sur quelques statues royales des collections turinoises (Cat. 1381, 1382 et 3148)». *Rivista del Museo Egizio* 1 (dicembre). <https://doi.org/10.29353/rime.2017.507>.
- Connor, Simon. 2018. «Sculpture Workshops: Who, Where and for Whom?» In *The Arts of Making in Ancient Egypt: Voices, Images, and Objects of Material Producers 2000–1550 BC*, a cura di Gianluca Miniaci, Juan Carlos Moreno García, Stephen Quirke, e Andréas Stauder. Sidestone Press.
- Davies, Vivian W. 1995. «Ancient Egyptian Timber Imports: An Analysis of Wooden Coffins in the British Museum». In *Egypt, the Aegean and the Levant: Interconnections in the Second Millennium BC*, a cura di W. V. Davies e Louise Schofield. British Museum Press.
- Davies, W. V., a c. di. 2001. *Colour and Painting in Ancient Egypt*. British Museum Press.
- De Marco, Anna Giulia. 2021. «La statuaria lignea nell'antico Egitto: considerazioni a partire da una statua inedita». *Egitto e Vicino Oriente* 43: 53–61.
<https://doi.org/10.12871/97888333947496>.
- Deglin, Flavie. 2012. «Wood Exploitation in Ancient Egypt: Where, Who and How?» In *Current Research in Egyptology 2011*, a cura di Heba Abd El Gawad. Current Research in Egyptology Symposium. Oxbow Books.
- Del Vesco, Paolo. 2017. «Le tombe di Assiut». In *Missione Egitto, 1903-1920: l'avventura archeologica M.A.I. raccontata*, a cura di Beppe Moiso e Paolo Del Vesco, con un contributo di Museo egizio. Franco Cosimo Panini Editore.
- Di Biase-Dyson, Camilla. 2023. «Building Ideas out of Wood. What Ancient Egyptian Funerary 'Models' Tell Us about Thought and Communication». *Cambridge Archaeological*

Journal 33 (3): 413–29. <https://doi.org/10.1017/S0959774322000385>.

- Donadoni Roveri, Anna Maria. 1990a. «Il Museo Egizio di Torino». In *L'Egitto dal mito all'egittologia*, a cura di Sergio Donadoni, Silvio Curto, e Anna Maria Donadoni Roveri. Fabbri Editori, Istituto Bancario San Paolo.
- Donadoni Roveri, Anna Maria. 1990b. «Tombs and Funerary Equipment». In *Beyond the Pyramids: Egyptian Regional Art from the Museo Egizio, Turin*, a cura di Gay Robins. Trinity University Press.
- Donadoni, Sergio. 1970. *Testi religiosi egizi*. Classici delle religioni 1. UTET.
- Donadoni, Sergio. 1989. «L'immagine e la forma: l'esperienza della scultura». In *Civiltà degli egizi. Le arti della celebrazione*, di Anna Maria Donadoni Roveri. Civiltà degli Egizi 3. Istituto Bancario San Paolo di Torino – Electa Spa.
- El Sherbiny, Hend Ali Ahmed. 2015. «Studies in Dendro-Egyptology: The Laboratory of Tree-Ring Research Egyptian Wooden Collection». Ph.D. thesis, University of Arizona.
- Enrico Ferraris. 2022. «Rappresentare la ricerca: metodi e strategie di comunicazione visiva in ambito museale». In *DIALOGHI / DIALOGUES • visioni e visualità / visions and visibility*. FrancoAngeli srl. <https://doi.org/10.3280/oa-832-c109>.
- Es Sebar, Leila, Luca Lombardo, Paola Buscaglia, et al. 2023. «3D Multispectral Imaging for Cultural Heritage Preservation: The Case Study of a Wooden Sculpture of the Museo Egizio Di Torino». *Heritage* 6 (3): 2783–95. <https://doi.org/10.3390/heritage6030148>.
- Eschenbrenner Diemer, Gersande. 2025. «Ebony or not Ebony? Use and Identification of Black Woods in Ancient Egypt. Overview and Case Study from the Western Wadis Archaeological Mission, Luxor Region, Egypt». *Interdisciplinaria Archaeologica - Natural Sciences in Archaeology* XVI (2): 105–20. <https://doi.org/10.24916/iansa.2025.2.1>.
- Eschenbrenner-Diemer, Gersande. 2010. «Les “modèles” funéraires du musée d’Ethnographie de Neuchâtel». *Bulletin de l’Institut Français d’Archéologie Orientale* 110: 47–72.
- Eschenbrenner-Diemer, Gersande. 2013. «Modèles égyptiens en bois. Matériaux, fabrication, diffusion, de la fin de l’Ancien Empire à la fin du Moyen Empire (circ. 2350–1630 av. J.-C.)». Ph.D. thesis.
- Eschenbrenner-Diemer, Gersande. 2017. «From the Workshop to the Grave: The Case of Wooden Funerary Models». In *Company of Images: Modelling the Imaginary World of Middle Kingdom Egypt (2000-1500 BC)*, a cura di Gianluca Miniaci, Marilina Bettrò, e Stephen Quirke. Orientalia Lovaniensia Analecta 262. Peeters.
- Eschenbrenner-Diemer, Gersande. 2018. «The Petrie Museum’s Collection of Funerary Wooden Models: Investigating Chronology and Provenance». *Archaeology International* 21 (1): 101–8. <https://doi.org/10.5334/ai-378>.
- Eschenbrenner-Diemer, Gersande. 2021. «A Wood Workshop at Meir at the Beginning of

- the Middle Kingdom: The Case of the Wooden Models». In *Middle Kingdom Palace Culture and Its Echoes in the Provinces*, a cura di Alejandro Jiménez-Serrano e Antonio J. Morales. Harvard Egyptological Studies 12. Brill. https://doi.org/10.1163/9789004442825_007.
- Eschenbrenner-Diemer, Gersande. 2023. «Le projet Medjehu: redessiner l’histoire économique et sociale de l’artisanat du bois au fil du Nil». *Bulletin de la Société Française d’Égyptologie* 208: 45–60.
- Eschenbrenner-Diemer, Gersande. 2024. «(Re)connecting artefacts and thinking in the afterlife: the case of wooden funerary models». In *Variability in the Earlier Egyptian Mortuary Texts*, di Carlos Gracia Zamacona. BRILL. <https://doi.org/10.1163/9789004677982>.
- Fiore Marocchetti, Elisa. 2019. *Mummie Egizie di Torino*. Studi del Museo Egizio 2. Franco Cosimo Panini Editore.
- Fiore Marocchetti, Elisa, e Kristine Doneaux. 2008. «La scultura in legno al Museo Egizio di Torino. Problemi di conservazione e restauro». *Materiali e strutture. Problemi di conservazione sulla scultura* Anno VI (11–12): 9–31.
- Freed, Rita E. 1996. «Stela Workshops of Early Dynasty 12». In *Studies in Honor of William Kelly Simpson*, a cura di Peter Der Manuelian, vol. 1. Museum of Fine Arts.
- Freed, Rita E. 2006. «Rethinking the Rules for Old Kingdom Sculpture. Observations on Poses and Attributes of Limestone Statuary from Giza». In *The Old Kingdom Art and Archaeology. Proceedings of the Conference Held in Prague, May 31–June 4, 2004*, a cura di Miroslav Bárta. Institute of Egyptology, Charles University.
- Gale, Rowena, Peter Gasson, Nigel Hepper, e Geoffrey Killen. 2000. «Wood». In *Ancient Egyptian Materials and Technology*, a cura di Paul T. Nicholson e Ian Shaw. Cambridge University Press.
- Glanville, Stephen R. K., e Raymond O. Faulkner. 1972. *Wooden Model Boats*. Catalogue of Egyptian Antiquities in the British Museum, II. Trustees of the British Museum.
- Grajetzki, Wolfram. 2017. «Places of coffin production in the early and late middle kingdom». *Egitto e Vicino Oriente* 39: 25–44. <https://doi.org/10.12871/97888674174763>.
- Grajetzki, Wolfram. 2022. «Coffins of the Middle Kingdom. Their Origin and Development». In *Death on the Nile: Uncovering the Afterlife of Ancient Egypt*, a cura di Christina Riggs. The Metropolitan Museum of Art.
- Griffith, Francis Llewellyn. 1889. *The Inscriptions of Siût and Dêr Rîfeh*. Trübner & Company.
- Hartwig, Melinda K. 2014. «Sculpture». In *A Companion to Ancient Egyptian Art*, a cura di Melinda K. Hartwig. Blackwell Companions to the Ancient World. Wiley-Blackwell (John Wiley & Sons).
- Harvey, Julia. 1991. «A Late Middle Kingdom Wooden Statue from Assiut in the Walters Art Gallery». *The Journal of the Walters Art Gallery* 49/50: 1–6.

- Harvey, Julia. 2001. *Wooden Statues of the Old Kingdom. A Typological Study*. Egyptological Memoirs 2. Brill.
- Harvey, Julia. 2006. «Continuity or Collapse: Wooden Statues from the End of the Old Kingdom and the First Intermediate Period». In *The Old Kingdom Art and Archaeology: Proceedings of the Conference Held in Prague, May 31–June 4, 2004*, a cura di Miroslav Bárta. Institute of Egyptology, Faculty of Arts, Charles University.
- Hays, Harold M. 2011. «The Death of the Democratisation of the Afterlife, In: Old Kingdom: New Perspectives. Egyptian Art and Archaeology 2750–2150 BC». In *Old Kingdom, New Perspectives: Egyptian Art and Archaeology 2750-2150 BC*, di Nigel Strudwick e Helen M. Strudwick. Oxbow books.
- Hogarth, David George. 1910. *Accidents of an Antiquary's Life*. Macmillan and Co.
- Ikram, Salima. 2014. «Interpreting Egyptian Material Culture». In *A Companion to Ancient Egyptian Art*, a cura di Melinda K. Hartwig. Blackwell Companions to the Ancient World. Wiley-Blackwell (John Wiley & Sons).
- Ilin-Tomich, Alessandro. 2018. «Centralized and Local Production, Adaptation, and Imitation: Twelfth Dynasty Offering Tables». In *The Arts of Making in Ancient Egypt: Voices, Images, and Objects of Material Producers 2000–1550 BC*, a cura di Gianluca Miniaci, Juan Carlos Moreno García, Stephen Quirke, e Andréas Stauder. Sidestone Press.
- Joevenller, Sheng, Johannes A. J. Huber, Henrik Svennerstam, Fredrik Nysjö, e Olov Karlsson. 2025. «X-Ray Computed Tomography-Based Qualitative Analysis of Internal Resinwood in Scots Pine». *Wood Material Science & Engineering*, luglio 30, 1–12. <https://doi.org/10.1080/17480272.2025.2536725>.
- Jollois, Jean-Baptiste-Prosper, e Édouard de Villiers du Terrage. 1822. «Description de Syout, et des Antiquités qui paraissent avoir appartenu à l'ancienne ville de Lycopolis». In *Antiquités, IV. Description de l'Égypte, ou Recueil des observations et des recherches qui ont été faites en Égypte pendant l'expédition de l'armée française*. Panckoucke.
- Jones, Dilwyn. 1990. *Model Boats from the Tomb of Tut'ankhamūn*. Tut'ankhamūn's Tomb Series 9. Griffith institute.
- Kahl, Jochem, a c. di. 2007. *Ancient Asyut: The First Synthesis after 300 Years of Research*. The Asyut Project 1. Harrassowitz.
- Kahl, Jochem. 2016. *Ornamente in Bewegung: die Deckendekoration der Großen Querhalle im Grab von Djefai-Hapi I. in Assiut*. The Asyut project, Volume 6. Harrassowitz Verlag.
- Kahl, Jochem. 2019. *Die Statue Assiut S10/16: ein Regionalstil und seine Bewertung*. The Asyut project, Volume 11. Harrassowitz Verlag.
- Kahl, Jochem, e Andrea Kilian. 2022. *Asyut: The Capital That Never Was*. The Asyut Project 18. Harrassowitz.
- Kahl, Jochem, e Mohamed Osman. 2022. «The Desert Route of Darb El-Arba'in at Asyut».

- In *Asyut: The Capital That Never Was*, di Jochem Kahl e Andrea Kilian. The Asyut Project 18. Harrassowitz.
- Kahl, Jochem, Alice Maria Sbriglio, Paolo Del Vesco, e Marcella Trapani, a c. di. 2019. *Asyut: The Excavations of the Italian Archaeological Mission 1906-1913*. Studio Del Museo Egizio 1. Museo egizio Franco Cosimo Panini.
- Kilian, Andrea. 2019. *Untersuchungen zur Keramik der Ersten Zwischenzeit und des frühen Mittleren Reichs aus Assiut/Mittelägypten*. The Asyut Project, volume 12. Harrassowitz Verlag.
- Killen, Geoffrey. 1994. *Egyptian Woodworking and Furniture*. Shire Egyptology 21. Shire Publications.
- Laboury, D. 1998. *La statuaire de Thoutmosis III: essai d'interprétation d'un portrait royal dans son contexte historique*. Aegyptiaca leodiensia: Travaux. C.I.P.L.
<https://books.google.it/books?id=EQtpQgAACAAJ>.
- Leospo, Enrichetta. 1988. «Gebelein e Assiut tra Primo Periodo Intermedio e Medio Regno». In *Civiltà degli Egizi: Le credenze religiose*, a cura di Anna Maria Donadoni Roveri. Civiltà degli Egizi 2. Istituto Bancario San Paolo di Torino – Electa Spa.
- Leospo, Enrichetta. 1989a. «Materiali lignei». In *Dal museo al museo. Passato e futuro del Museo Egizio di Torino*, a cura di Anna Maria Donadoni Roveri. Archivi di archeologia 239. Umberto Allemandi & C.
- Leospo, Enrichetta. 1989b. «Riti propiziatori, aspetti di vita quotidiana, attività lavorative e ricreative nelle pitture lignee e nelle decorazioni parietali». In *Civiltà degli egizi. Le arti della celebrazione*, a cura di Anna Maria Donadoni Roveri. Civiltà degli Egizi 3. Istituto Bancario San Paolo di Torino – Electa Spa.
- Leospo, Enrichetta. 1993. «Assiut». In *Beyond the Pyramid: Egyptian Women and the Afterlife*, a cura di Gay Robins. Trinity University Press.
- Leospo, Enrichetta, a c. di. 2001. *Arte del legno*. Quaderni del Museo Egizio. Electa.
- Lorand, David. 2012. «The 'Four Schools of Art' of Senwosret I. Is It Time for a Revision?» In *Art and Society. Ancient and Modern Contexts of Egyptian Art. Proceedings of the International Conference Held at the Museum of Fine Arts, Budapest, 13 - 15 May 2010*, a cura di Katalin Anna Kóthay. Museum of Fine Arts.
- Lucas, Alfred, e J. R. Harris. 1926. *Ancient Egyptian Materials and Industries*. Edward Arnold & Co.
- Lucas, Gavin. 2001. *Critical Approaches to Fieldwork: Contemporary and Historical Archaeological Practice*. Con un contributo di American Council of Learned Societies. Routledge.
- Lucas, Paul. 1719. *Troisième Voyage du Sieur Paul Lucas fait en M. DCCXIV, & C. par ordre de Louis XIV. Dans la Turquie, l'Asie, la Sourie, la Palestine, la Haute et la Basse Egypte, & C.* Vol.

2. Robert Machuel le jeune.

- Manfreda, Nicole. 2019. «Problematiche conservative di un'opera con doppia policromia: una scultura lignea di Nuovo Regno proveniente dal Museo Egizio di Torino». Master degree, Università degli Studi di Torino.
- Manfreda, Nicole, Paola Buscaglia, Paolo Gallo, et al. 2021. «An Ancient Egyptian Multilayered Polychrome Wooden Sculpture Belonging to the Museo Egizio of Torino: Characterization of Painting Materials and Design of Cleaning Processes by Means of Highly Retentive Hydrogels». *Coatings* 11 (11): 1335.
<https://doi.org/10.3390/coatings11111335>.
- Mangiapane, Gianluigi, e Rosa Boano. 2024. «La Collezione Antropologica Egizia Dell'Ateneo Torinese: Una Revisione Bibliografica». *Rivista Di Storia Dell'Università Di Torino* XIII: 129–47.
- Marco, Anna Giulia De, Gersande Eschenbrenner-Diemer, e Paolo Marini. 2019. «Woodcraft in Deir El-Medina: From the Manufactured Object to the Workshop». *Proceedings of the Twelfth International Congress of Egyptologists (ICE XII)* (Leuven – Paris – Bristol, CT), *Orientalia Lovaniensia Analecta*, vol. 278: 462–92.
- Marro, Giovanni. 1913. «Osservazioni morfologiche ed osteometriche sopra lo scheletro degli Egiziani antichi (Necropoli di Assiut, 2500–3000 anni a.C.)». *Rivista di Antropologia. Atti della Società Romana di Antropologia* 18: 3–48.
- Merriman, Ann Marie. 2011. *Egyptian Watercraft Models from the Predynastic to Third Intermediate Periods*. BAR International Series 2263. British Archaeological Reports.
- Miniaci, Gianluca, Juan Carlos Moreno García, Stephen Quirke, e Andréas Stauder, a c. di. 2018. *The Arts of Making in Ancient Egypt: Voices, Images, and Objects of Material Producers 2000–1550 BC*. Sidestone Press.
- Moiso, Beppe. 2022. *La storia del Museo Egizio*. Con un contributo di Museo Egizio. I Libri del Museo Egizio. Franco Cosimo Panini Editore S.p.A.
- Moiso, Beppe, e Tommaso Montonati. 2021. «L'Archivio Fotografico Del Museo Egizio Di Torino». *Rivista Del Museo Egizio* 5 (dicembre): 87–108.
<https://doi.org/10.29353/rime.2021.3897>.
- Moreno García, Juan Carlos. 2017. «Trade and Power in Ancient Egypt: Middle Egypt in the Late Third/Early Second Millennium BC». *Journal of Archaeological Research* 25 (2): 87–132.
- Nervo, Marco. 2013. *Il progetto neu-ART: studi e applicazioni. Neutron and X-ray tomography and imaging for cultural heritage*. Editris.
- Newman, Richard, e Margaret Serpico. 2000. «Adhesives and Binders». In *Ancient Egyptian Materials and Technology*, a cura di Ian Shaw e Paul T. Nicholson. Cambridge University Press.

- Nicholson, Paul T., e Ian Shaw. 2000. *Ancient Egyptian Materials and Technology*. Cambridge university press.
- Nyord, Rune. 2017. «An Image of the Owner as He Was on Earth'. Representation and Ontology in Middle Kingdom Funerary Images». In *Company of Images: Modelling the Imaginary World of Middle Kingdom Egypt (2000-1500 BC)*, a cura di Gianluca Miniaci, Marilina Betrò, e Stephen Quirke. *Orientalia Lovaniensia Analecta* 262. Peeters.
- Nyord, Rune. 2020. *Seeing Perfection: Ancient Egyptian Images beyond Representation*. 1^a ed. Cambridge University Press. <https://doi.org/10.1017/9781108881494>.
- Pagès-Camagna, S., e S. Colinart. 2003. «The Egyptian Green Pigment: Its Manufacturing Process and Link to Egyptian Blue». *Archaeometry* 45 (4): 637–58. <https://doi.org/10.1046/j.1475-4754.2003.00134.x>.
- Poldi, Gianluca, e Giovanni Carlo Federico Villa, a c. di. 2006. *Dalla conservazione alla storia dell'arte: riflettografia e analisi non invasive per lo studio dei dipinti*. Strumenti 3. Edizioni della Normale.
- Quirke, Stephen. 2009. «The Residence in Relations between Places of Knowledge, Production and Power: Middle Kingdom Evidence». In *Egyptian Royal Residences: 4th Symposium on Egyptian Royal Ideology, London, June 1st–5th, 2004*, a cura di Rolf Gundlach e John H. Taylor, 4.1. Harrassowitz.
- Rao, K. K. e Ramayya, N. 1984. «Structure and distribution of calcium oxalate crystals in the stem wood of *Ficus L.*, in relation to taxonomy». *Indian Journal of Forestry* (Dehradun, India) 7 (1): 25–30.
- Regulski, Ilona, e Maria Golia. 2018. *Asyut: Guardian City*. The British Museum.
- Reisner, George Andrew. 1913. *Models of Ships and Boats*. Catalogue Général Des Antiquités Égyptiennes Du Musée Du Caire 68. Imprimerie de l'Institut français d'archéologie orientale.
- Robins, Gay. 1993. *Canon and Proportion in Ancient Egyptian Art*. The British Museum Press.
- Robins, Gay. 2001. *Egyptian Statues*. Shire Egyptology 26. Shire Publications.
- Rondano, Vera. 2021. «The Economy of Human Resilience: Exploring Economic Growth During Periods of Political Fragmentation in Ancient Egypt». Ph.D. thesis, University of California UCLA.
- Roth, Ann Macy. 2002. «The Meaning of Menial Labor: "Servant Statues" in Old Kingdom Serdabs». *Journal of the American Research Center in Egypt* 39: 103–21. <https://doi.org/10.2307/40001151>.
- Roth, Ann Macy, e Catharine H. Roehrig. 1989. «The Bersha Procession: A New Reconstruction». *Journal of the Museum of Fine Arts, Boston* 1: 31–40.
- Ryan, Donald P. 1995. «David George Hogarth at Asyut, Egypt, 1906-1907. The History of a "Lost" Excavation». *Bulletin of the History of Archaeology* 5 (2).

<https://doi.org/10.5334/bha.05202>.

- Rzeuska, Teodozja. 2017. *Chronological Overview of Pottery from Asyut: A Contribution to the History of Gebel Asyut al-Gharbi*. The Asyut Project, Volume 7. Harrassowitz.
- Saleh, Mohamed, e Houring Sourouzian. 1987. *The Egyptian Museum, Cairo: Official Catalogue*. Organisation of Egyptian Antiquities; Verlag Philipp von Zabern.
- Scheel, Bernd. 1989. *Egyptian Metalworking and Tools*. 1. publ. Shire Egyptology 13. Shire Publ.
- Schneider, Hans D. 1977. *Shabtis. An Introduction to the History of Ancient Egyptian Funerary Statuettes, with a Catalogue of the Collection of Shabtis in the National Museum of Antiquities at Leiden*. Vol. 1. E. J. Brill.
- Schulz, Regine, a c. di. 1999. *Egitto: la terra dei faraoni*. Könnemann.
- Seyr, Philipp, e Medhat Medhat Abd El Rahman. 2021. «A Rediscovered Wooden Statue of the Overseer of the Two Granaries Ihy – Cairo, Egyptian Museum, JE 100373: An Archaeological and Conservation Study». In *Prague Egyptological Studies*. Prague Egyptological Studies 26. Czech Institute of Egyptology, Faculty of Arts, Charles University.
- Smith, Mark. 2017. *Following Osiris: Perspectives on the Osirian Afterlife from Four Millennia*. 1st ed. Oxford University Press.
- Smith, William. S. 1957. «A Painting in the Assiut Tomb of Hepzefa». *Mitteilungen Des Deutschen Archäologischen Instituts, Abteilung Kairo* 15: 221–24.
- Smith, William Stevenson. 1978. *A History of Egyptian Sculpture and Painting in the Old Kingdom*. 1. publ., Reissued. Hacker Art Books.
- Spencer, A. J. 1984. *Death in Ancient Egypt*. Reprinted. Penguin Books.
- Stauder, Andréas. 2018. «Staging Restricted Knowledge: The Sculptor Irtysen's Self-Presentation (ca. 2000 BC)». In *The Arts of Making in Ancient Egypt: Voices, Images, and Objects of Material Producers 2000–1550 BC*, a cura di Gianluca Miniaci, Juan Carlos Moreno García, Stephen Quirke, e Andréas Stauder. Sidestone Press.
- Stevenson, Alice. 2019. *Scattered Finds: Archaeology, Egyptology and Museums*. UCL Press.
- Tooley, Angela Mary Johanne. 1989. «Middle Kingdom Burial Customs. A Study of Wooden Models and Related Material». Ph.D. thesis, University of Liverpool.
- Tooley, Angela Mary Johanne. 1995. *Egyptian Models and Scenes*. Shire Egyptology 22. Shire Publ.
- Tooley, Angela Mary Johanne. 2005. «Models». In *The Oxford Encyclopedia of Ancient Egypt*, a cura di Donald B. Redford. Oxford Univ. Press.
- Urzi, Elena. 2022. «"You Cannot Judge a Book by Its Cover": Considerations on Some Plants in the Pharaonic Medical Literature». In *Aegyptus et Pannonia VIII: Plants for Health*

from Ancient Egypt to Present Day. HEFS–AEC.

Vandier, Jacques. 1958. *Manuel d'archéologie égyptienne. Les grandes époques: La statuaire*. Vol. 3. Picard.

Vigorelli, Luisa, Alessandro Lo Giudice, Tiziana Cavaleri, et al. 2020. «Upgrade of the X-Ray Imaging Set-up at CCR “La Venaria Reale”: The Case Study of an Egyptian Wooden Statuette». *2020 IMEKO TC-4 International Conference on Metrology for Archaeology and Cultural Heritage*, 623–38.

Widmaier, Kai. 2017. *Bilderwelten: Ägyptische Bilder und ägyptologische Kunst: Vorarbeiten für eine bildwissenschaftliche Ägyptologie*. BRILL. <https://doi.org/10.1163/9789004347748>.

Wildung, Dieter. 1990. «Bilanz eines Defizits: Problemstellungen und Methoden in der ägyptologischen Kunstwissenschaft». In *Studien zur ägyptischen Kunstgeschichte*, di Marianne Eaton-Krauss e Erhart Graefe. Hildesheimer ägyptologische Beiträge 29. Gerstenberg.

Wilkinson, Richard H. 2003. *The Complete Gods and Goddesses of Ancient Egypt*. 1. publ. Thames & Hudson.

Winlock, Herbert E. 1955. *Models of Daily Life in Ancient Egypt: From the Tomb of Meket-Re at Thebes*. Publications of the Metropolitan Museum of Art Egyptian Expedition 18. Harvard University Press.

Wood, Wendy. 1977. «Early Wooden Tomb Sculpture in Ancient Egypt». Ph.D. thesis, Case Western Reserve University.

Zitman, Marcel. 2010. *The Necropolis of Assiut: A Case Study of Local Egyptian Funerary Culture from the Old Kingdom to the End of the Middle Kingdom*. Orientalia Lovaniensia Analecta 180. Peteers Departement Oosterse Studies.

Zöller-Engelhardt, Monika. 2016. «Wooden Models, Tools and Weapons». In *Asyut, Tomb III, Objects*, di Jochem Kahl. The Asyut project, volume 3. Harrassowitz Verlag.

Zöller-Engelhardt, Monika. 2022. «Correlations of Wooden Model Equipment and Wall Decorations in Asyut». In *Asyut: The Capital That Never Was*, di Jochem Kahl e Andrea Kilian, 155–198 vols. The Asyut Project 18. Harrassowitz.

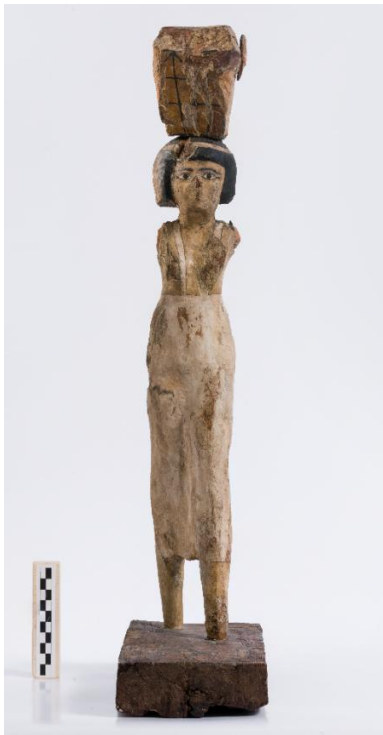
Zöller-Engelhardt, Monika. 2023. «Aesthetics of anthropomorphous funerary wooden models: Case studies from Asyut». In *Schöne Denkmäler sind entstanden*. Propylaeum. <https://doi.org/10.11588/PROPYLAEUM.1085.C16625>.

APPENDIX A – Photographies

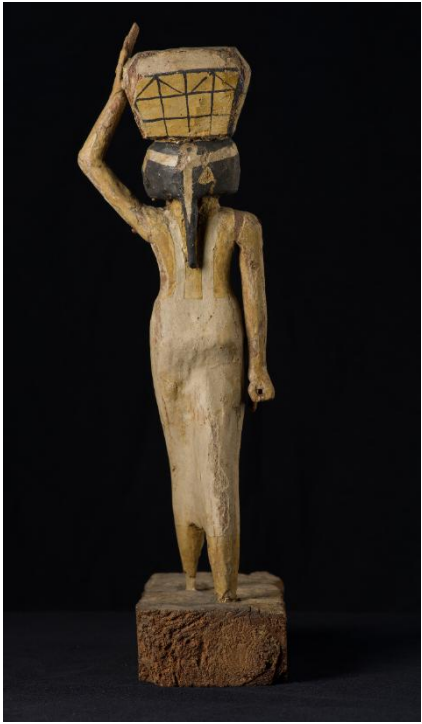
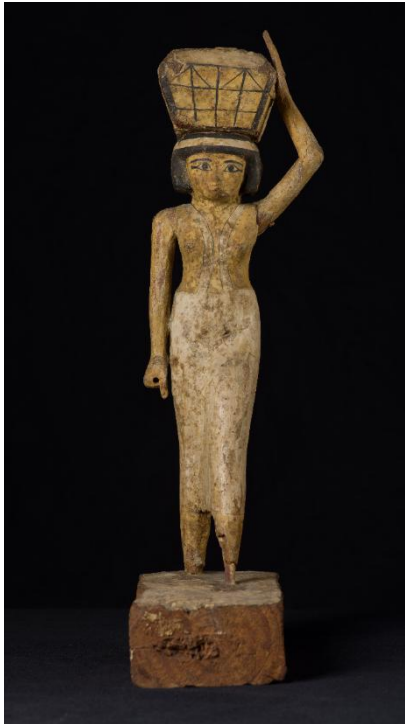


Wooden artefacts found in Minhotep Tomb, in their first setup in Museo Egizio. From above and from the left: Unknown; S.8794; S.8795; S.8796; S.8789; S.8793; S.8790; S.8792; S.8791; Not pertinent; S.8788; S.8786; S.8787. Firenze, Raccolte Museali Fratelli Alinari (RMFA)

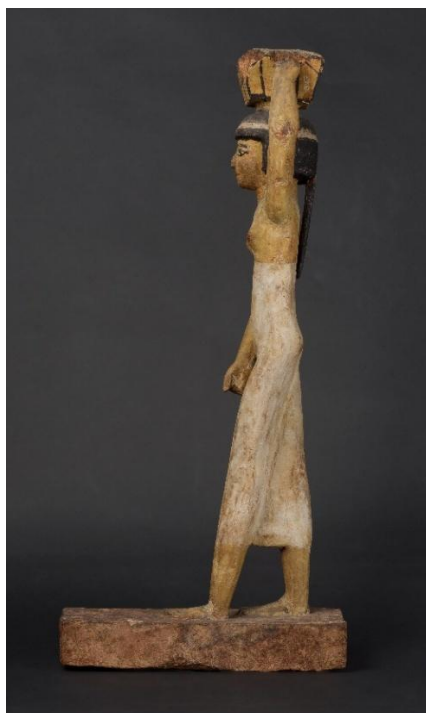
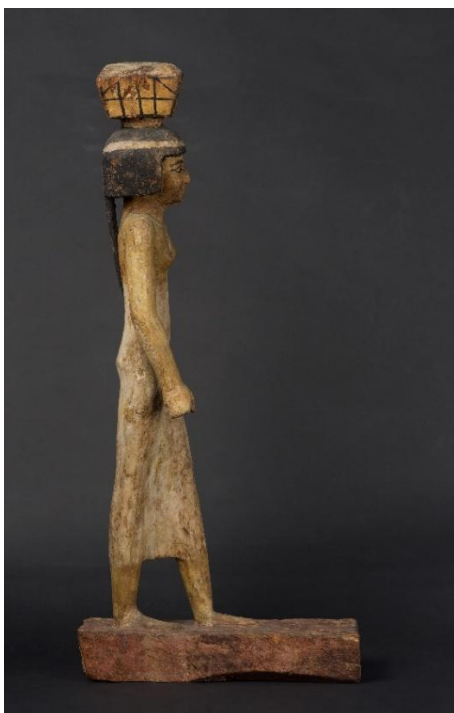
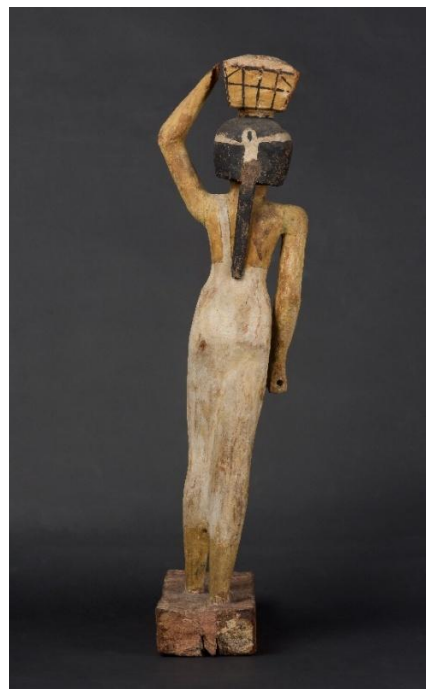
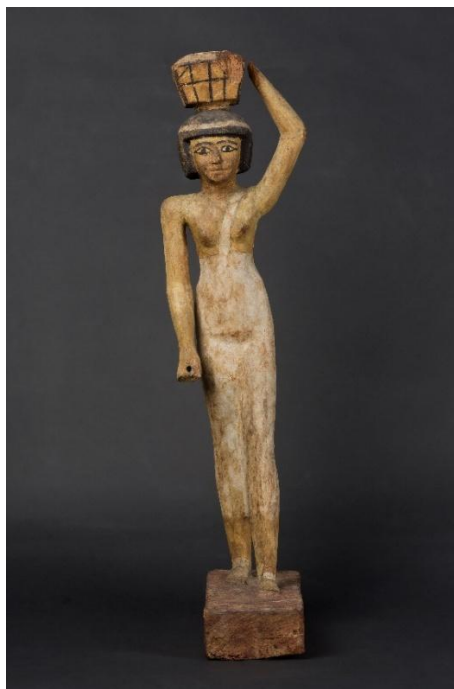
Bearer A



Bearer B

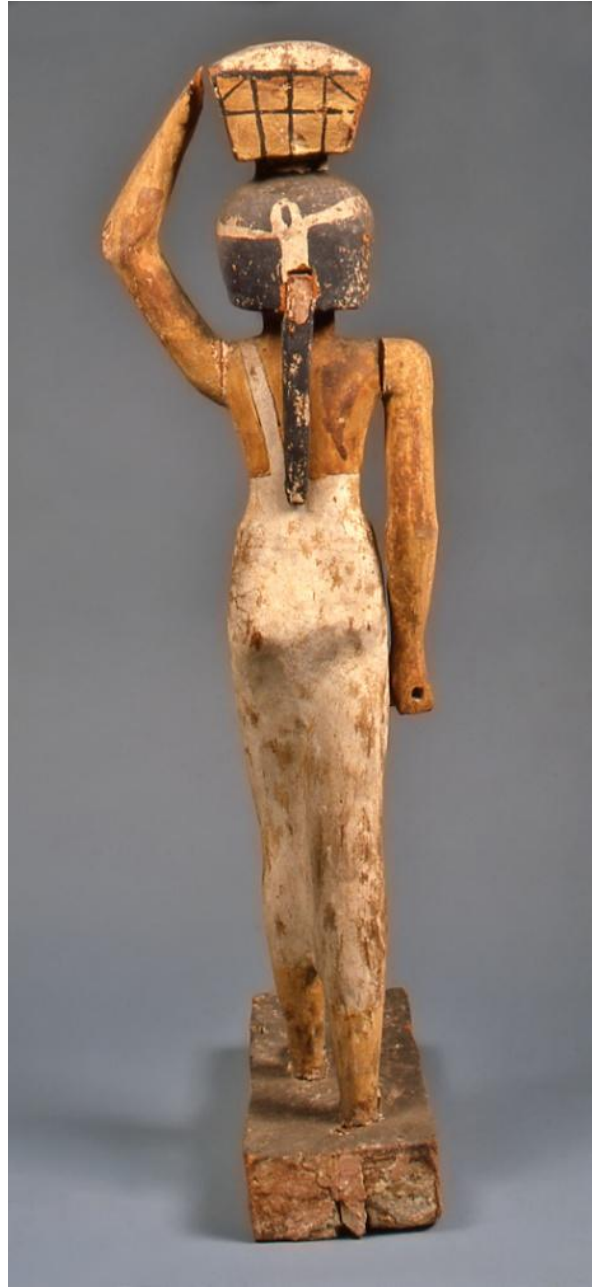


Bearer C





Archival photographs of Bearer C, date unknown



Archival photographs of Bearer C, date unknown

Bearers - Erratic elements



From the left: duck wing S. 8165/32 (Bearer A); S. 8165/33 (Bearer C); left arm Provv. 65;
right arm Provv. 45, both linked to Bearer A

Boat 0

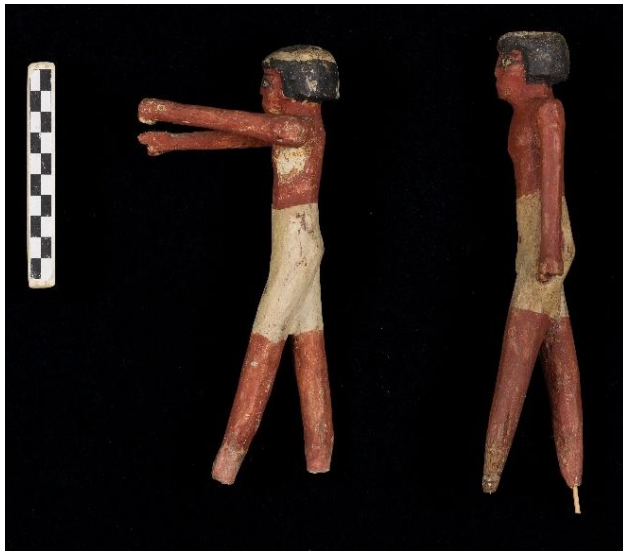




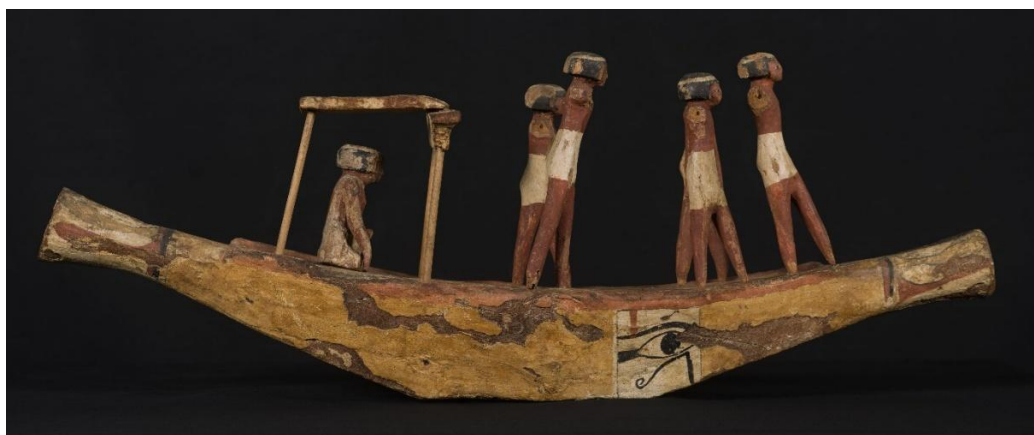


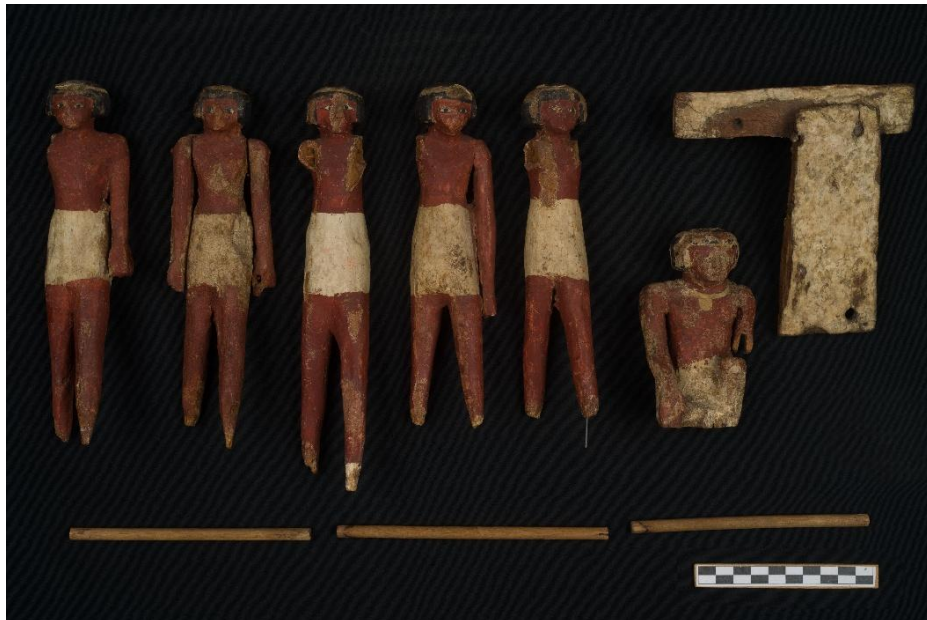
Boat 1





Boat 2





Boat 3





Boats - Erratic elements



From the left: Sailor B2-E1 (S.14813/134); B1-E1 (S.14813/71); B1-E2 (S.14813/72); B1-E3 (S.14813/48)





From the left: B1-E5H (S.14813/132); B2-E2H (S.14813/131); B1-E4P (S.14813/127)



From the left: four canopy supports; canopy S14828/16; B0 quarter rudder oar stanchion, B1 crossbeam quarter rudder; B1-E quarter rudder oar stanchions (S. 14829/1-2)

APPENDIX B – Graphic mapping and reconstructive hypothesis

In this section graphic comparison maps and reconstructive hypotheses developed in the course of the current study are presented. It includes comparative visual maps juxtaposing the historical photographs from the 1920s with the elements currently identified within the museum collection that may be pertinent to the original sets. These mappings are intended to provide a systematic and transparent tool for assessing correspondences, and possible re-associations between past documentation and the extant material.

In addition, the appendix presents photographic reconstructions of the artefacts as they appeared in the 1920s, insofar as this can be inferred from the available documentation. These reconstructions do not claim to offer definitive restitutions. Rather, they aim to visualise plausible configurations based on the combined analysis of historical imagery, surviving components, and technical evidence.

Offering bearers' erratic elements

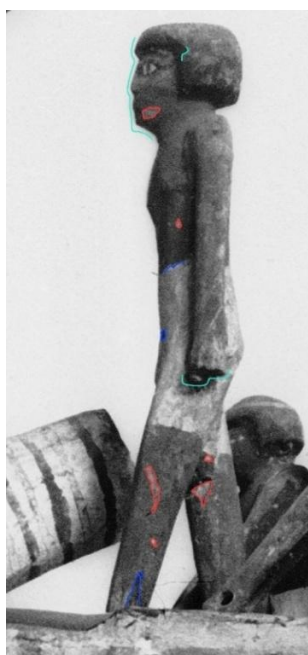


Bearer A: Graphic mapping and reconstruction test of the arms (Prov. 45; Prov. 65).

Red: Paint losses; Blue: stains; Light blue: silhouettes

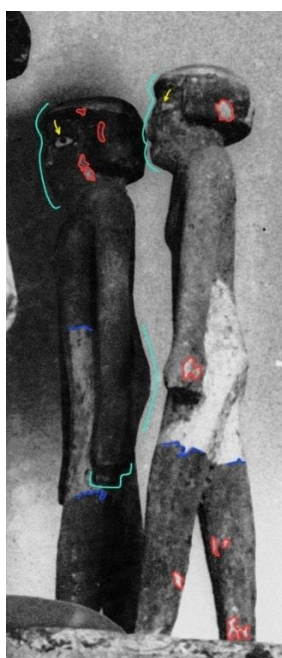
Boats models' erratic elements

Boat 0



Left: punter of Boat 0 in the historical photograph; right: punter of Boat 1 (B1-1) at present day. Red: Paint losses; Blue: stains; Light blue: silhouettes

Boat 1



Left: B1-E1 today; centre: historical photograph; right: B1-E2 today. Red: Paint losses; Blue: stains; Light blue: silhouettes



Left: historical photograph; right: B1-E3 today. Red: Paint losses; Blue: stains; Light blue: silhouettes

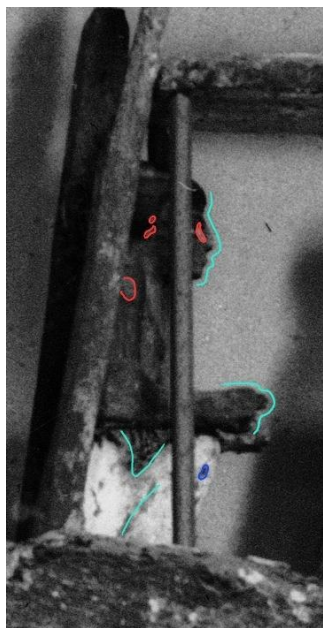


Left: B1-E4 today; centre: historical photograph; right: B1-E5 today. Red: Paint losses; Blue: stains; Light blue: silhouettes

Boat 2



Left: historical photograph; right: B2-E1 today. Red: Paint losses; Blue: stains; Light blue: silhouettes

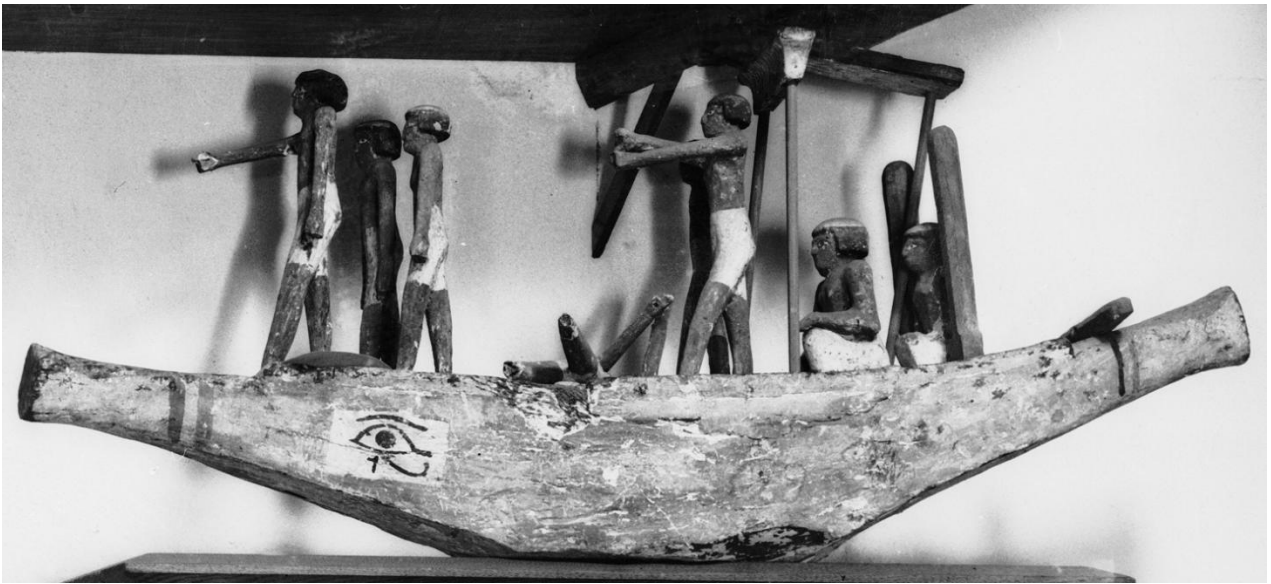


Left: historical photograph; right: B2-E2 today. Red: Paint losses; Blue: stains; Light blue: silhouettes

Boats reconstructive hypothesis



Boat 0: historical photograph (top), and the proposed reconstructive hypothesis on the basis of the available evidence (bottom)



Boat 1: historical photograph (top), and the proposed reconstructive hypothesis on the basis of the available evidence (bottom)



Boat 2: historical photograph (top), and the proposed reconstructive hypothesis on the basis of the available evidence (bottom)

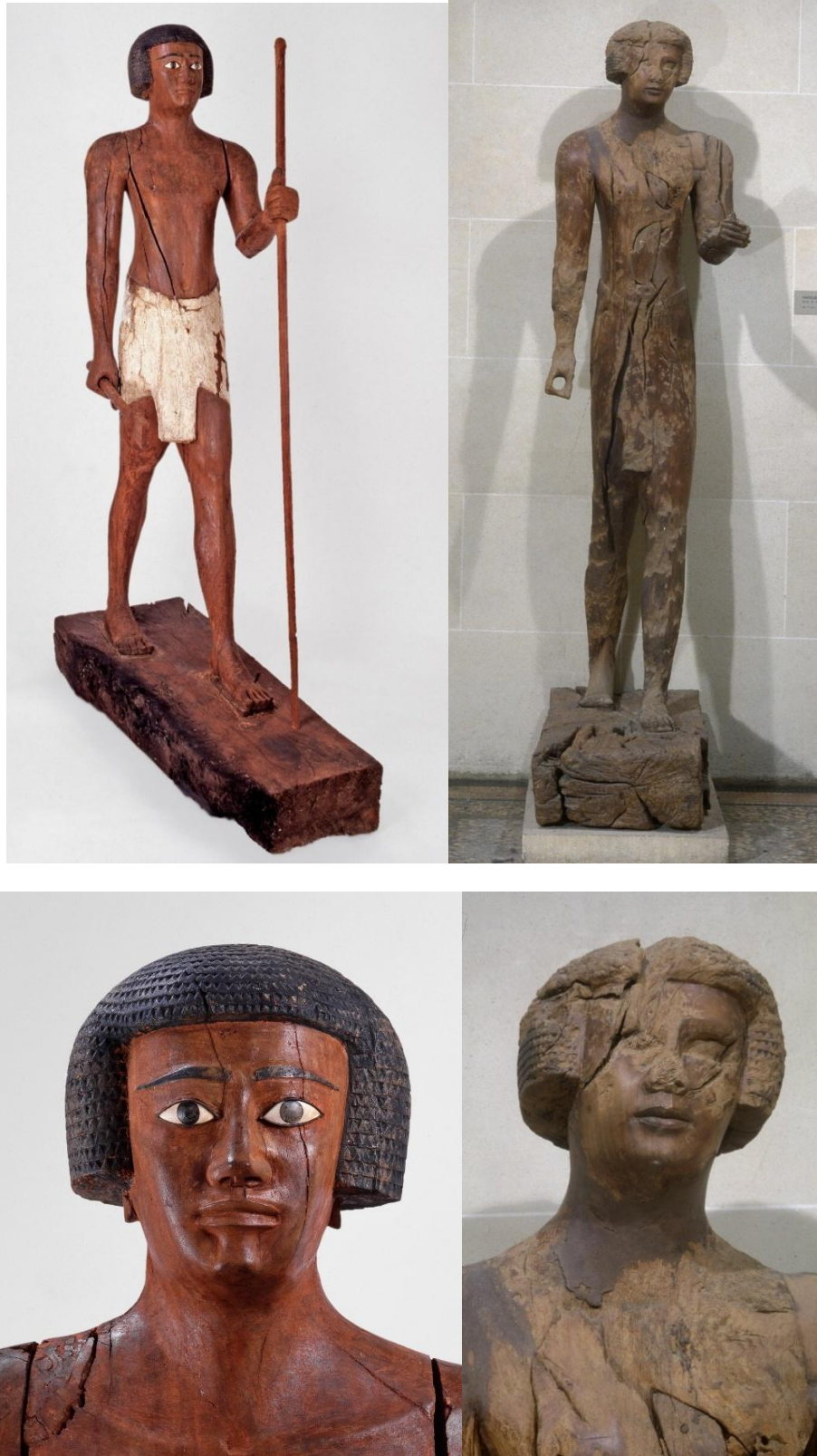
APPENDIX C – Iconographic comparisons

Sculptures of Minhotep and Wepwawetemhat



Asyut, Tomb of Minhotep, Middle Kingdom, early XII dyn. 1939–1875 a.C., Schiaparelli 1908, Museo Egizio (Torino)

Left-right: sculpture of Minhotep S. 8787 (133 x 35 x 76 cm); sculpture of Minhotep 8788 (90 x 22 x 54 cm); sculpture of Wepwawetemhat S. 8786 (138 x 32 x 79 cm)



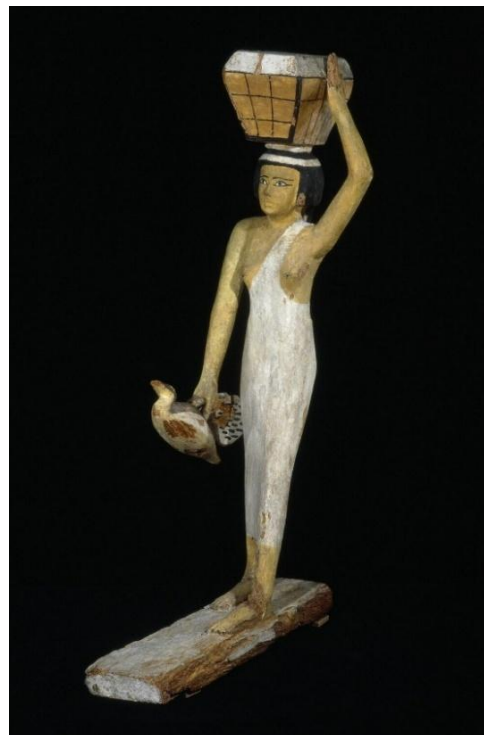
Asyut, Middle Kingdom, early XII dyn.

Left-right: sculpture of Djefai-hapi I, S. 8650, (207 x 53 x 115 cm), 1939–1875 a.C., Schiaparelli 1908, Museo Egizio (Torino); sculpture of Djefai-hapi I, E. 26915, (228 x 43 x 129 cm), 1960 -1915 a. C., Kamhal 1913-1914, Musée du Louvre (Paris)

Sculptures of offering bearers



Offering bearer E 11990, (63,2 x 32,8 cm), Asyut, tomb of Wepwawetemhat (Tomb 14), Middle Kingdom, early XII dyn., Musée du Louvre (Paris)



Offering bearer E 11991, (63,2 x 33,8 cm), Asyut, tomb of tomb of Ankhef, Middle Kingdom, early XII dyn., Musée du Louvre (Paris)



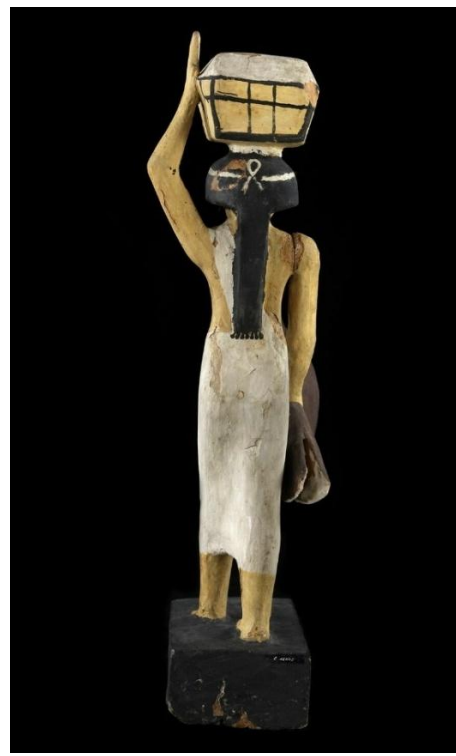
Offering bearer E 11992, (56,3 x 28 cm),
Asyut, tomb of Nakhti ? (Tomb 7), Middle
Kingdom, early XII dyn., Musée du Louvre
(Paris)



Offering bearer E 20575, (57,7 x 27,7 x 11,3
cm), Asyut, tomb of Nakhti (Tomb 7),
Middle Kingdom, early XII dyn., Musée du
Louvre (Paris)

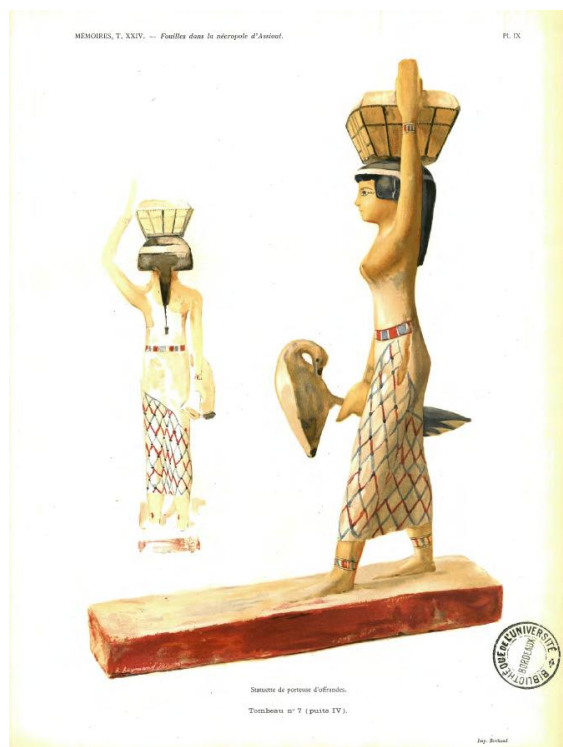


Offering bearer E 12001, (49,7 x 22 x 10,1 cm), Asyut, tomb unknown, Middle Kingdom,
early XII dyn., Musée du Louvre (Paris)

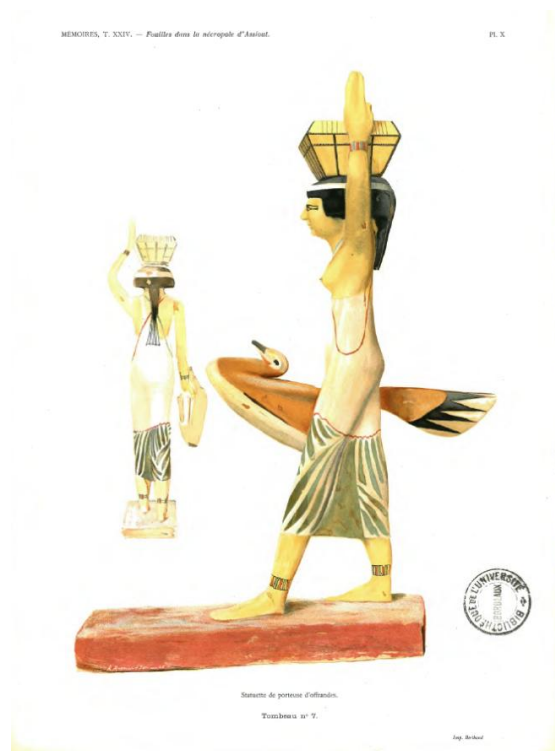




Offering bearer E 12029, (57,7 x 27,7 x 11,3 cm), Asyut, tomb of Nakhti (Tomb 7), Middle Kingdom, early XII dyn., Musée du Louvre (Paris)



Offering bearer JE 36290, Asyut, tomb of Nakhti (Tomb 7), Middle Kingdom, early XII dyn., Egyptian Museum (Cairo); drawing from Chassinat & Palanque, 1911: Pl IX



Offering bearer JE 36291, Asyut, tomb of Nakhti (Tomb 7), Middle Kingdom, early XII dyn., Egyptian Museum (Cairo); drawing from Chassinat & Palanque, 1911: Pl X



Offering bearer 04.1774, (h. 66 cm), Asyut, Tomb 6, Middle Kingdom, early XII dyn., Museum of Fine Arts (Boston)



Offering bearer EA 45055 (42,30 x 10,70 x 12 cm), Asyut, Hogarth Tomb VI, Middle Kingdom, early XII dyn., British Museum (London)



Offering bearer EA 45075, Asyut, Hogarth Tomb VI, Middle Kingdom, early XII dyn., British Museum (London)



Offering bearer S. 14786, Asyut, First Intermediate Period, 2118-1980 BCE, Museo Egizio (Torino)

Boat models



Rowing boat E 12027, (38,5 x 81 cm), Asyut, tomb of Nakhti (Tomb 7), Middle Kingdom, early XII dyn., Musée du Louvre (Paris)



Top: Sailing boat JE 36293, Asyut, tomb of Wepwawetemhat (Tomb 14), Middle Kingdom, early XII dyn., Grand Egyptian Museum (Cairo)

Bottom: Rowing boat E 12027, (38,5 x 81 cm), Asyut, tomb of Nakhti (Tomb 7), Middle Kingdom, early XII dyn., Musée du Louvre (Paris)



Sailing boat S. 8657, (25 x 71 cm x 13,5 cm), Asyut, tomb of Shemes, Middle Kingdom, early XII dyn., Museo Egizio (Torino)



Rowing boat S. 8659, (25 x 71 cm x 13,5 cm), Asyut, tomb of Shemes, Middle Kingdom, early XII dyn., Museo Egizio (Torino)



Rowing boat E 11993, (28,5 x 89 cm), Asyut, tomb of Wepwawetemhat (Tomb 14), Middle Kingdom, early XII dyn., Musée du Louvre (Paris)



Sailing boat E 11994, (35 x 90 x 20 cm), Asyut, tomb of Wepwawetemhat (Tomb 14), Middle Kingdom, early XII dyn., Musée du Louvre (Paris)

APPENDIX D – Imaging analysis

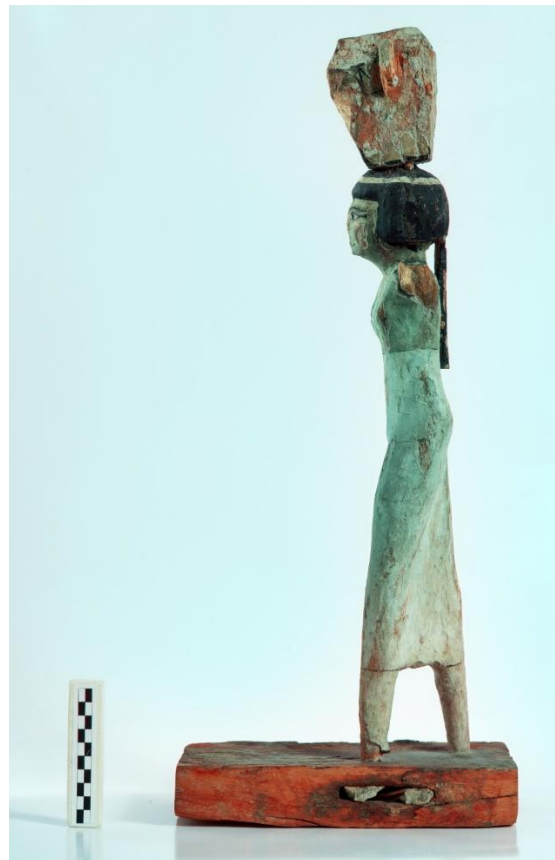
Bearer A



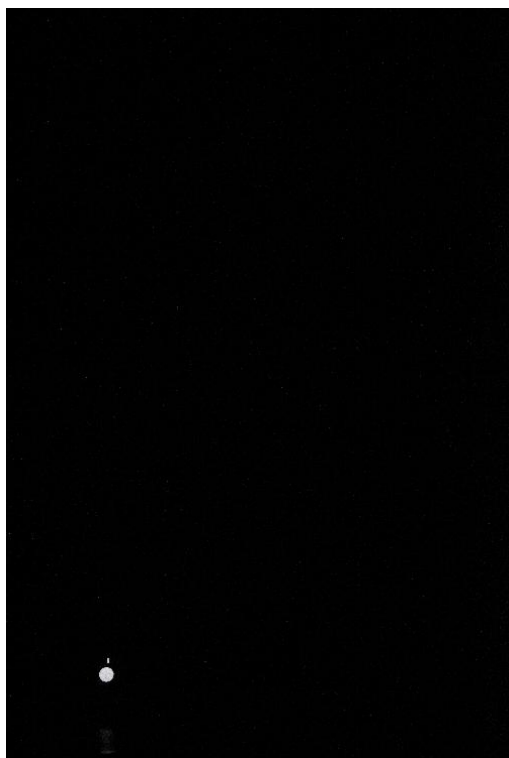
Bearer A – Ultraviolet-induced visible fluorescence photography (UVF)



Bearer A – Near-infrared reflectography (IRR-NIR)

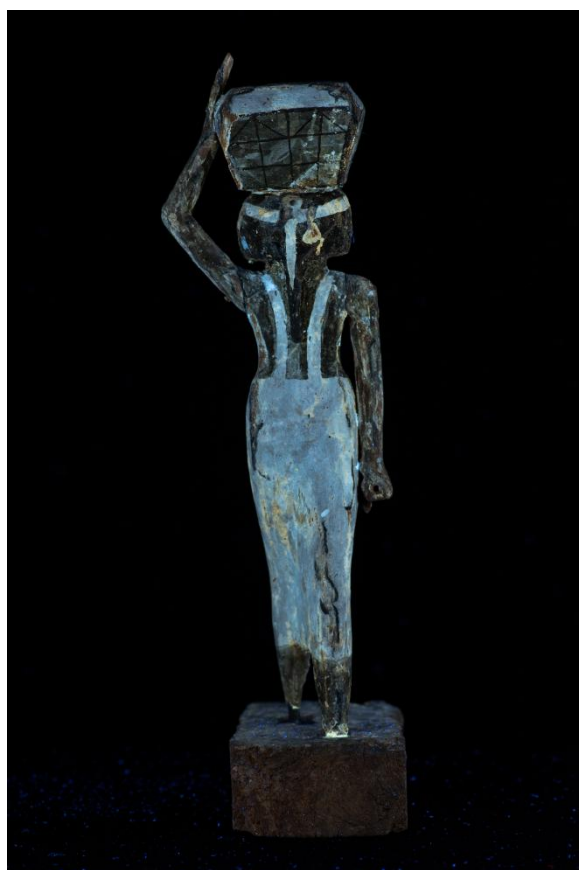
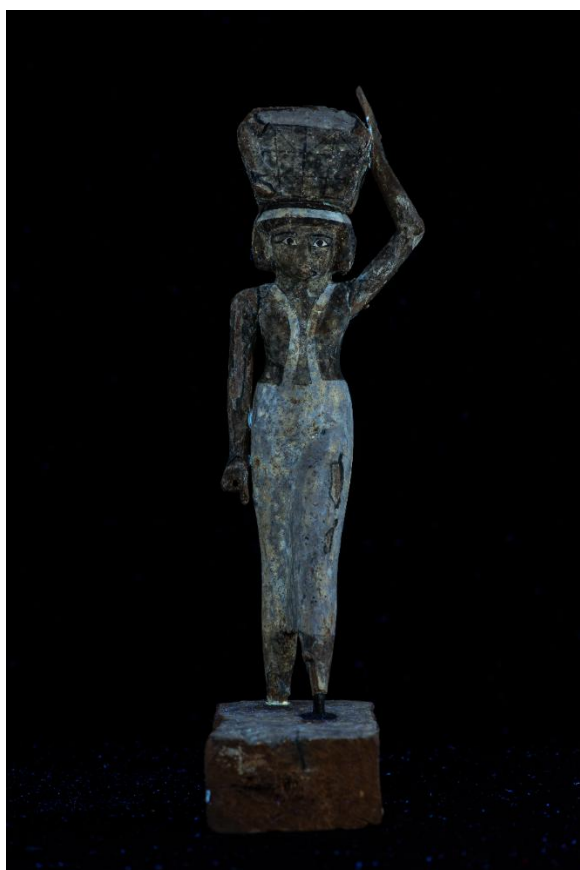


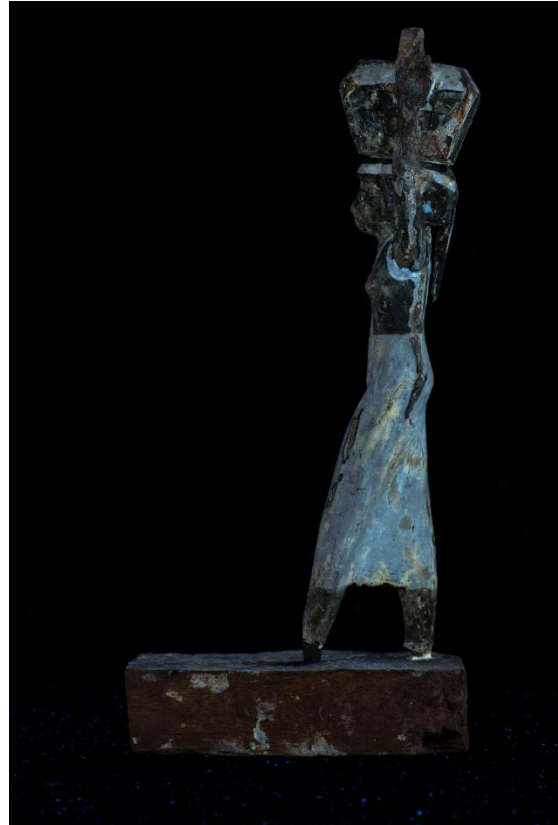
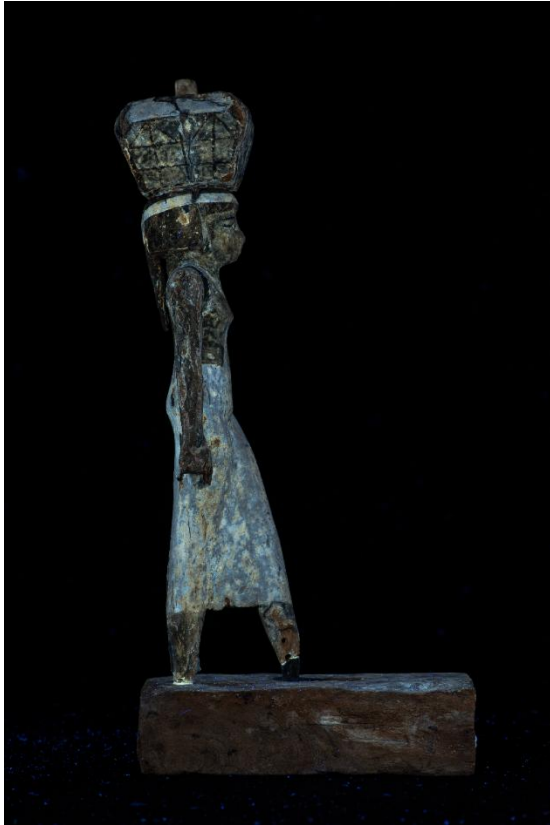
Bearer A – False-colour infrared composites (IRFC-NIR)



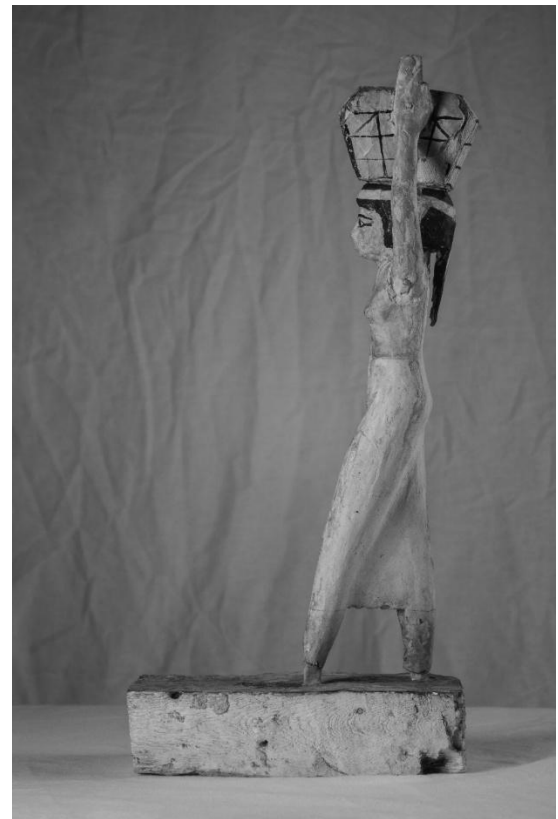
Bearer A – Visible-induced infrared luminescence (VIL)

Bearer B

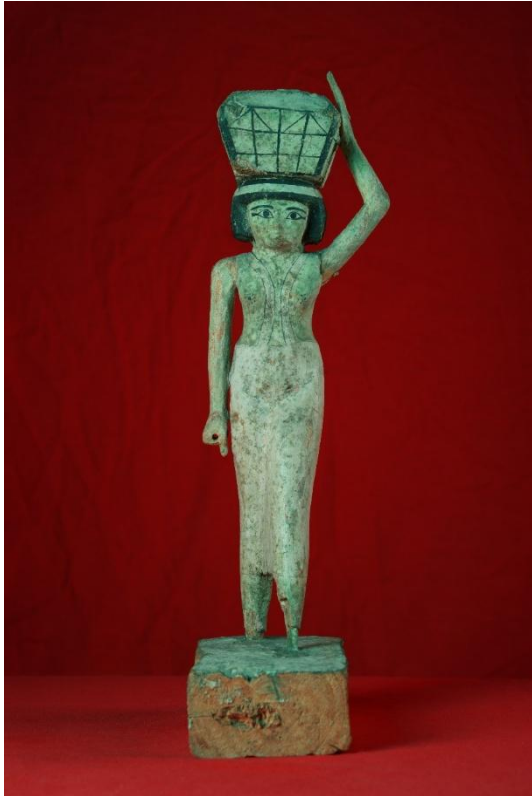




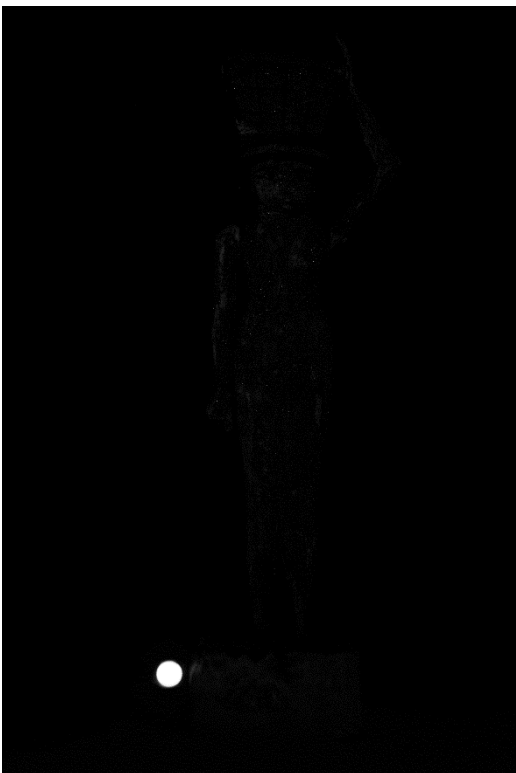
Bearer B – Ultraviolet-induced visible fluorescence photography (UVF)



Bearer B – Near-infrared reflectography (IRR-NIR)

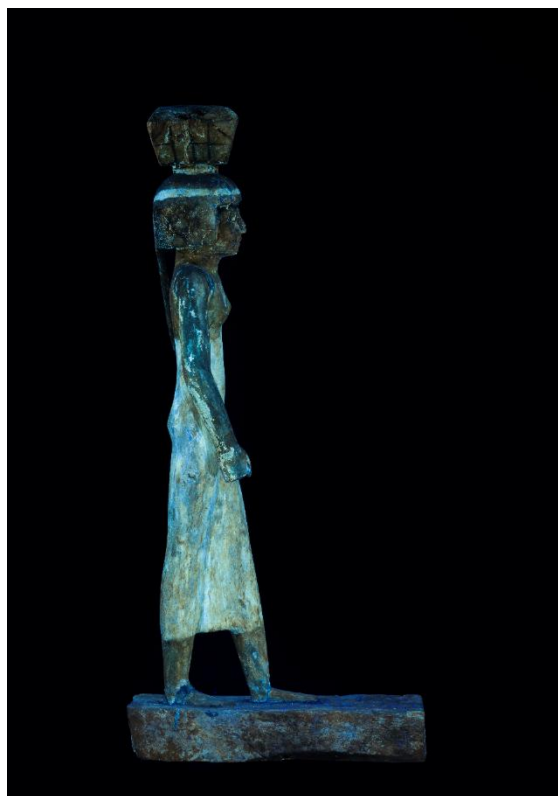
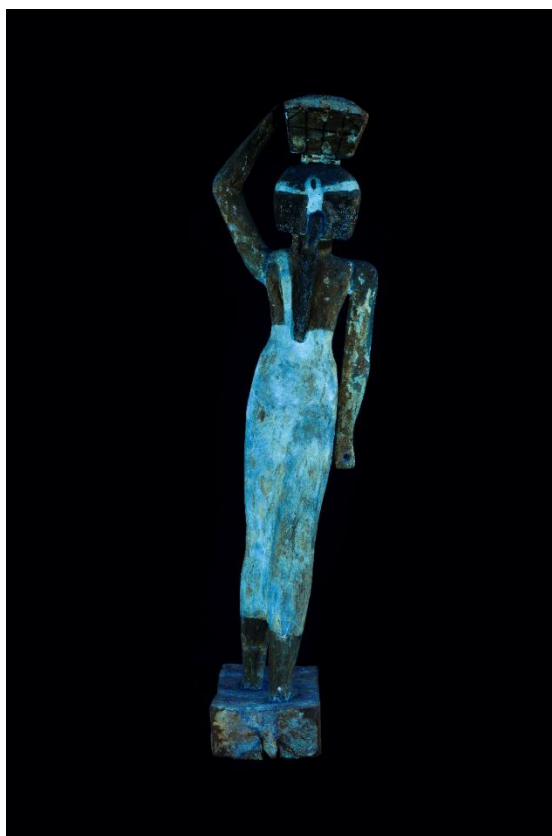
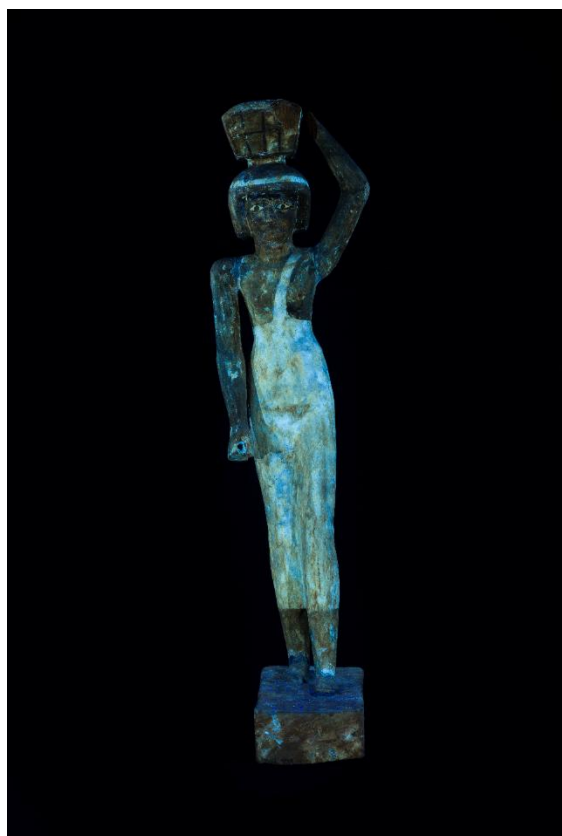


Bearer B – False-colour infrared composites (IRFC-NIR)



Bearer B – Visible-induced infrared luminescence (VIL)

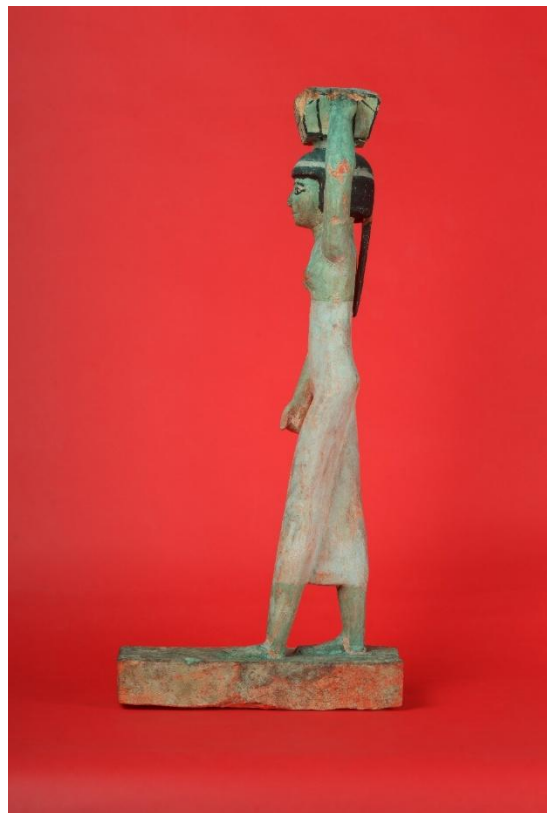
Bearer C



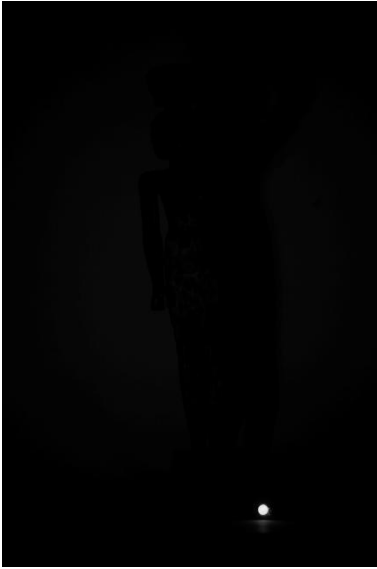
Bearer C – Ultraviolet-induced visible fluorescence photography (UVF)



Bearer C – Near-infrared reflectography (IRR-NIR)

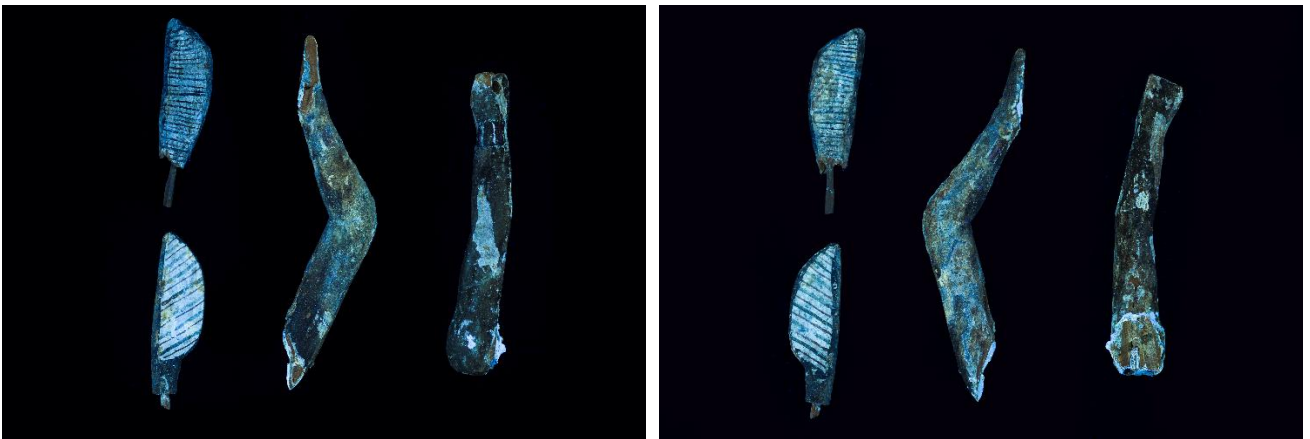


Bearer C – False-colour infrared composites (IRFC-NIR)

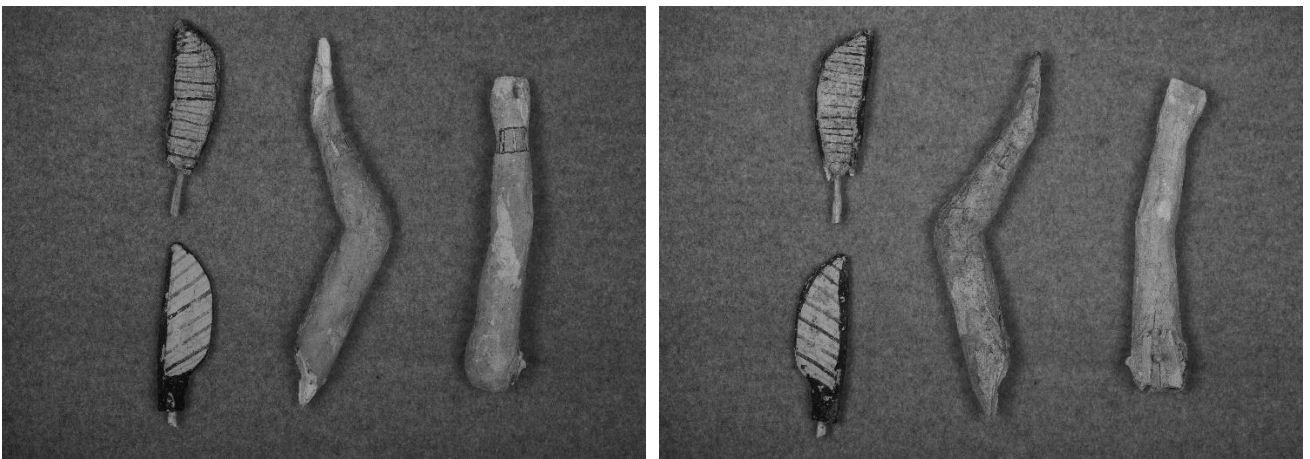


Bearer C – Visible-induced infrared luminescence (VIL)

Bearers' erratic elements



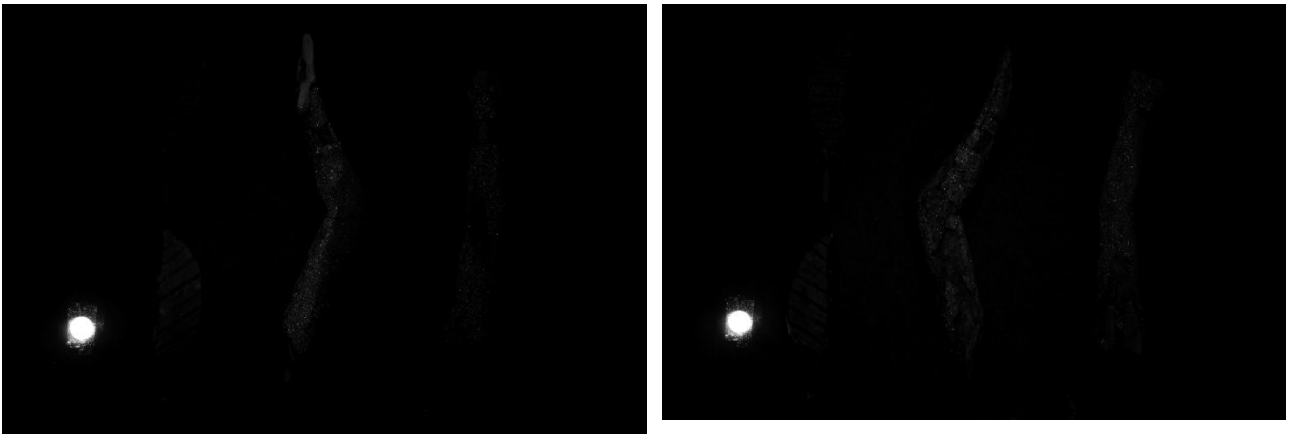
Bearers' erratic elements – Ultraviolet-induced visible fluorescence photography (UVF)



Bearers' erratic elements – Near-infrared reflectography (IRR-NIR)

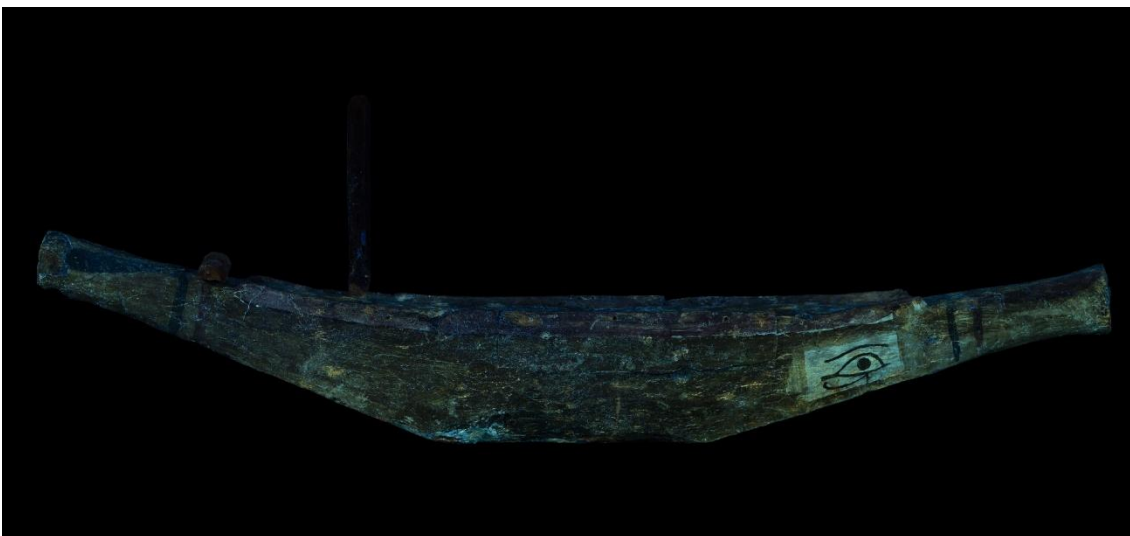


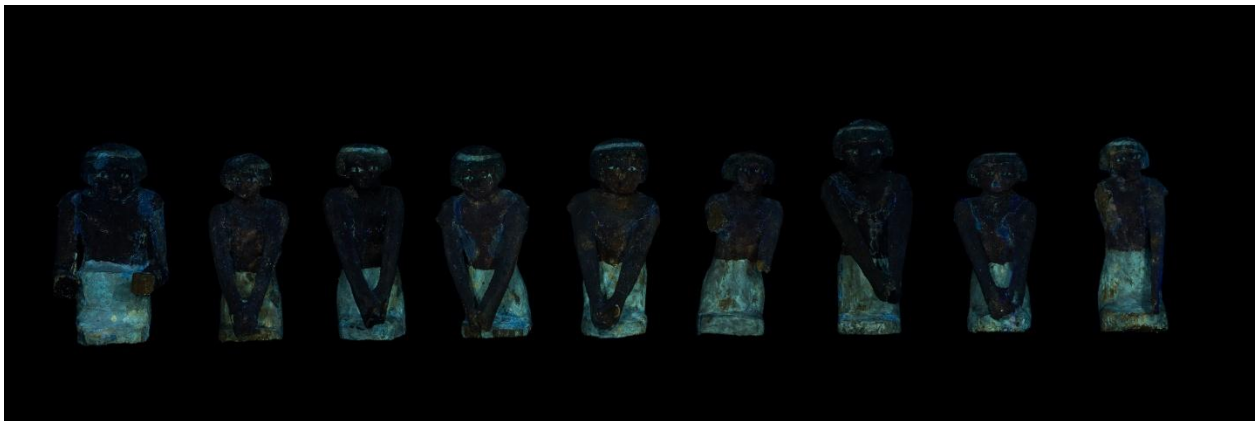
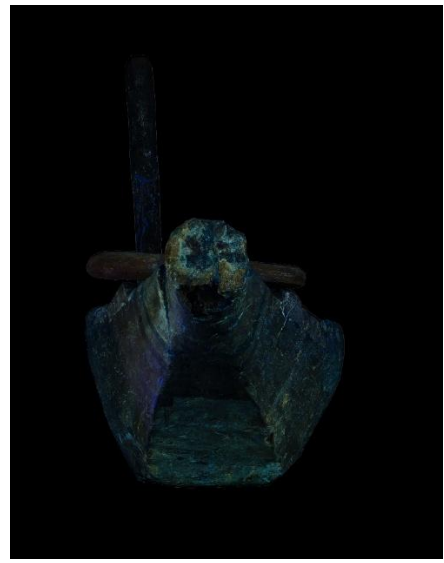
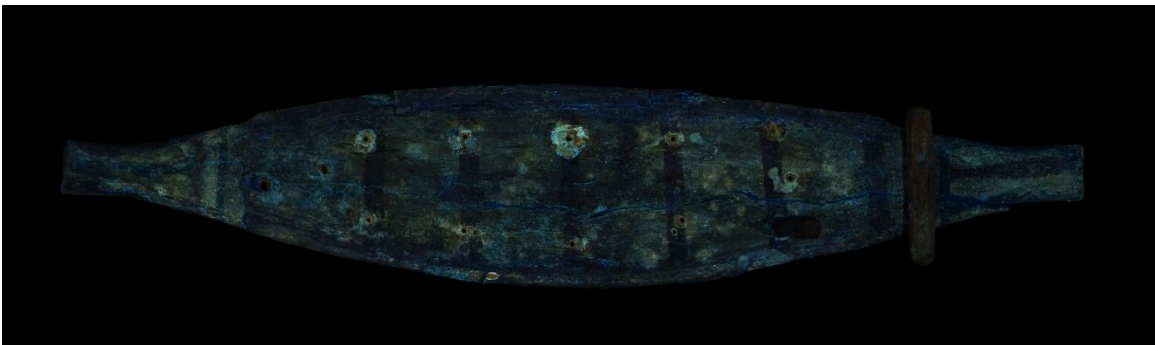
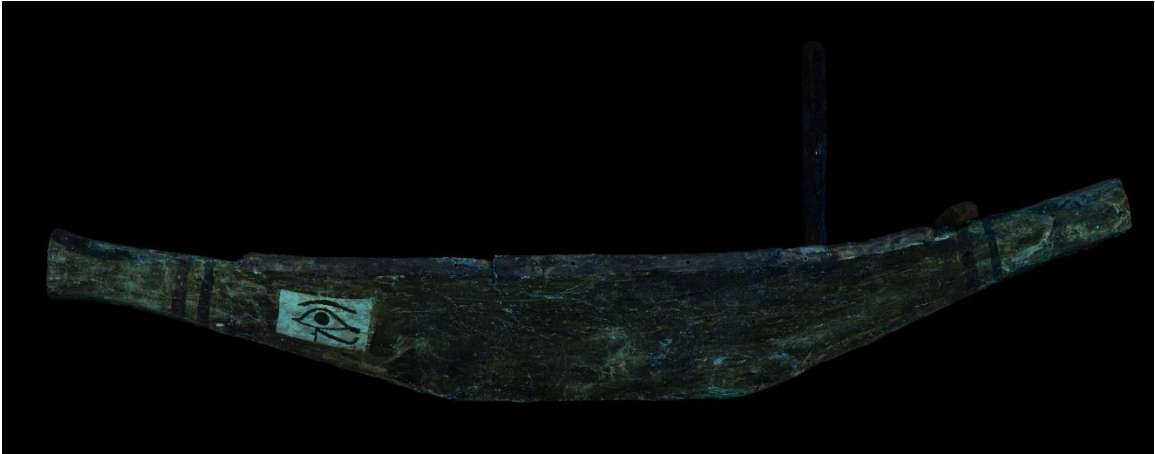
Bearers erratic elements – False-colour infrared composites (IRFC-NIR)

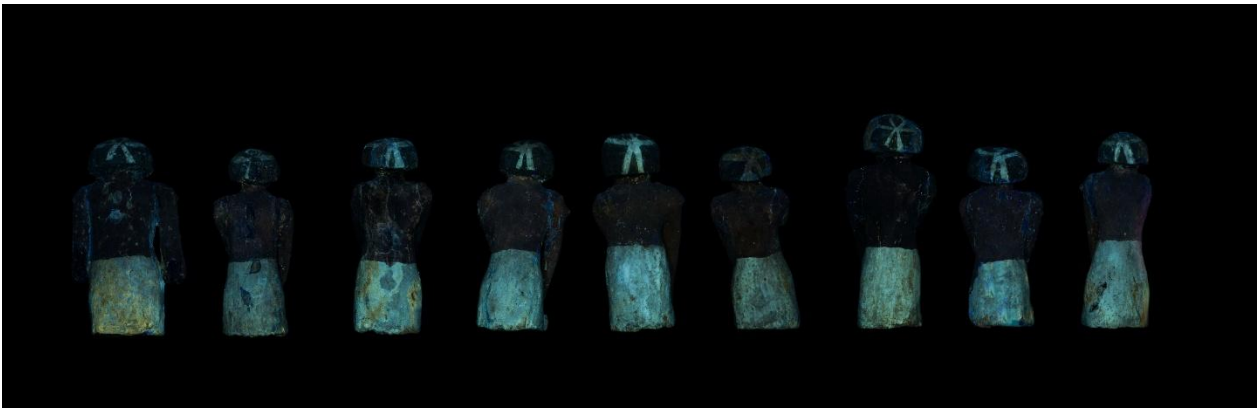


Bearers' erratic elements – Visible-induced infrared luminescence (VIL)

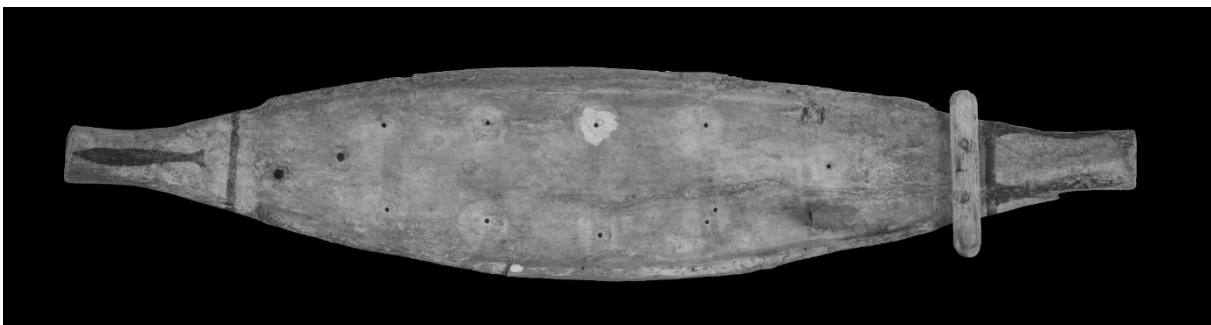
Boat 0

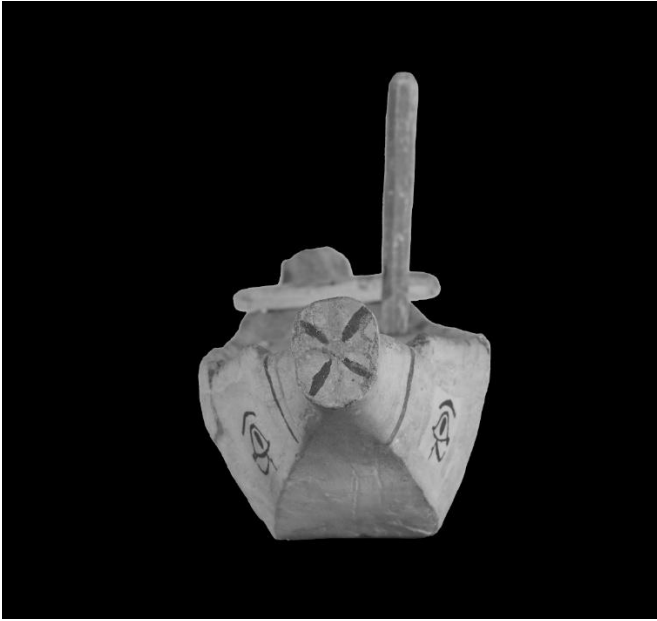




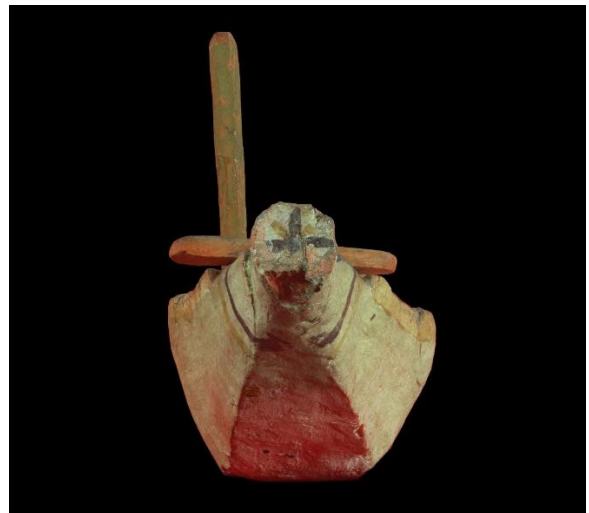


Boat 0 – Ultraviolet-induced visible fluorescence photography (UVF)





Boat 0 – Near-infrared reflectography (IRR-NIR)



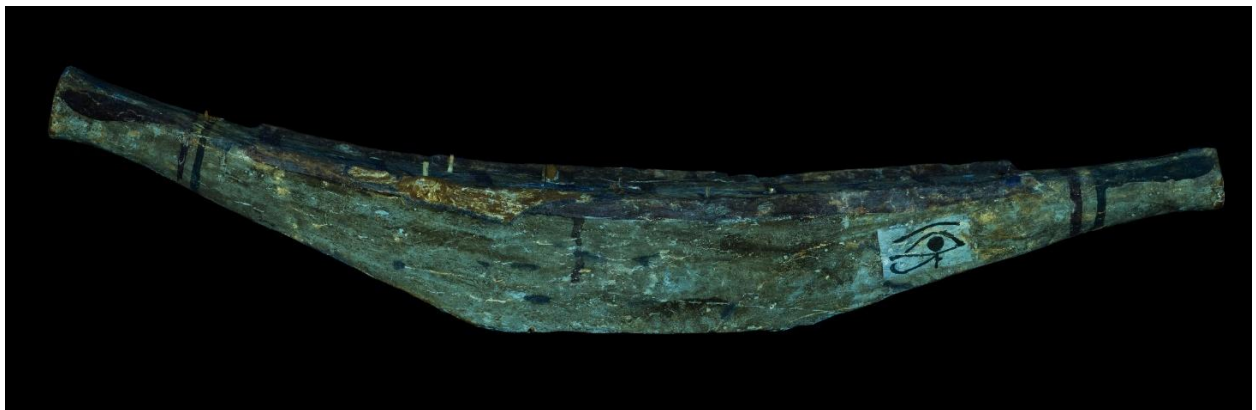


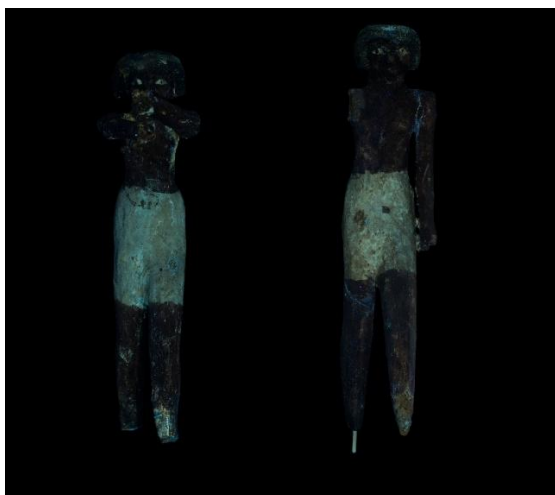
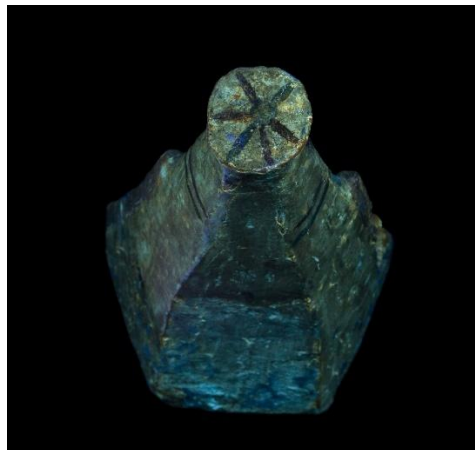
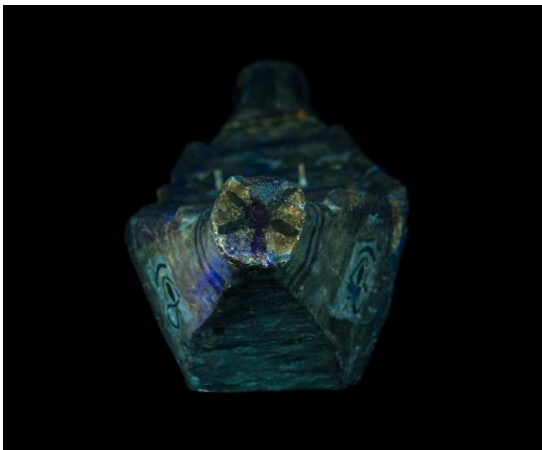
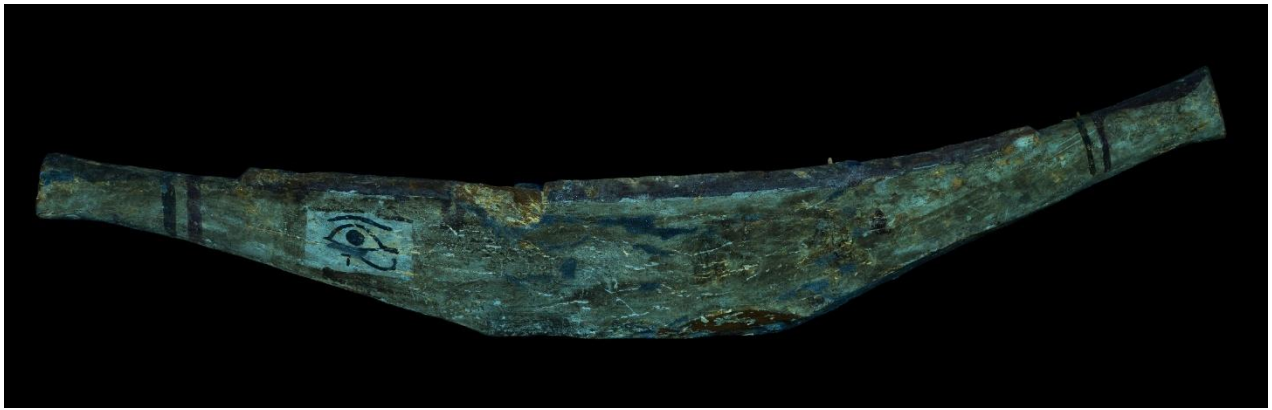
Boat 0 – False-colour infrared composites (IRFC-NIR)



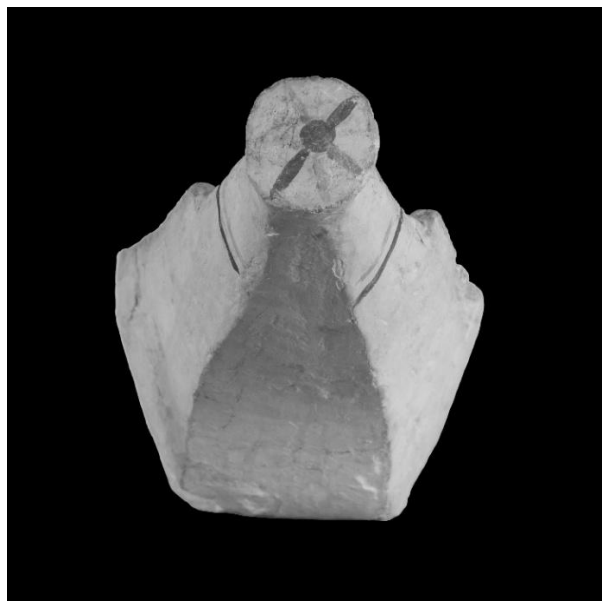
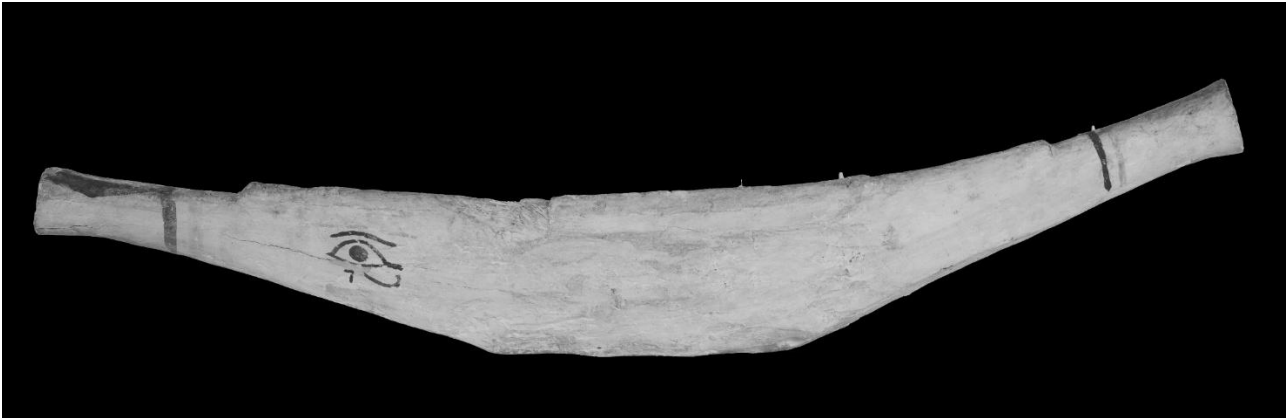
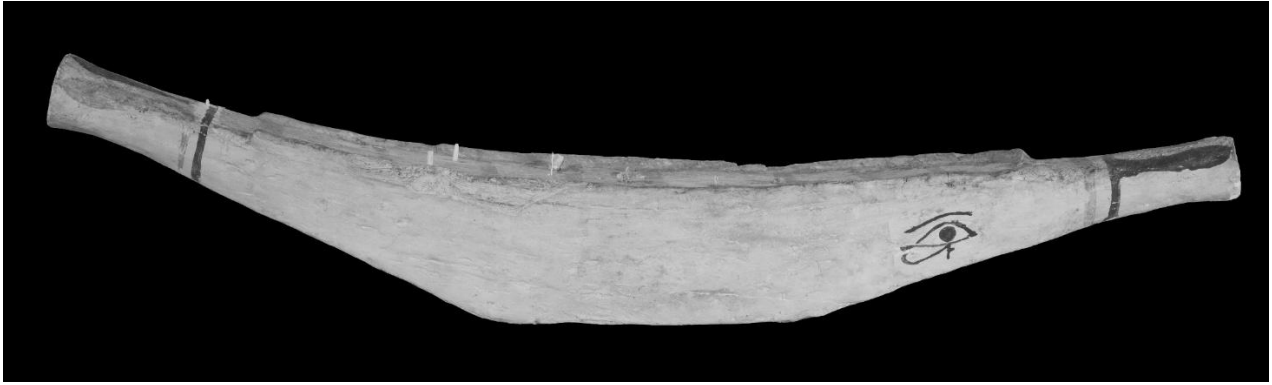
Boat 0 - Visible-induced infrared luminescence (VIL)

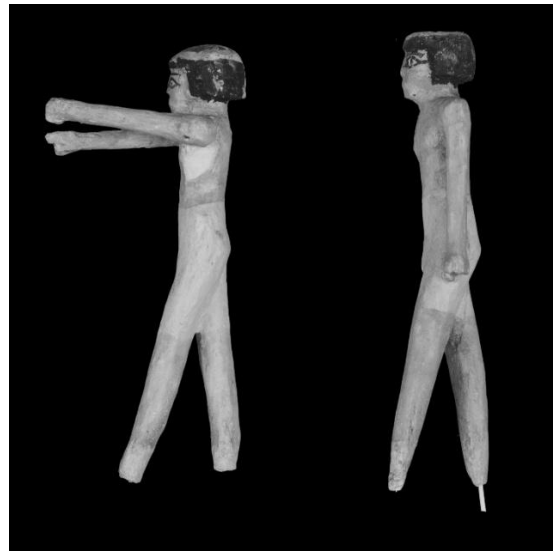
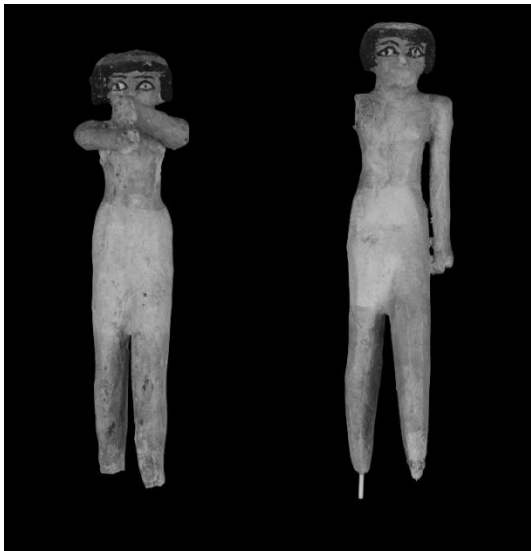
Boat 1



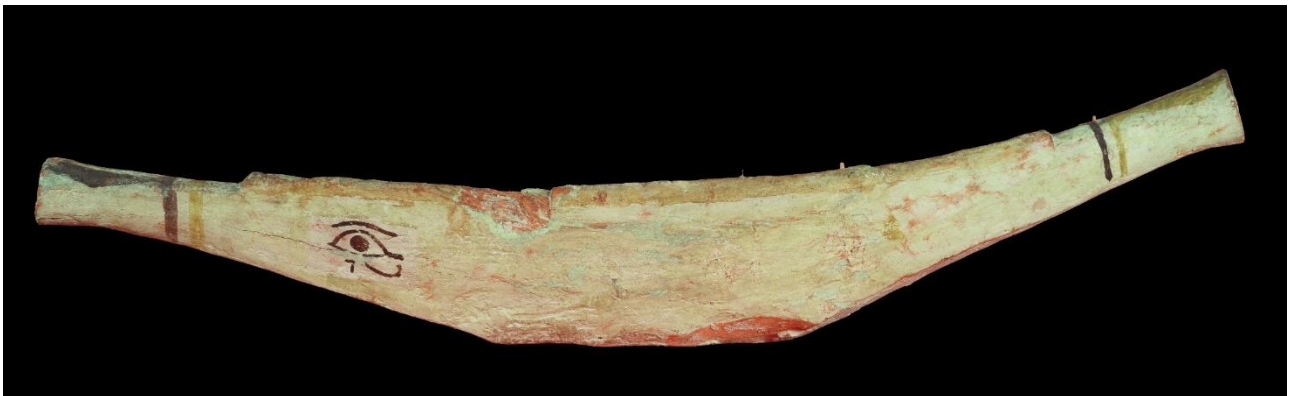
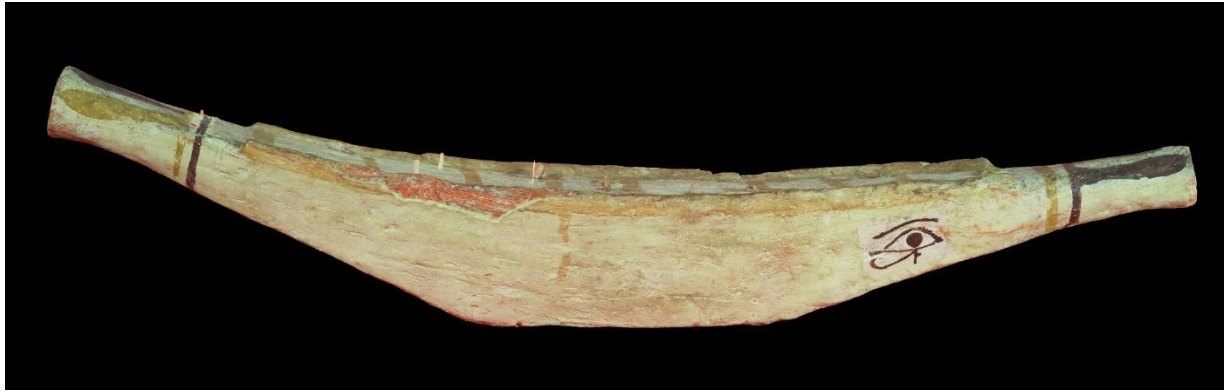


Boat 1 - Ultraviolet-induced visible fluorescence photography (UVF)





Boat 1 – Near-infrared reflectography (IRR-NIR)



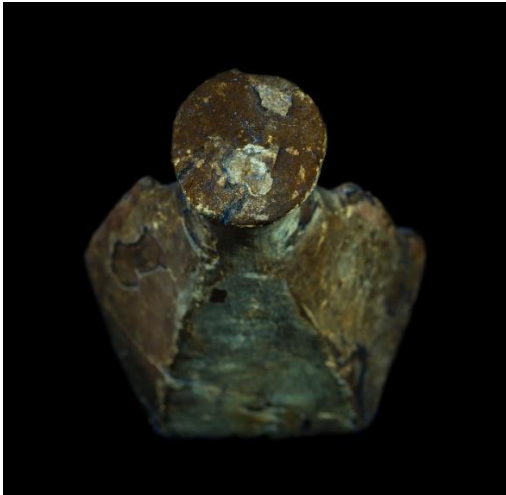


Boat 1 – False-colour infrared composites (IRFC-NIR)



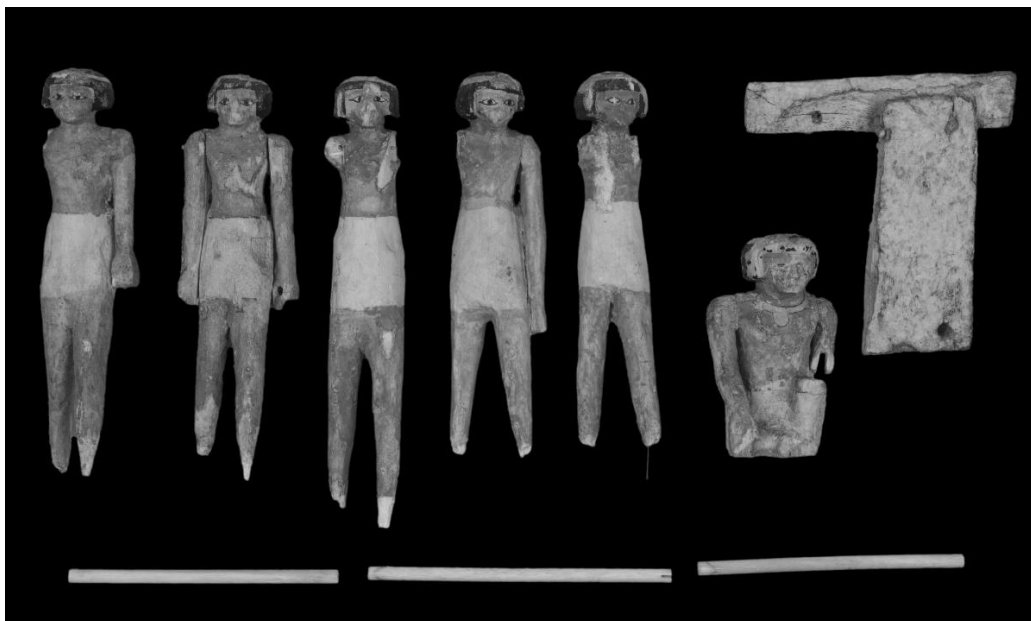
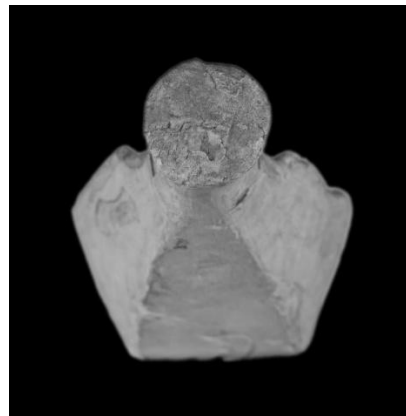
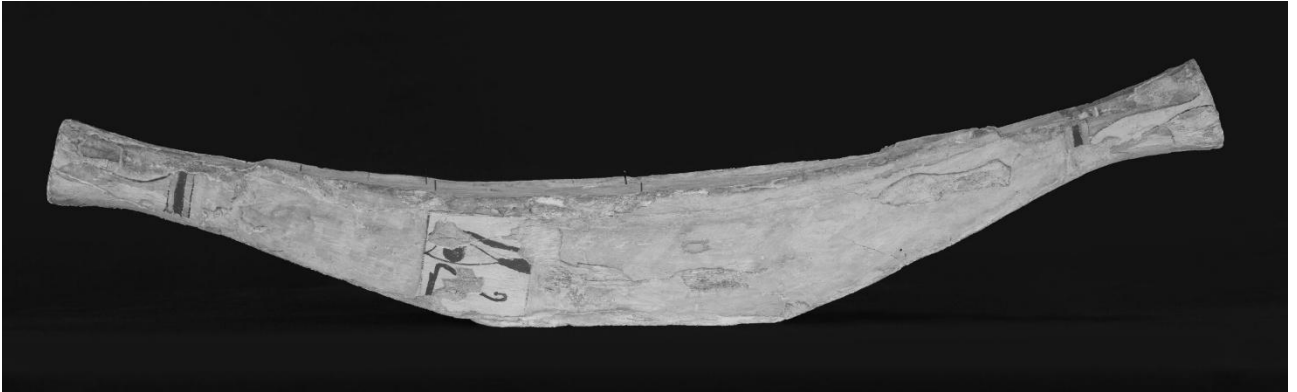
Boat 1 – Visible-induced infrared luminescence (VIL)

Boat 2



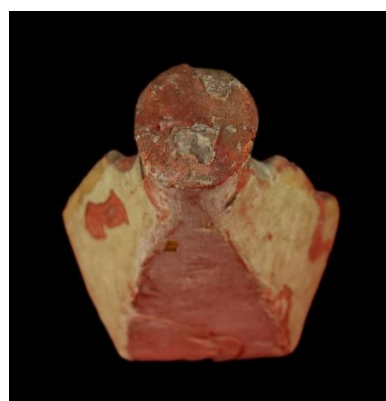
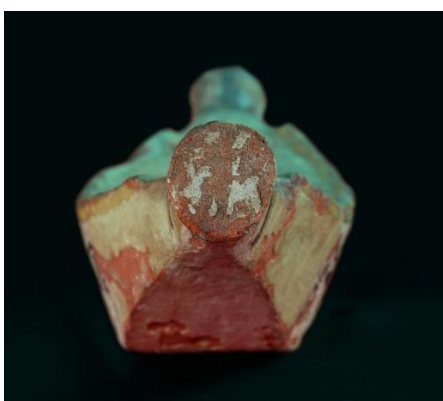


Boat 2 – Ultraviolet-induced visible fluorescence photography (UVF)



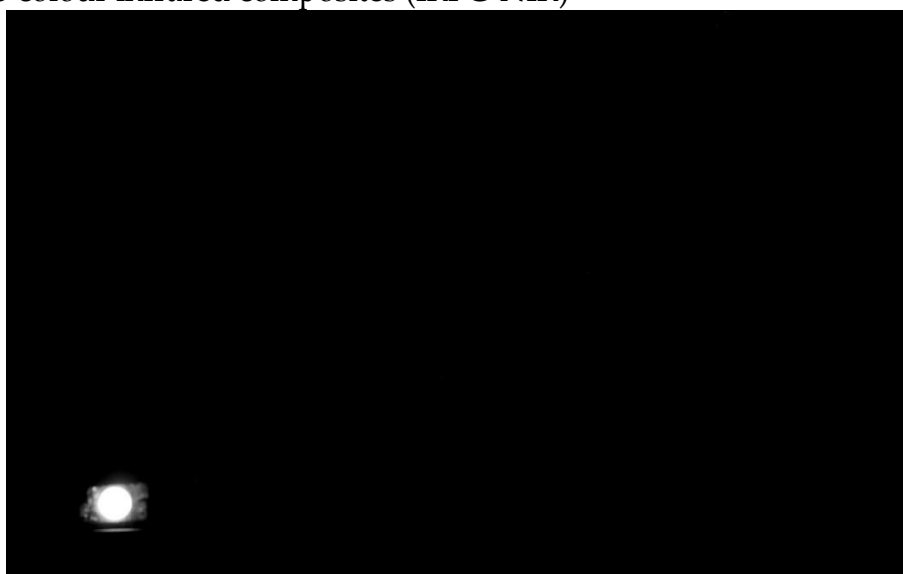


Boat 2 – Near-infrared reflectography (IRR-NIR)





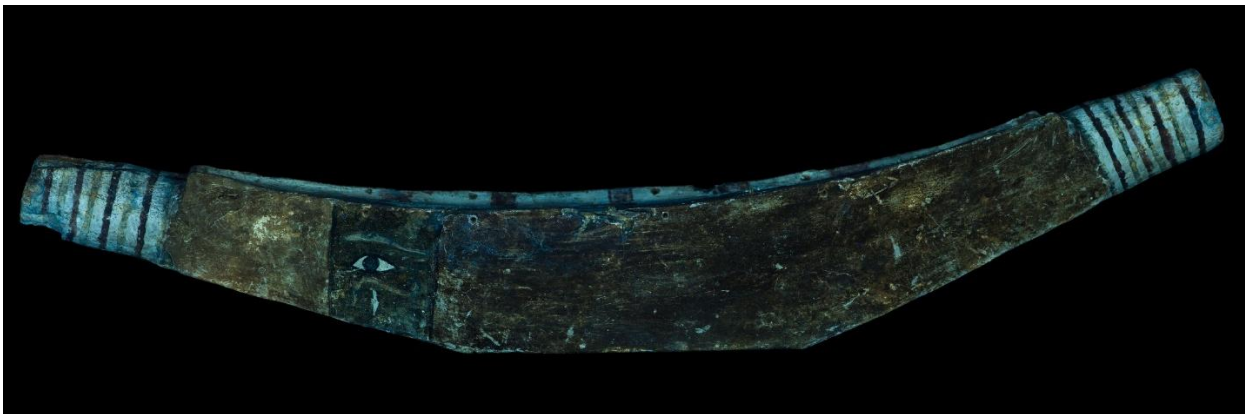
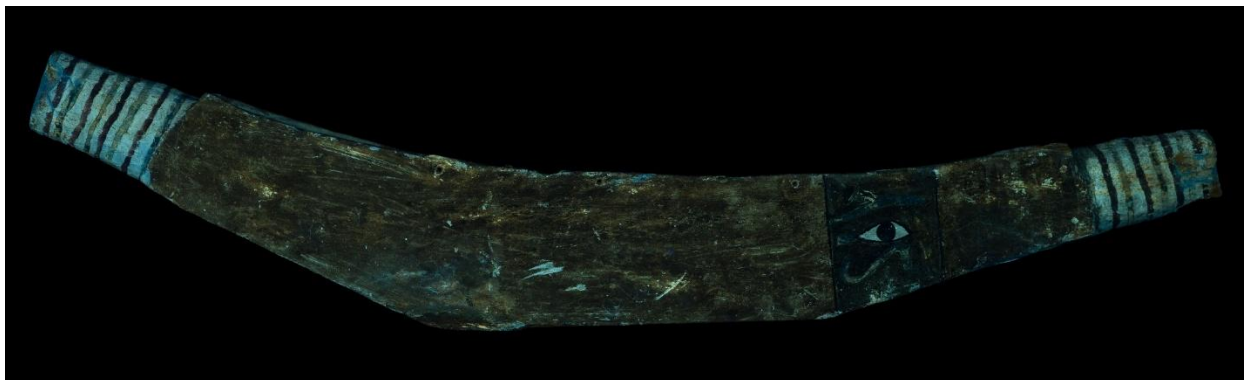
Boat 2 – False-colour infrared composites (IRFC-NIR)

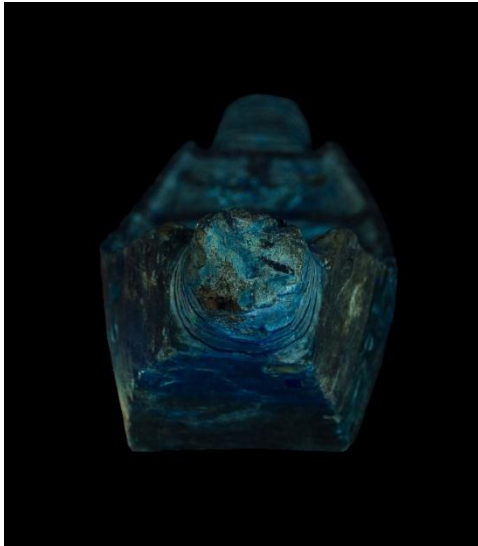
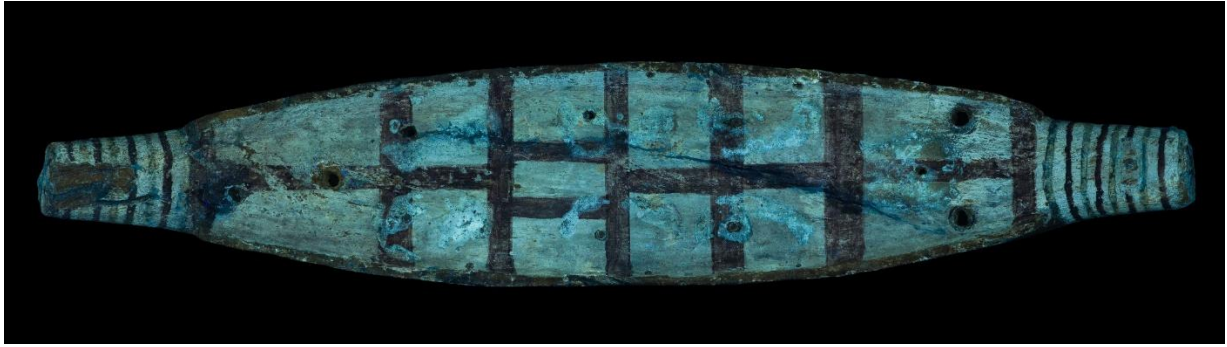




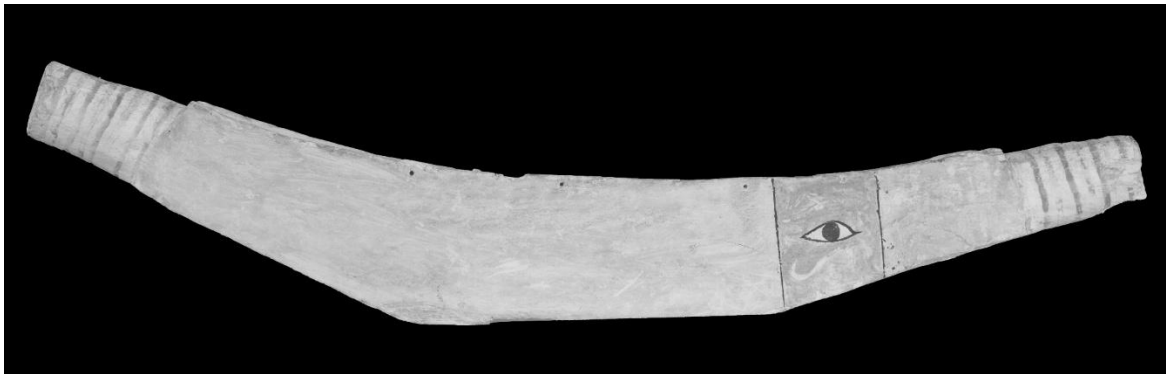
Boat 2 – Visible-induced infrared luminescence (VIL)

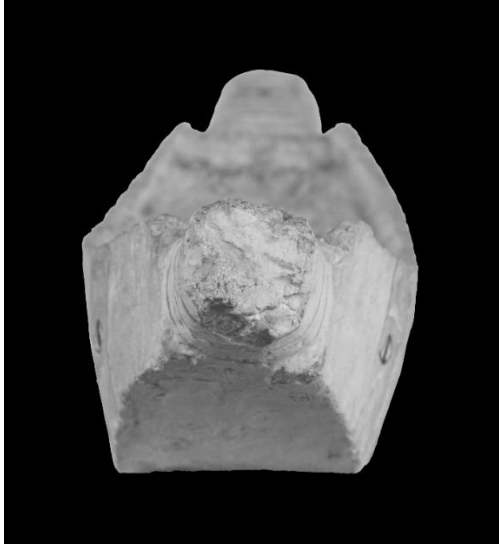
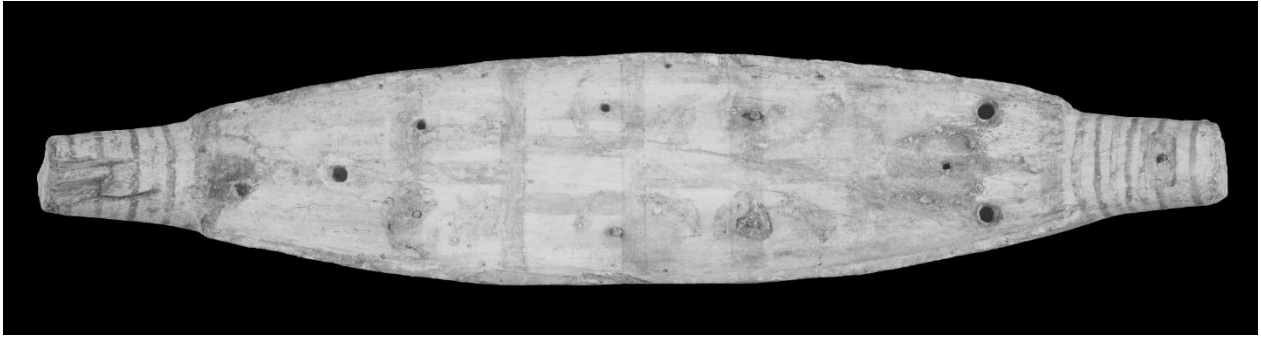
Boat 3





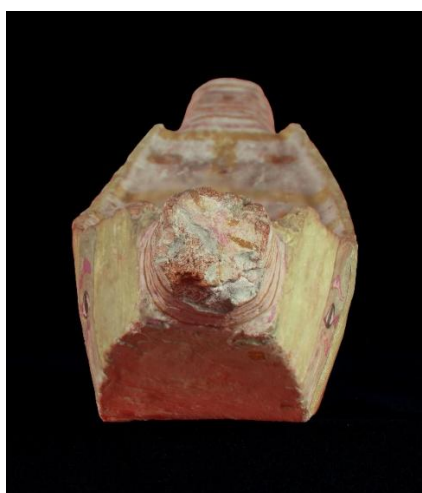
Boat 3 – Ultraviolet-induced visible fluorescence photography (UVF)



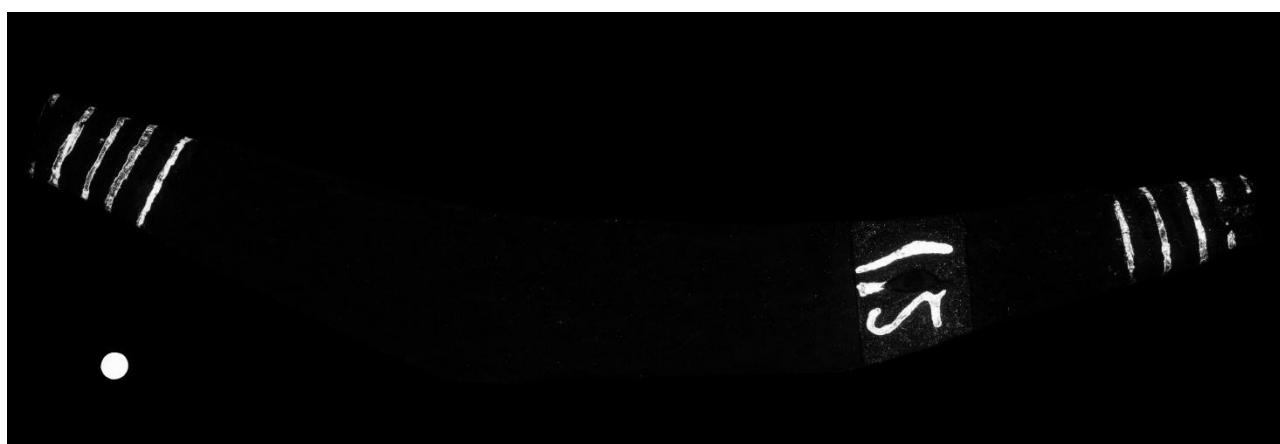


Boat 3 – Near-infrared reflectography (IRR-NIR)



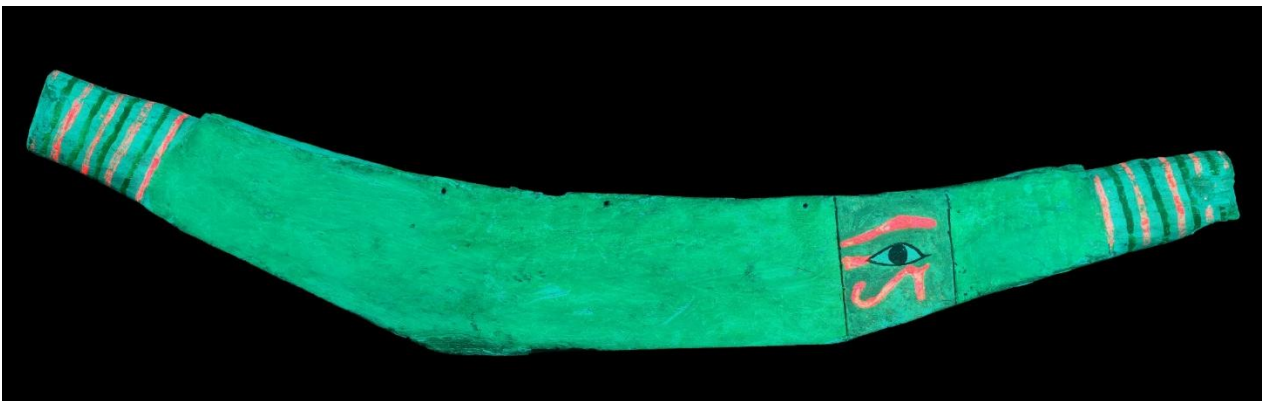


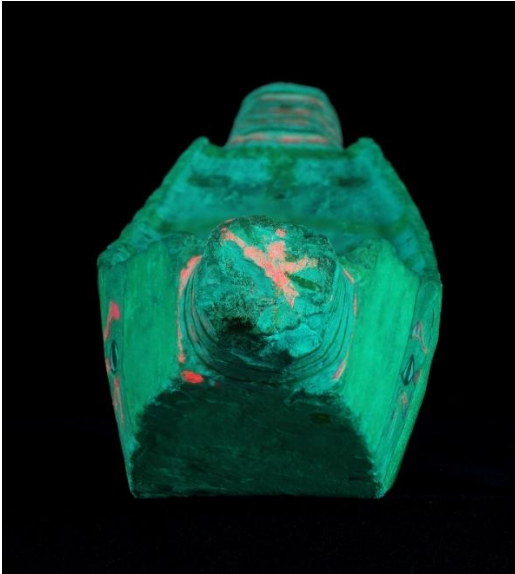
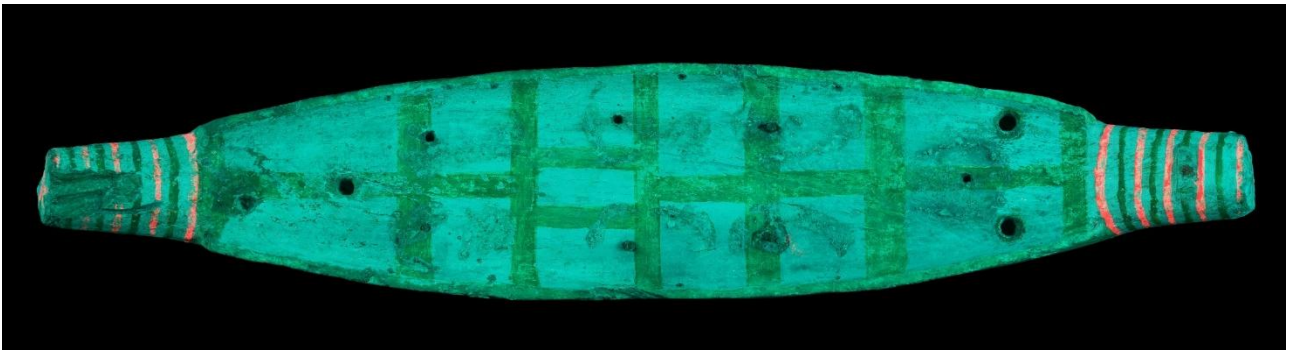
Boat 3 – False-colour infrared composites (IRFC-NIR)





Boat 3 – Visible-induced infrared luminescence (VIL)

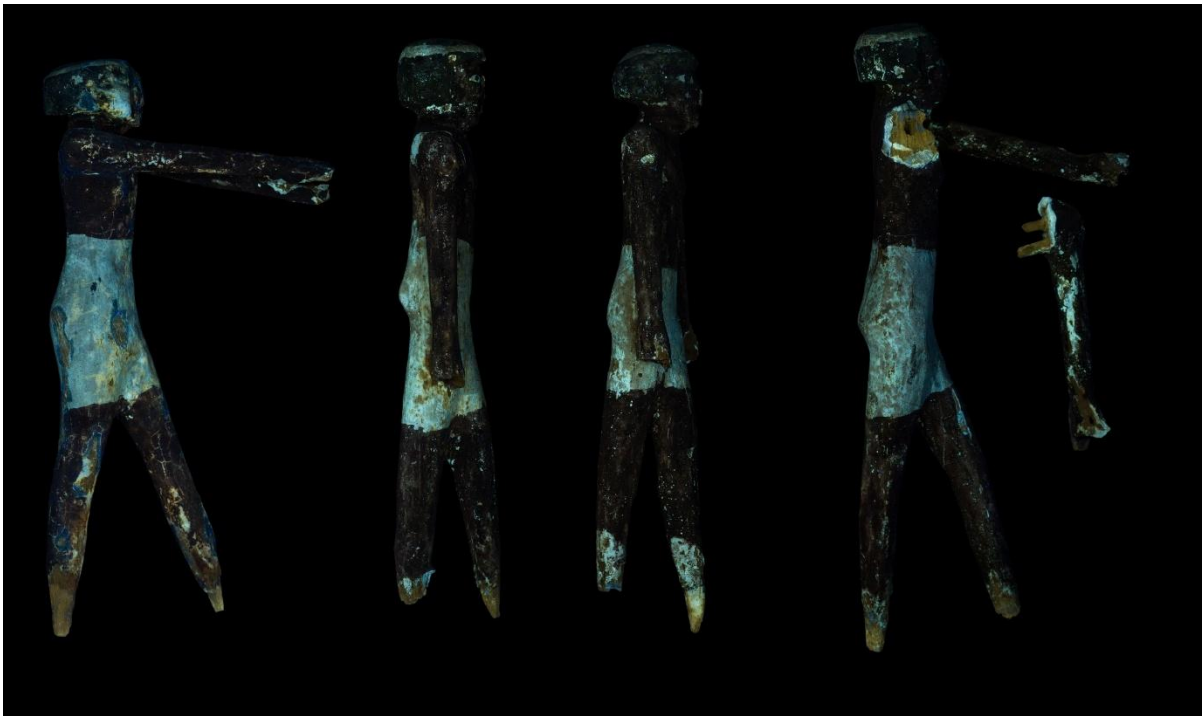


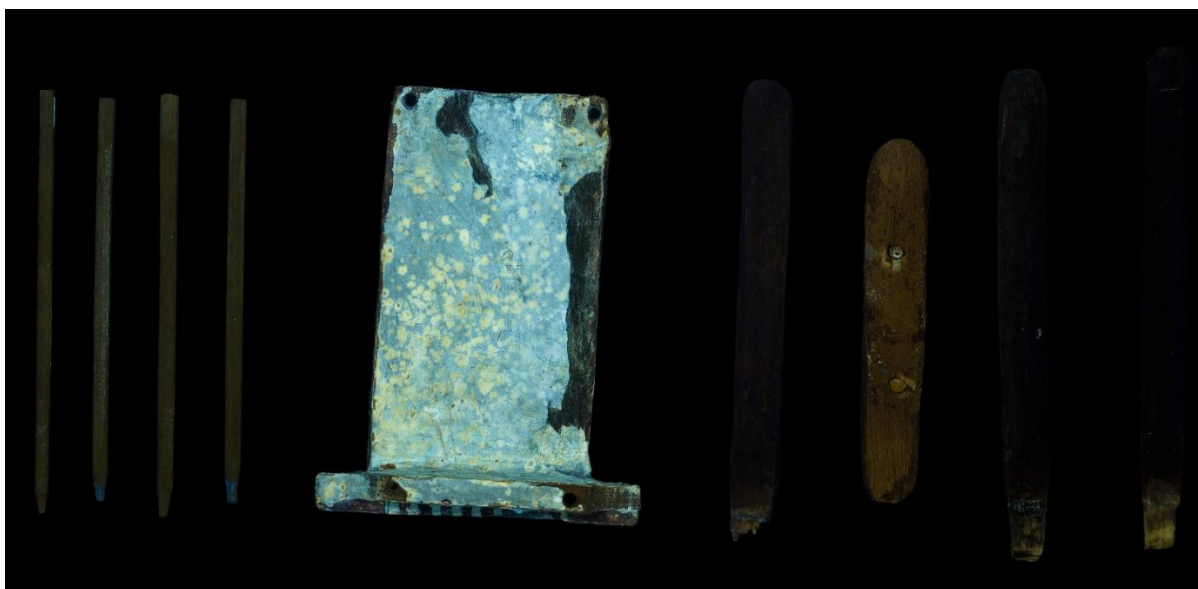
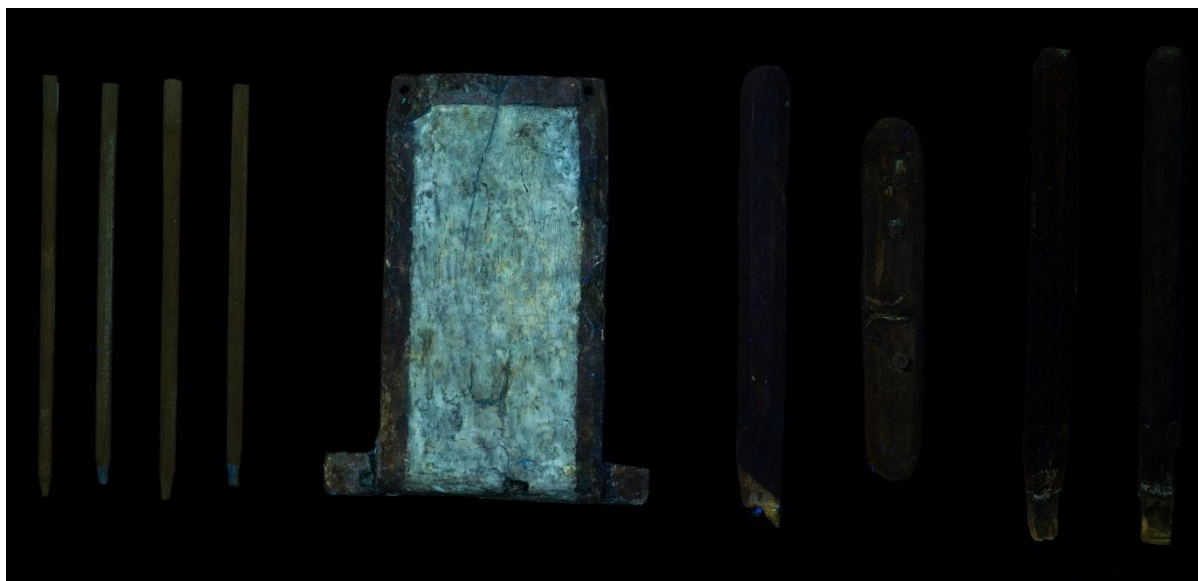


Boat 3 - False-colour visible-induced infrared luminescence (VIL-FC)

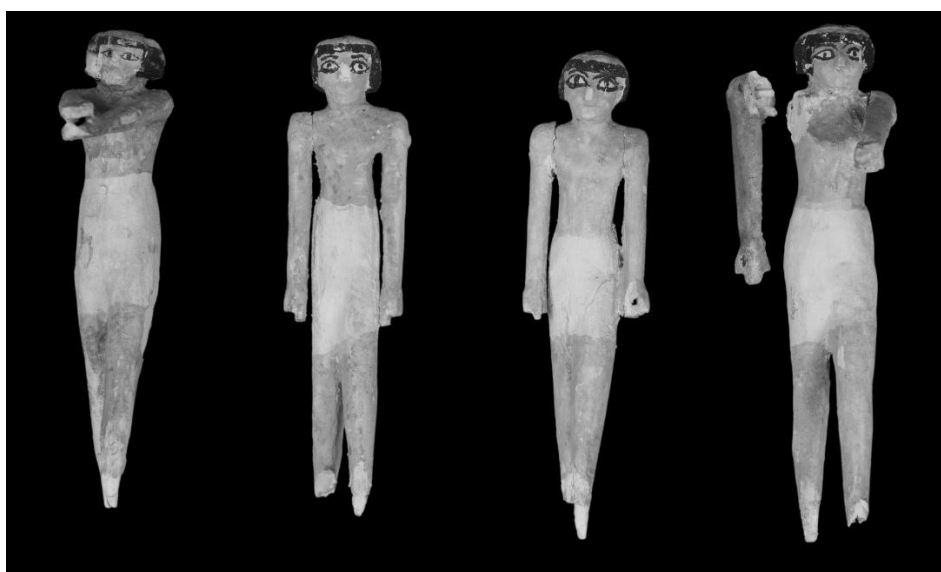
Boats erratic elements

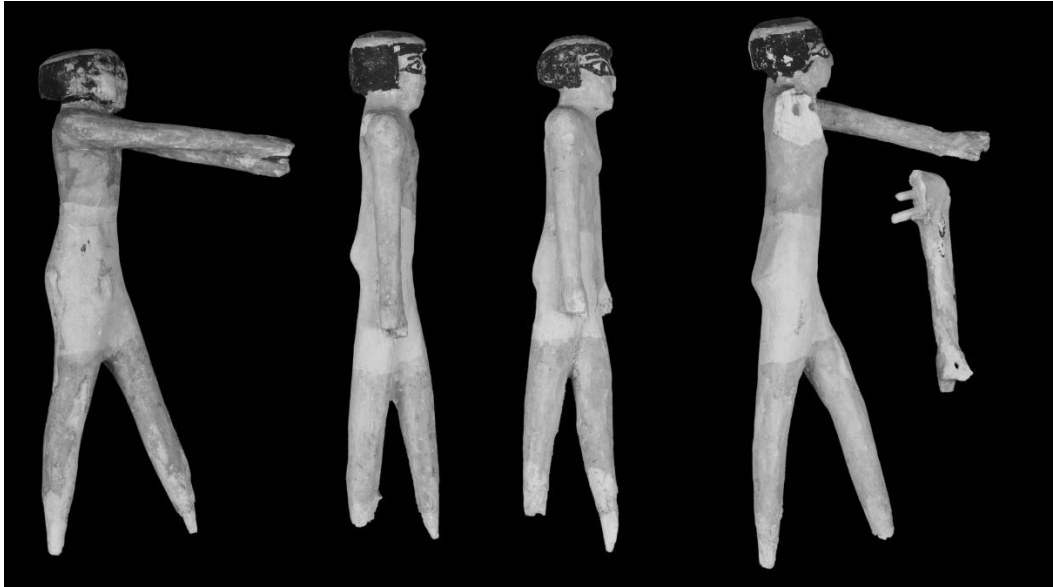






Boats erratic elements – Ultraviolet-induced visible fluorescence photography (UVF)







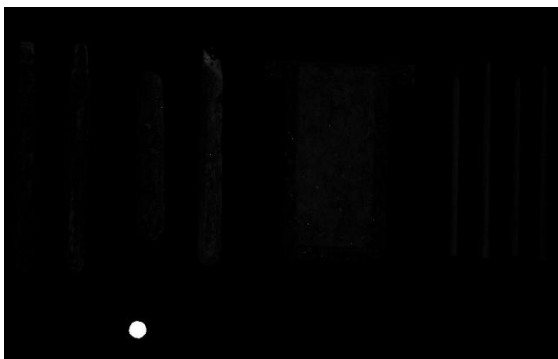
Boats erratic elements - Near-infrared reflectography (IRR-NIR)





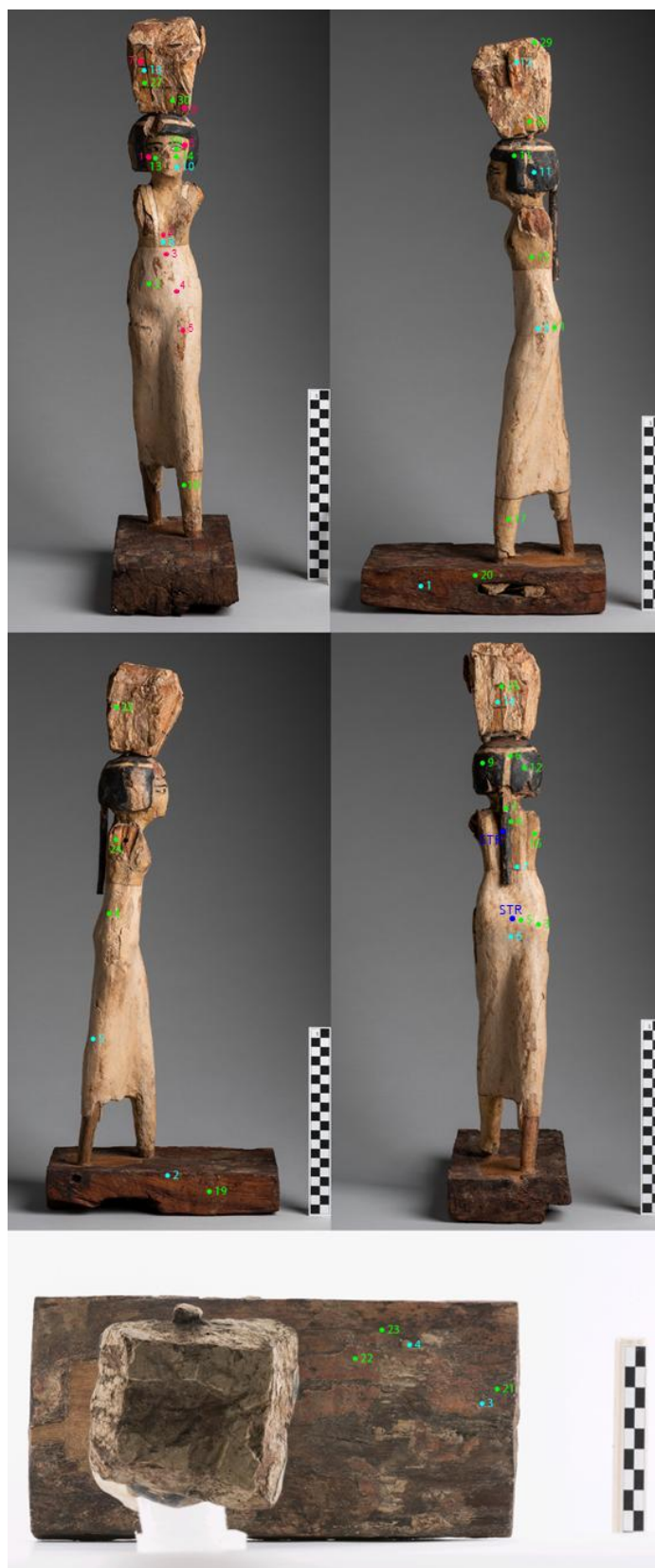


Boats erratic elements – False-colour infrared composites (IRFC-NIR)



Boats erratic elements – Visible-induced infrared luminescence (VIL)

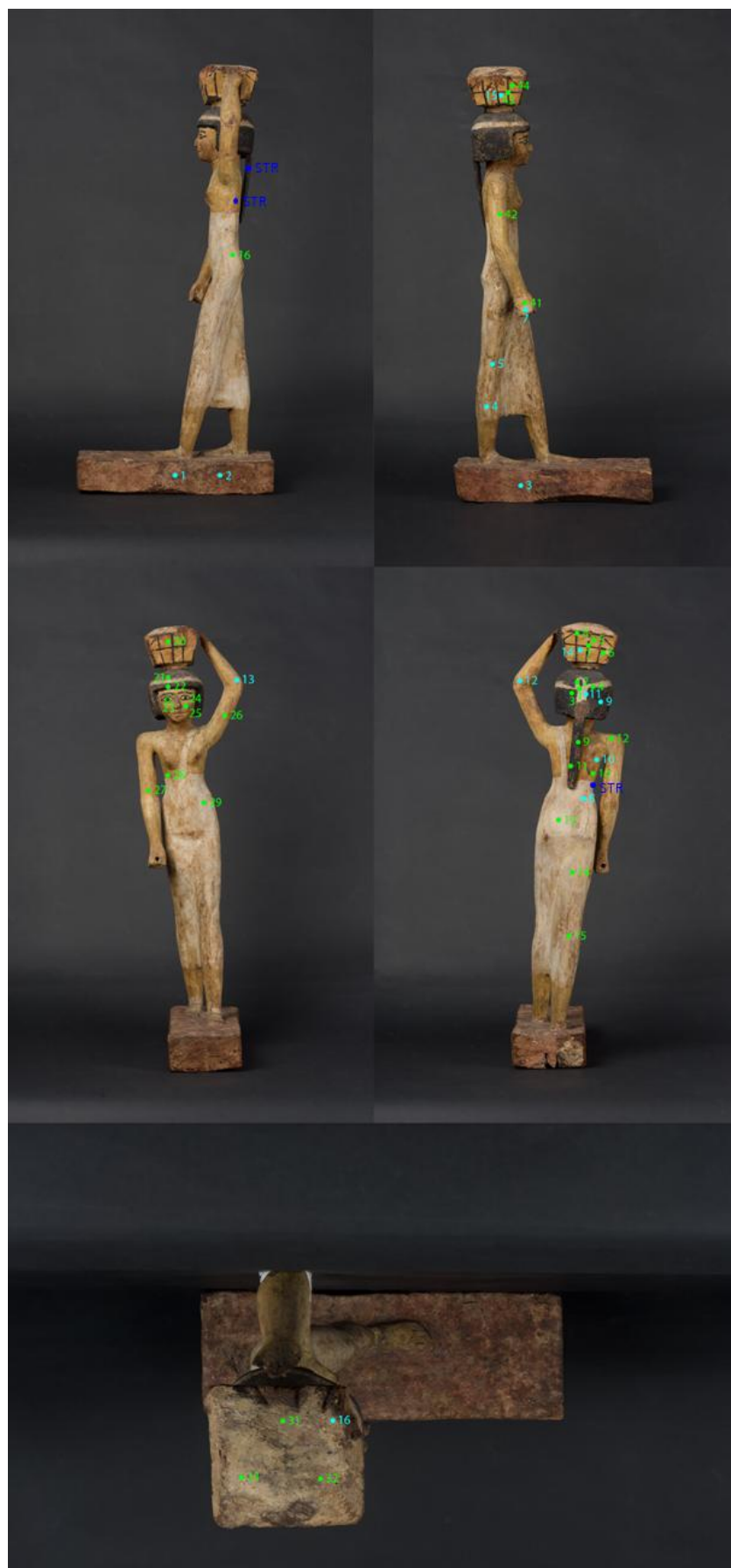
APPENDIX D – Painting layers analysis



Bearer A - Green: XRF THERMO Niton XL5 Plus portable spectrometer; Pink: Bruker ARTAX 200 Micro-EDXRF; Light blue: reflection FTIR; Blue: stratigraphic samples



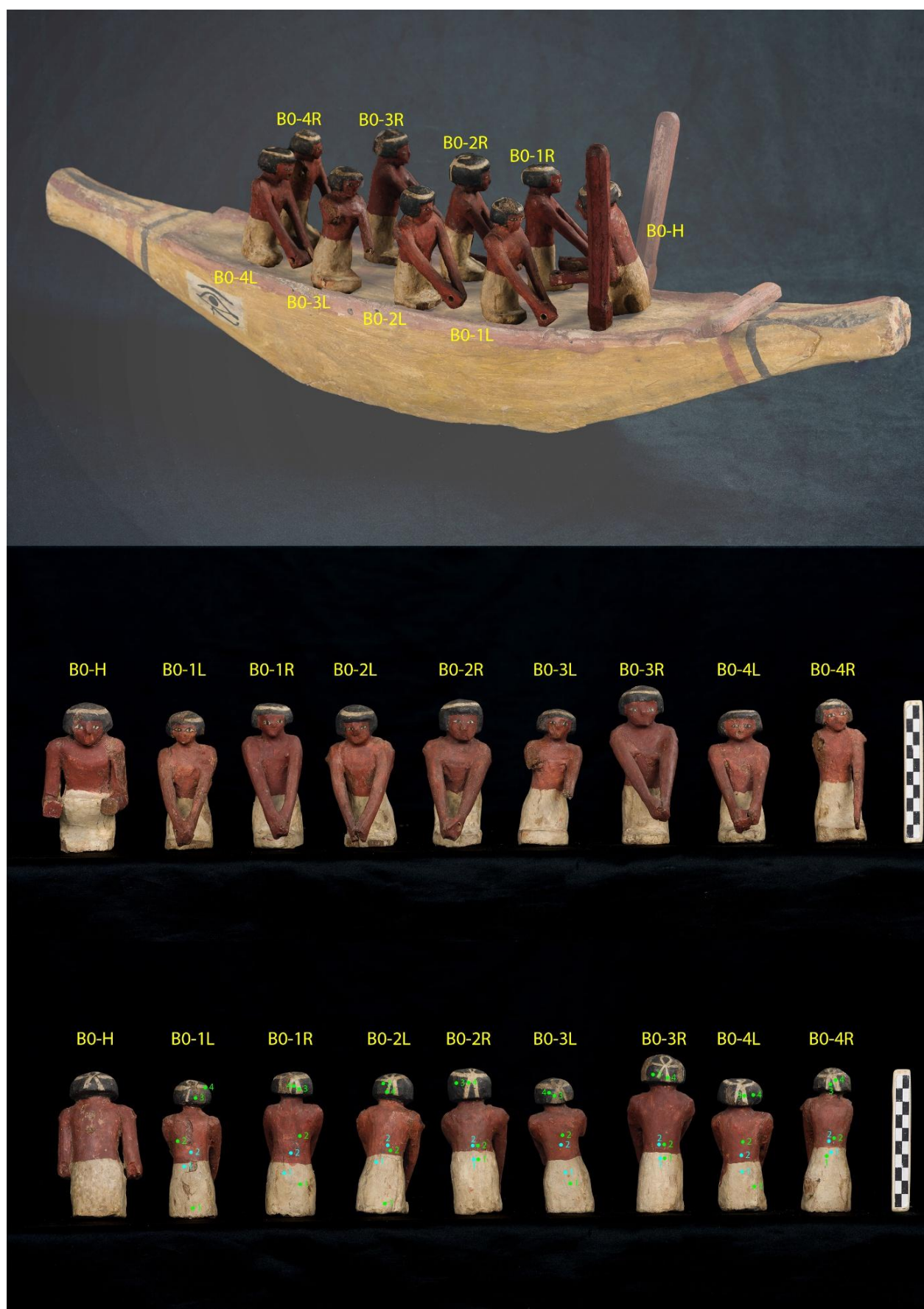
Bearer B - Green: XRF THERMO Niton XL5 Plus portable spectrometer; Pink: Bruker ARTAX 200 Micro-EDXRF; Light blue: reflection FTIR; Blue: stratigraphic samples



Bearer C - Green: Bruker ARTAX 200 Micro-EDXRF; Light blue: reflection FTIR; Blue: stratigraphic samples



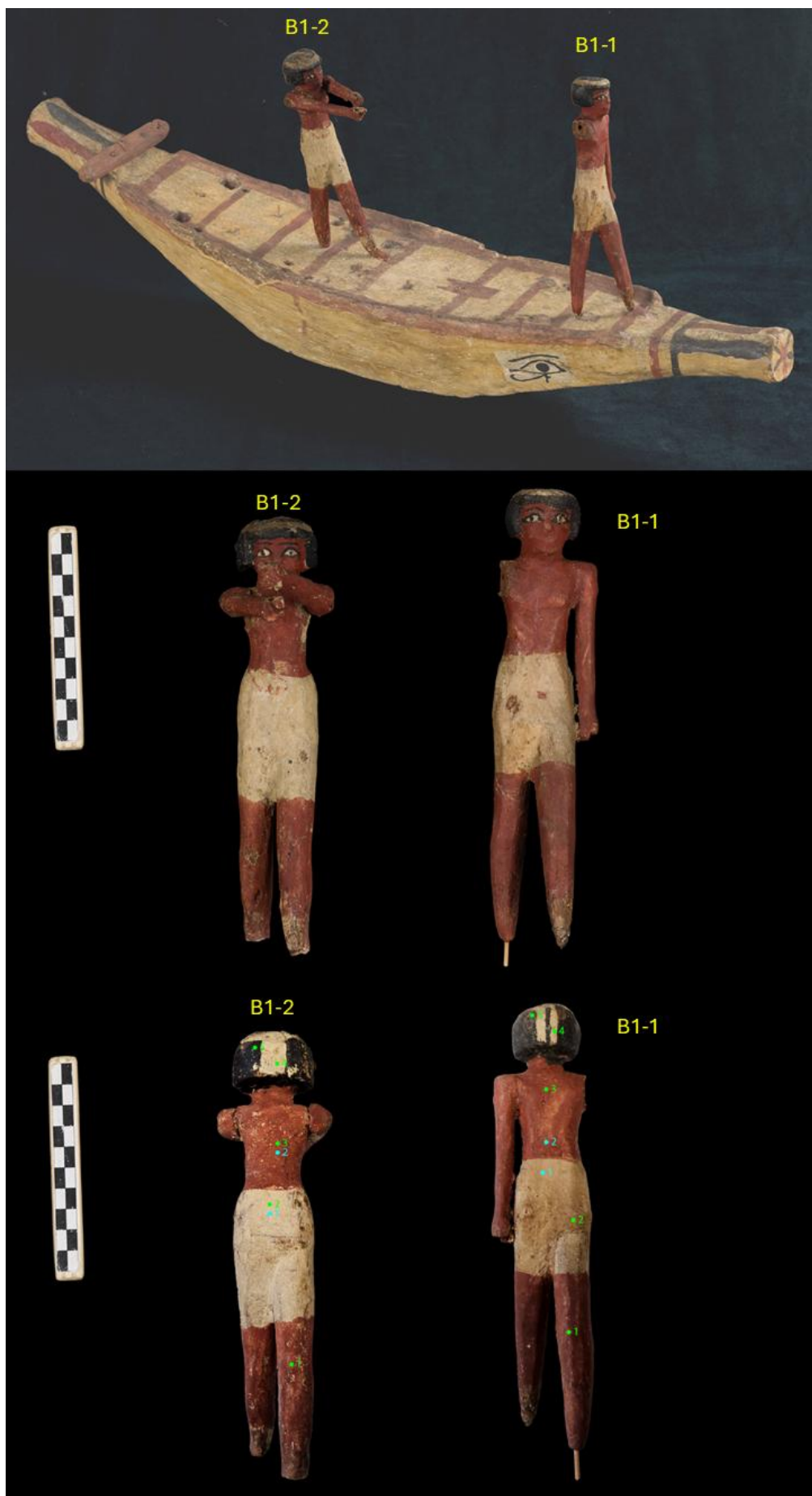
Boat 0 - Green: Bruker ARTAX 200 Micro-EDXRF; Light blue: reflection FTIR



Crew Boat 0 - Green: Bruker ARTAX 200 Micro-EDXRF; Light blue: reflection FTIR



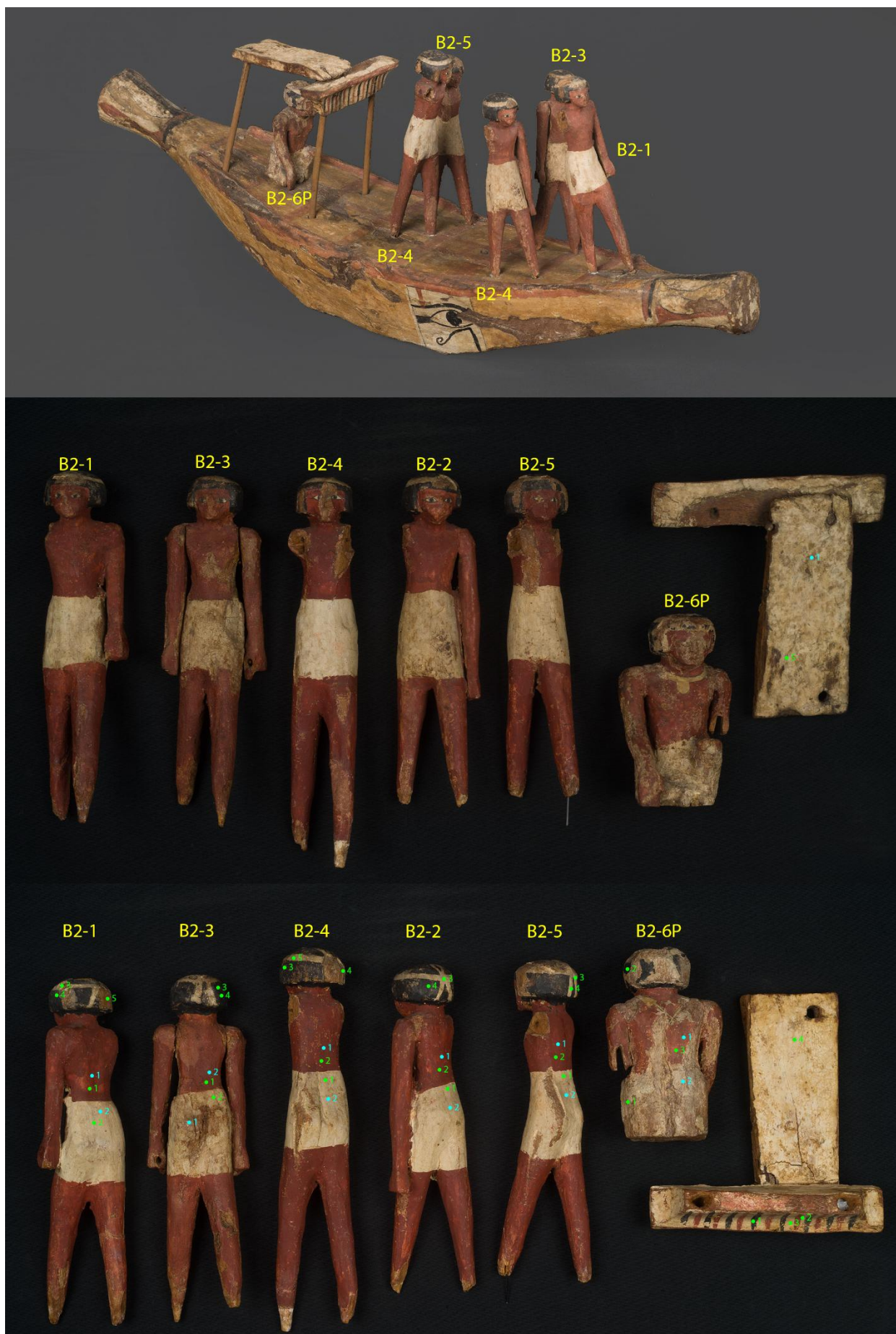
Boat 1 - Green: Bruker ARTAX 200 Micro-EDXRF; Light blue: reflection FTIR



Crew Boat 1 – Green: Bruker ARTAX 200 Micro-EDXRF; Light blue: reflection FTIR



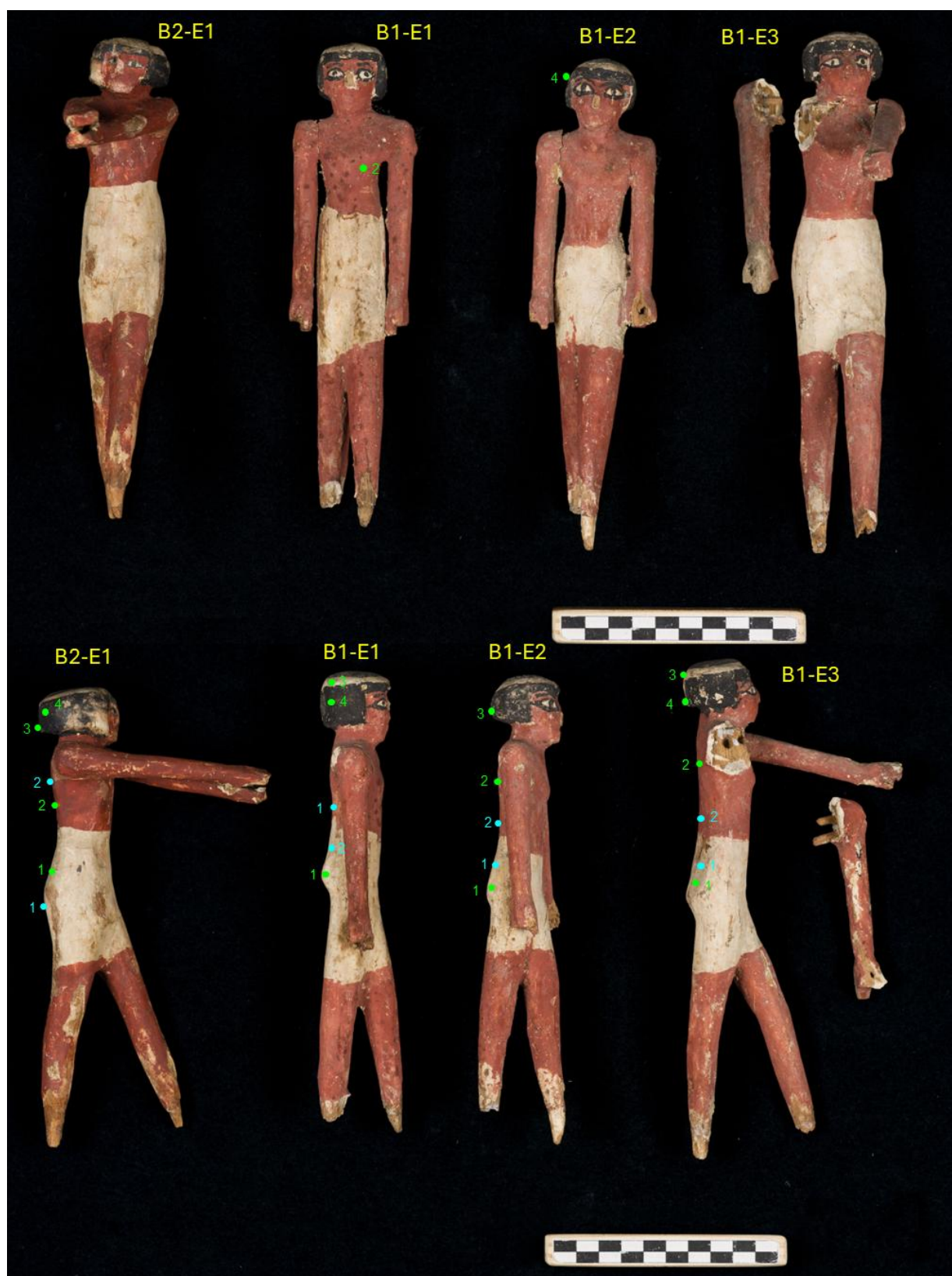
Boat 2 - Green: Bruker ARTAX 200 Micro-EDXRF; Light blue: reflection FTIR



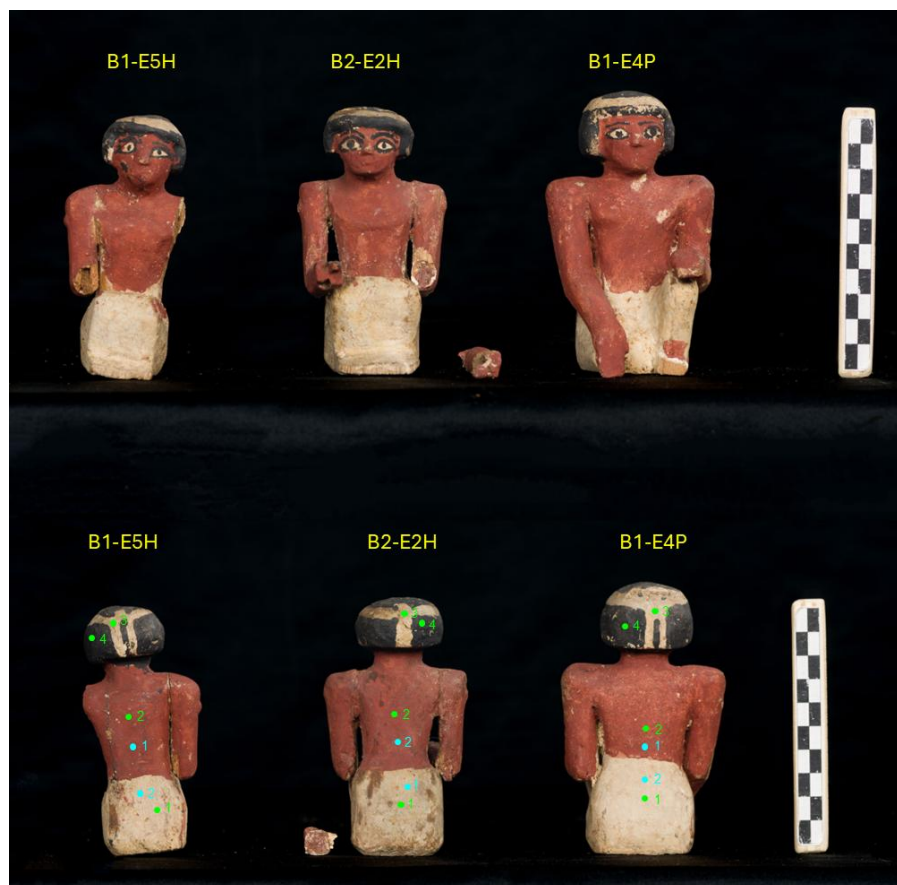
Boat 2 - Green: Bruker ARTAX 200 Micro-EDXRF; Light blue: reflection FTIR



Boat 3 – Boat 1 - Green: Bruker ARTAX 200 Micro-EDXRF; Light blue: reflection FTIR



Erratic figures - Green: Bruker ARTAX 200 Micro-EDXRF; Light blue: reflection FTIR



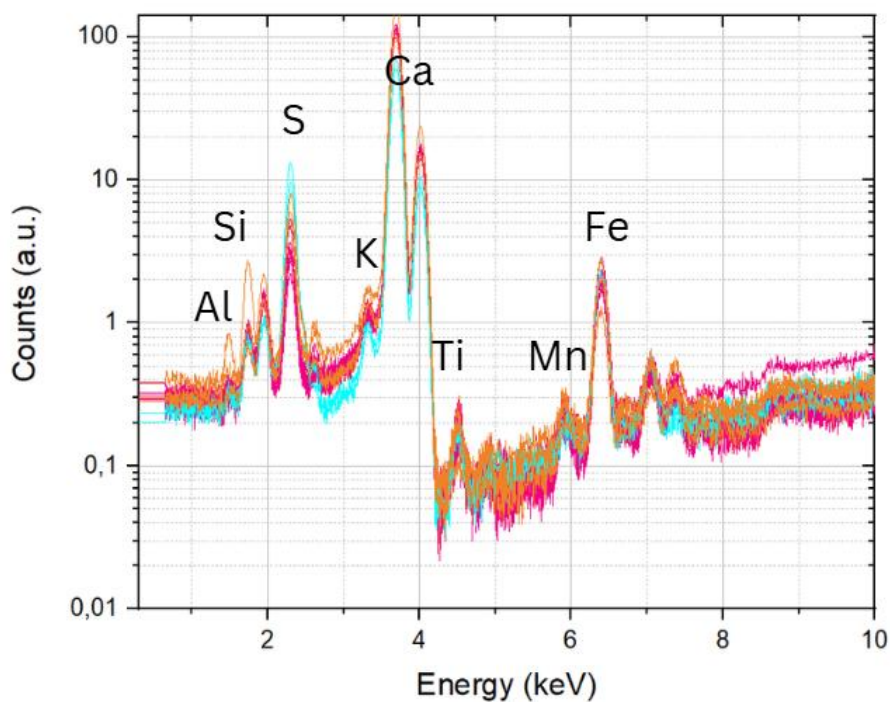
Erratic figures - Green: Bruker ARTAX 200 Micro-EDXRF; Light blue: reflection FTIR



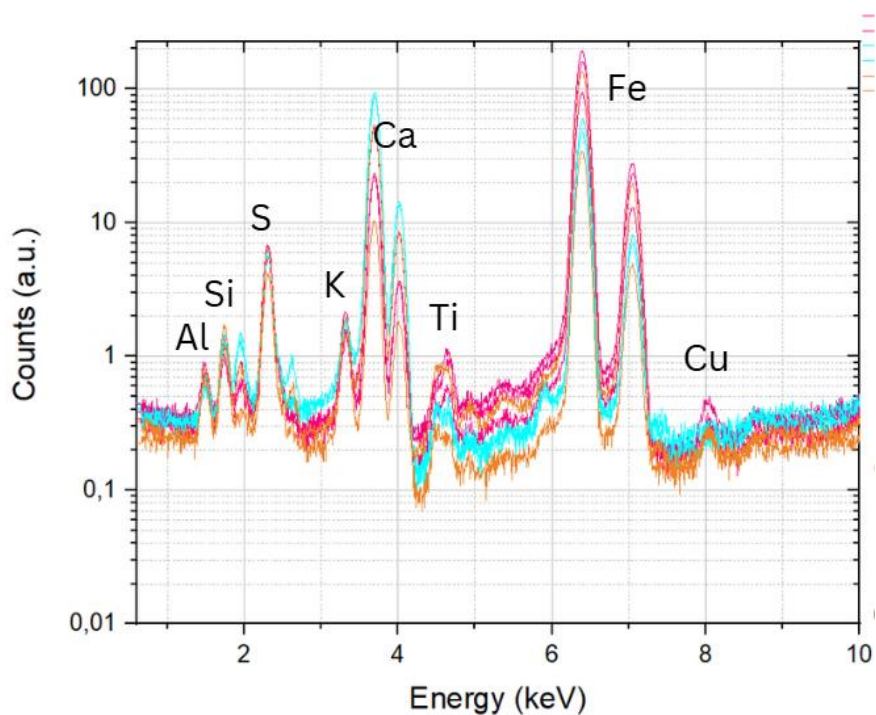
Other elements - Green: Bruker ARTAX 200 Micro-EDXRF; Light blue: reflection FTIR

XRF spectra

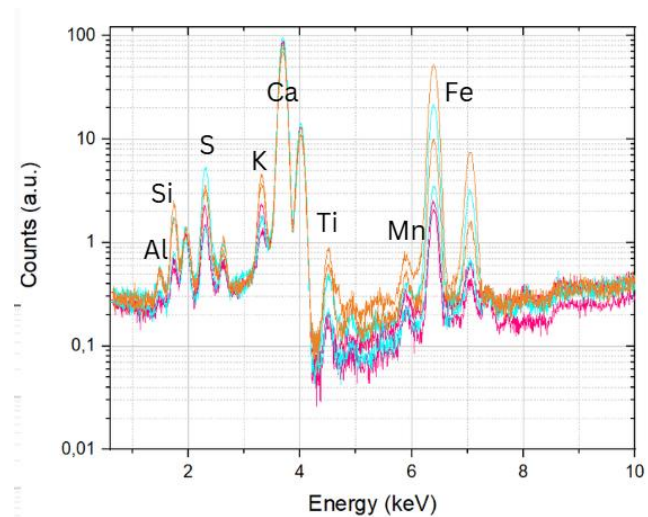
The following tables present selected examples of XRF spectra considered representative of the analysed materials. The complete dataset, including all acquired measurements and associated metadata, is available in the dedicated repository at: [10.5281/zenodo.18806563](https://zenodo.org/record/1880656)



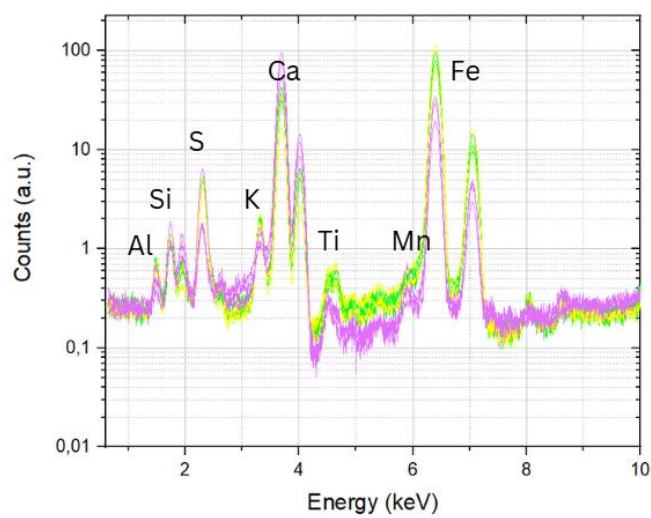
White layer: Bearer A (light blue), Bearer 2 (orange), Bearer C (pink)



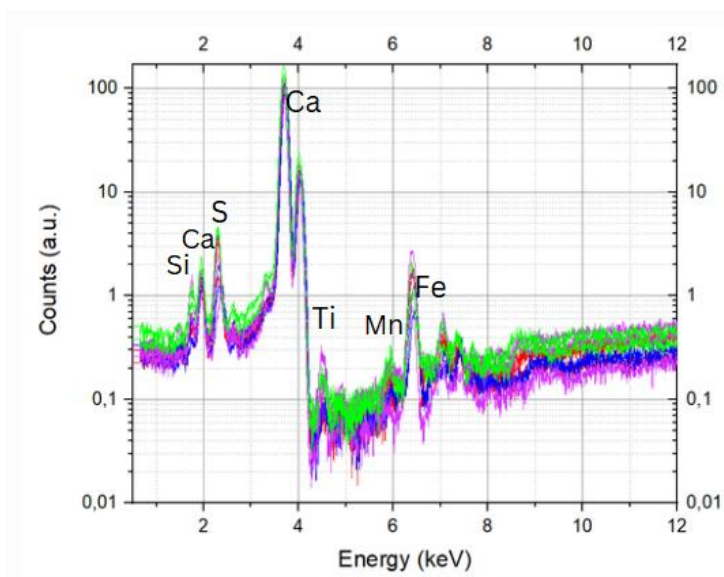
Yellow pigment: Bearer A (light blue), Bearer 2 (orange), Bearer C (pink)



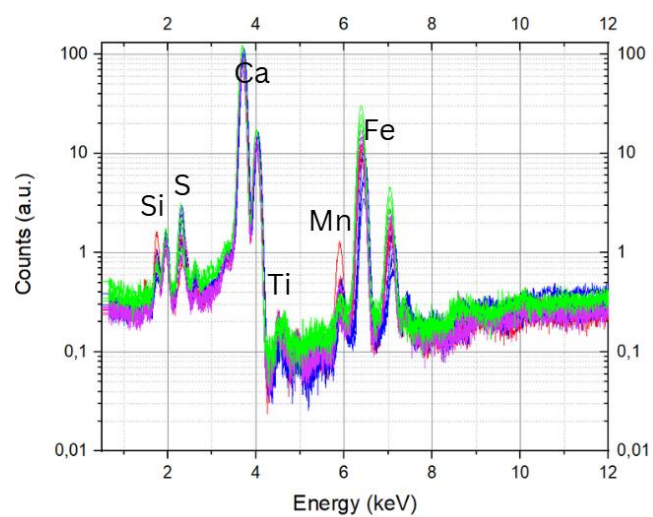
Black pigment: Bearer A (light blue), Bearer 2 (orange), Bearer C (pink)



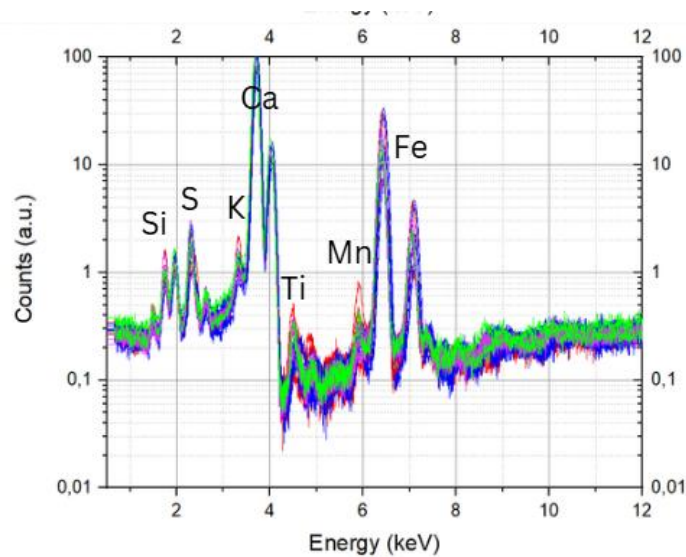
Yellow pigment: Bearer A (violet), Right arm (green), Left arm (yellow)



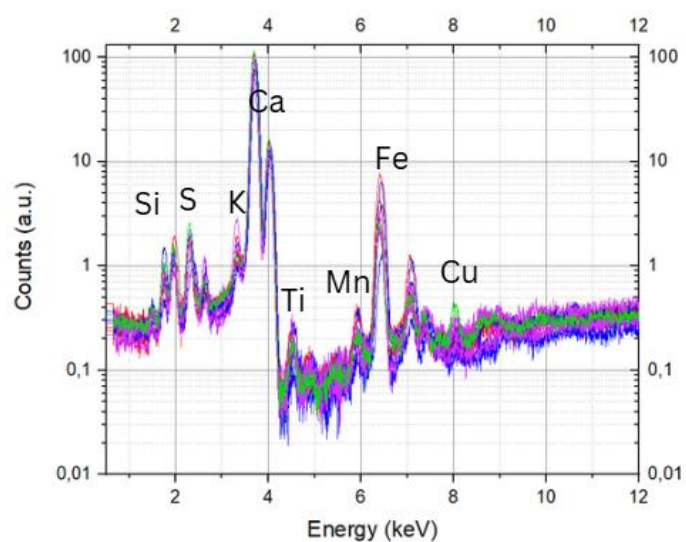
Ground layer: Boat 0 (red), Boat 1 (blue), Boat 2 (violet), Boat 3 (green)



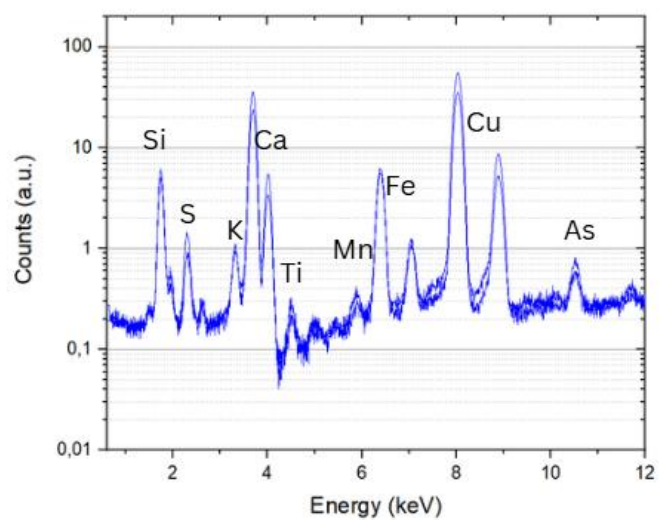
Yellow pigment: Boat 0 (red), Boat 1 (blue), Boat 2 (violet), Boat 3 (green)



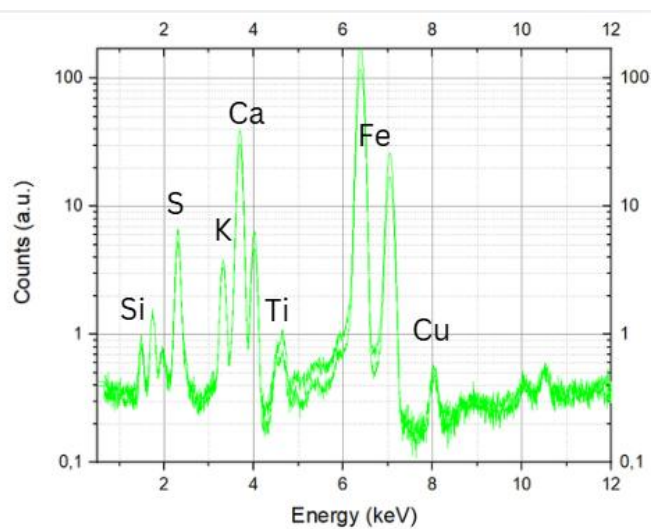
Red pigment: Boat 0 (red), Boat 1 (blue), Boat 2 (violet), Boat 3 (green)



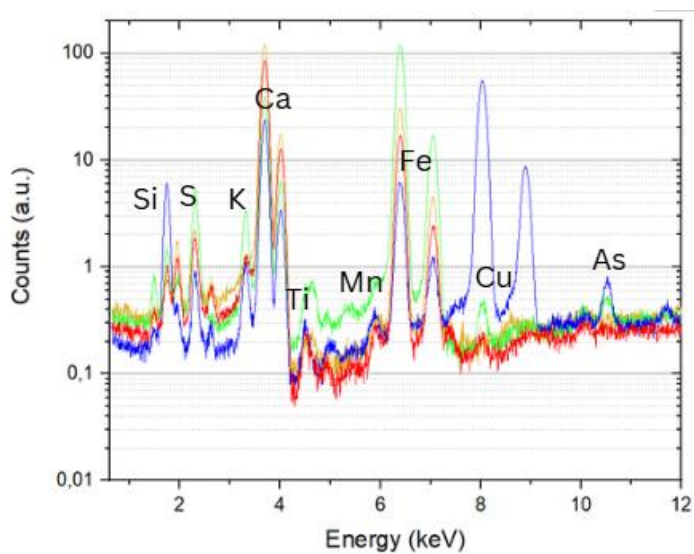
Black pigment: Boat 0 (red), Boat 1 (blue), Boat 2 (violet), Boat 3 (green)



Blue pigment: Boat 3 (blue)



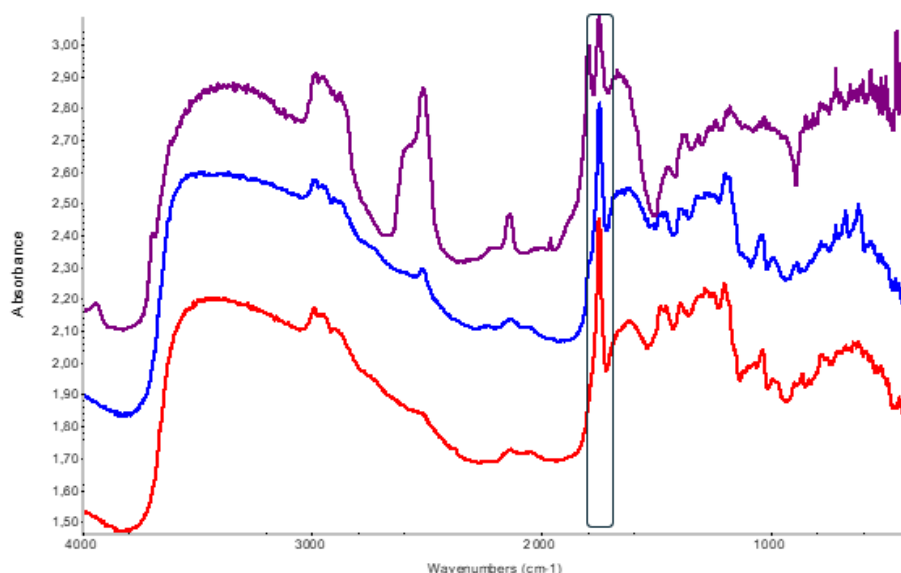
Brown pigment: Boat 3 (green)



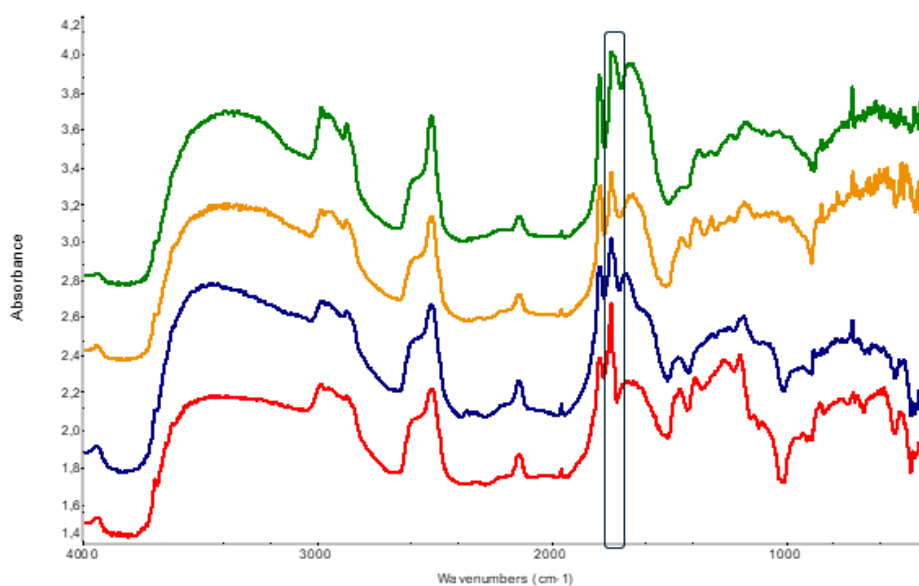
Boat 3: Blue (blue); Red (red); Yellow (yellow); Brown (green)

FTIR spectra

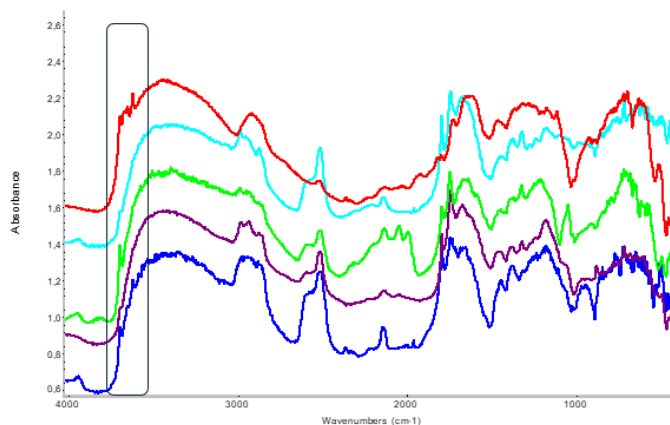
The following tables present selected examples of FTIR spectra considered representative of the analysed materials. The complete dataset, including all acquired measurements and associated metadata, is available in the dedicated repository at: [10.5281/zenodo.18806648](https://doi.org/10.5281/zenodo.18806648)



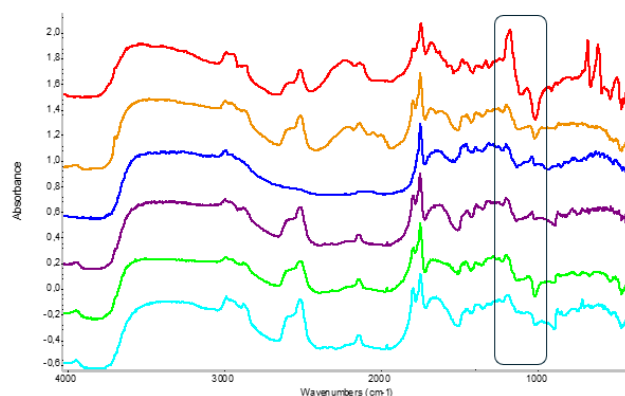
Offering-bearers – spectrum A/2 (red), B/1 (blue), C/2 (violet). The boxed area highlights the absorption band attributable to Paraloid B72, corresponding to the asymmetric stretching vibration of the carbonyl group (C=O)



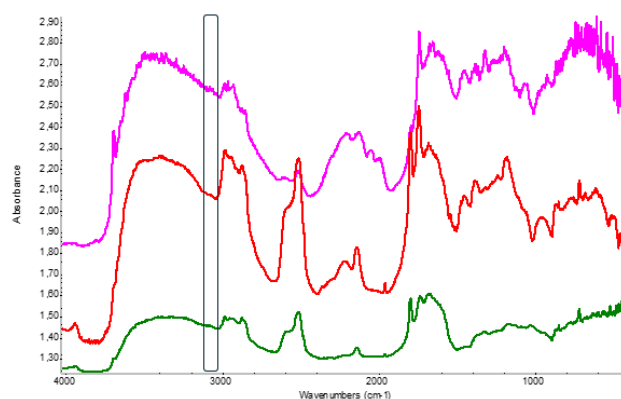
Boat models – spectrum B0/8 (red), B1/9 (blue), B2/12 (orange), B3/14 (green). The boxed area highlights the absorption band attributable to Paraloid B72, corresponding to the asymmetric stretching vibration of the carbonyl group (C=O)



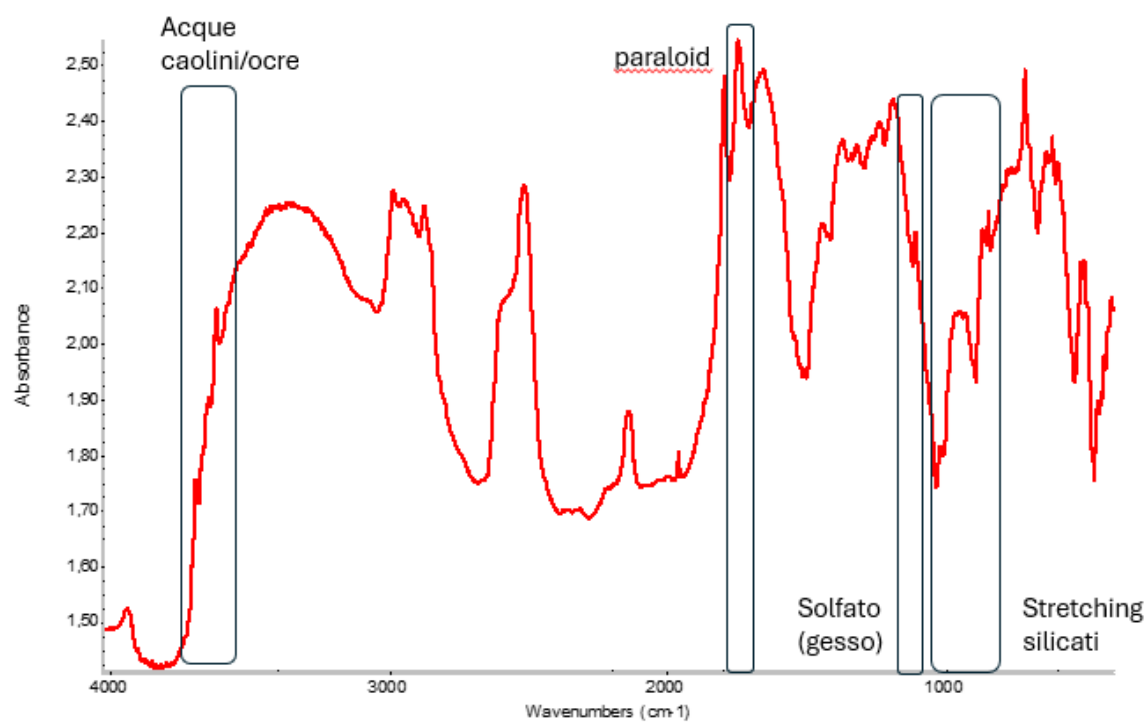
Red and yellow ochre – spectrum Bearer A/10 (blue), Bearer B/9 (violet), Bearer C/14 (green), B0/5 (light blue), B1/7 (red). The boxed area highlights the absorption bands of kaolinite associated with coordinated water



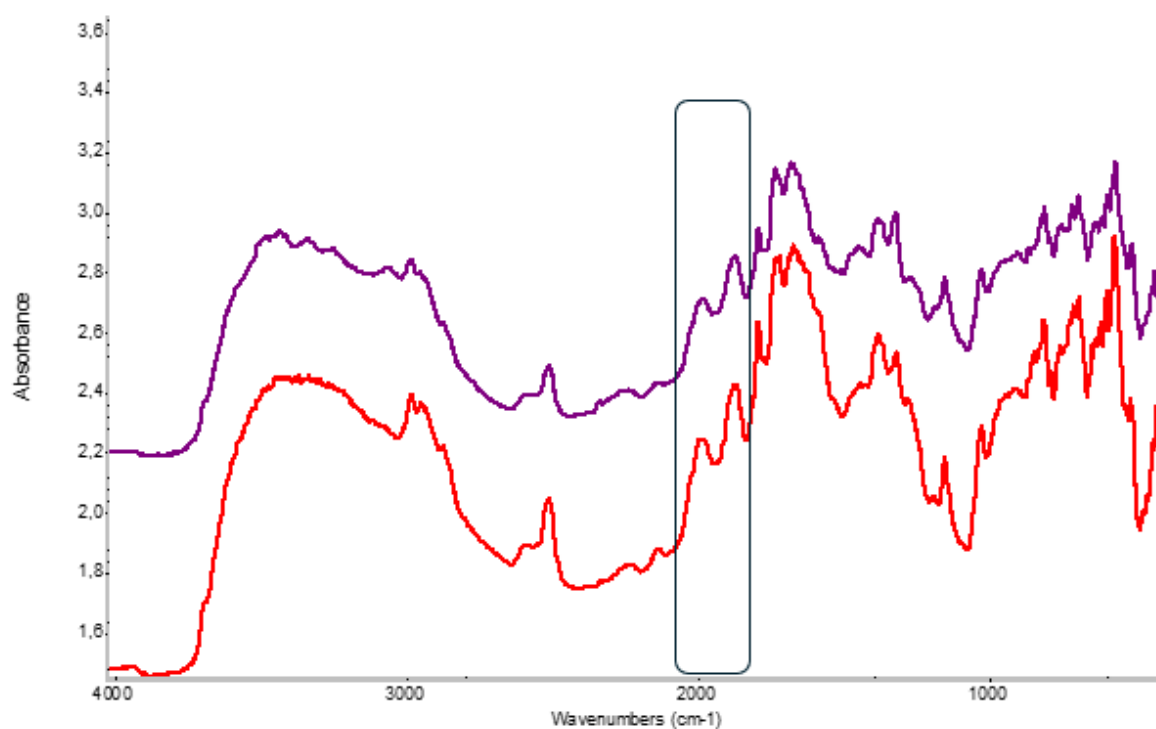
Gypsum – spectrum Bearer A/6 (light blue), Bearer B/10 (green), B0/11 (violet), B1/10 (blue), B1-1/1 (orange), B1-E5H/1 (red). The boxed region highlights the absorption band of gypsum, corresponding to the asymmetric stretching vibration of the sulphate ion



Proteins – spectrum A8 (green), B5 (red), C8 (pink). The boxed area indicates a band attributable to proteinaceous material, interpreted as an overtone of the Amide I vibration



Erratic canopy S14828/16

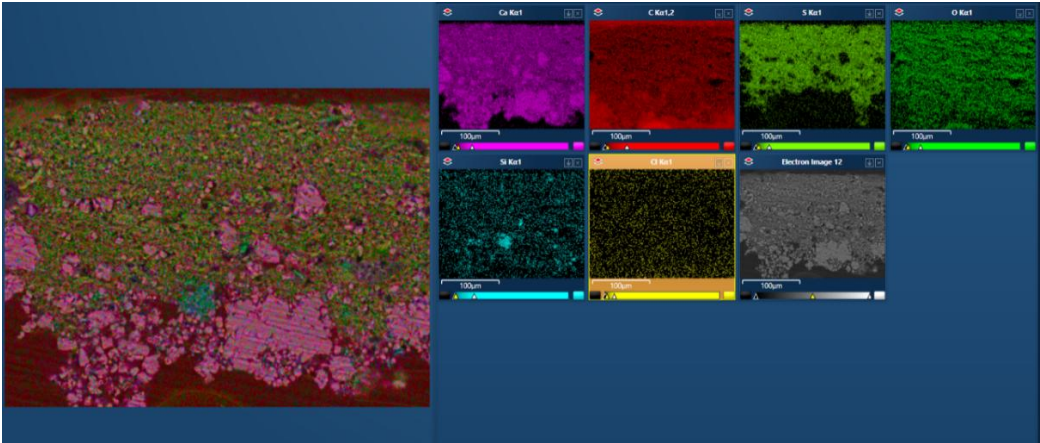


Egyptian blue – spectrum B3-6 (red), B3-11 (violet)

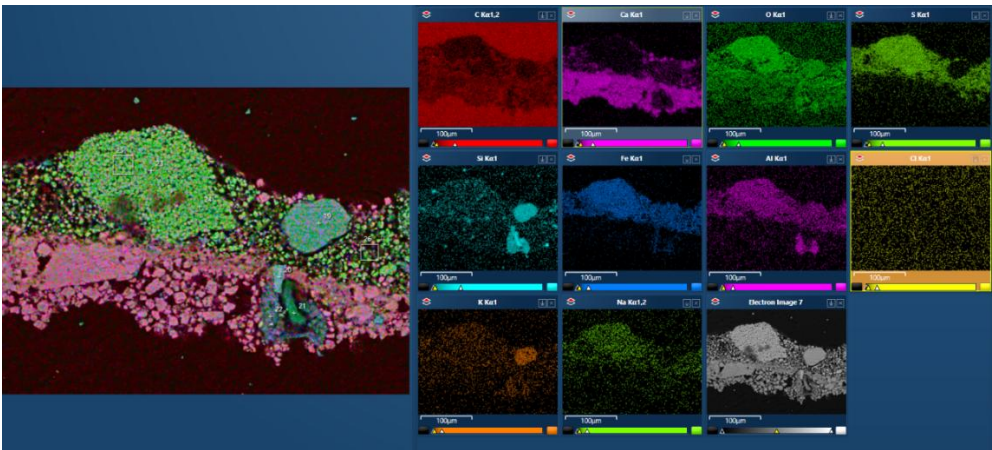
The boxed area indicates the characteristic absorption features of Egyptian blue (cuprorivaite, $\text{CaCuSi}_4\text{O}_{10}$), including the Si–O stretching vibrations and related overtone bands of the silicate framework

SEM maps

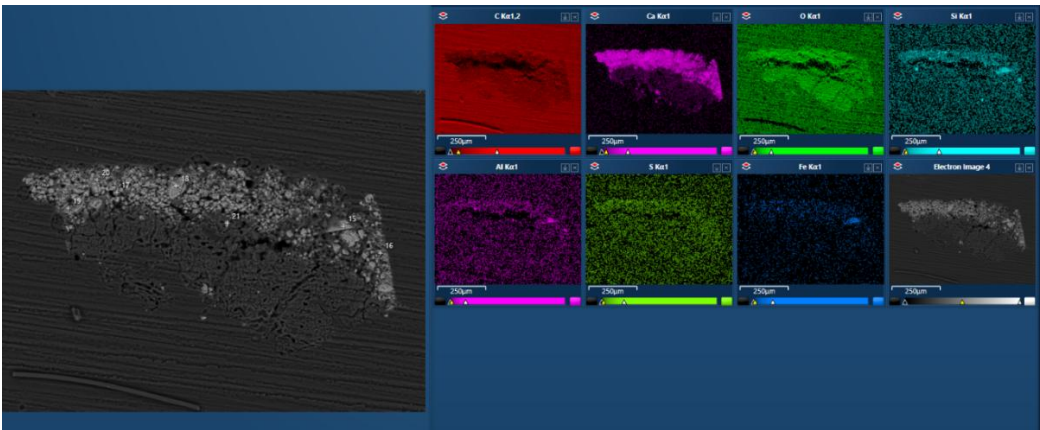
The following tables present selected examples of SEM maps considered representative of the analysed materials. The complete dataset, including all acquired measurements and associated metadata, is available in the dedicated repository at: [10.5281/zenodo.18807229](https://zenodo.org/record/18807229)



Bearer A – White (dress)



Bearer B – White (dress)



Bearer C – White (dress)

APPENDIX F – Micro-tomography and wooden identification

Among the most intriguing aspects to investigate in the reconstruction of ancient artistic techniques are the materials employed. The selection of specific materials, their nature and provenance, provide valuable insight not only into the technical and artisanal skills of the craftsmen but also into broader questions concerning the natural resources available and the trade relations maintained in the region of production. In this regard, the identification of the wood type used for the fabrication of these sculptures represents a crucial step in reconstructing their production history. Consequently, one of the key objectives of this study concerns the identification of the wooden species employed.

It is important to note that not all sculptures were necessarily made from the same wood species, and that each object consists of multiple wooden blocks assembled. This also implies that, within the same artefact, individual blocks or joining elements might have been produced using different types of wood. Furthermore, many of these components are concealed from view, either hidden beneath decorative layers or, in the case of joining elements, embedded within the internal structure.

The most common methods of wood identification is the macroscopic approach, which is rapid and non-invasive but qualitatively uncertain, based on the direct observation of the material through visual inspection or low-magnification lenses; the traditional micro-analytical approach is highly accurate, but constrained by the need for sampling, requiring specialists to obtain a specimen of at least 1 mm³, extracted following the correct fibre orientation for microscopic observation; and finally, the increasingly adopted tomographic approach, which allows for macroscopic or microscopic identification through computed tomography, combining non-invasiveness with high resolution, though it demands complex infrastructure and interdisciplinary expertise.

Conducting a study on the wood species, while accounting for the complexity of the artefacts and their conservation requirements, as well as the advantages and limitations of the available techniques, proved to be a challenging task. The first steps in this regard involved consulting wood technologists at the Department of Agricultural, Forest and Food Sciences of the University of Turin. A review of the state of the art was first of all undertaken. Despite the fact that it was not conceived as being exhaustive, the present review aimed to evaluate all potential methodologies with a greater degree of awareness.

At the macroscopic level, visual analysis and identification by the naked eye or with a hand lens represent the first diagnostic approach, based on the observation of general characteristics such as weight, colour, defects, porosity, grain pattern, and the presence of visible rays. The primary benefit of this method is that it is entirely non-invasive and can be carried out *in situ*, even on museum objects or artefacts of high historical value. However, it should be noted that certain difficulties may arise during the visual inspection of the wooden material, such as the presence of dyes, varnishes, or, as in the present case, a pictorial layer. This problem is frequently challenging to resolve. However, in certain instances, it is possible to rely on the inspection of lacunose areas or the underside of the

base, which was often undecorated. Consequently, a visual analysis can be conducted, even if not necessarily exhaustive for all the wooden blocks used in the construction. However, this method does not allow access to the wooden elements inside the structure. In general, the microscopic method is considered to be more precise than the macroscopic method. This is because it is often challenging to distinguish between species, or even genera, based solely on macroscopic characteristics.

A second critical issue pertains to the fact that, given the non-invasive nature of this method and its relative simplicity, the identification is sometimes undertaken not by specialists in the field, but by other categories of scholars, including archaeologists, conservators, or carpenters. Although these are professionals generally accustomed to observing wooden materials and therefore possess relevant expertise, their assessments are often less reliable and precise than those of wood technologists. The latter are specifically trained in wood identification and have access to more appropriate tools and knowledge. For this reason, a problematic aspect in consulting the technical literature is the tendency to report the wood species of the analysed artefacts without specifying the method of identification. Moreover, when the analysis is conducted on a macroscopic level, there is an absence of indication regarding the specialist responsible for the identification or the main diagnostic features that led to such an attribution.

A significant example of the application of this methodology is represented by the WoodScope project (Crivellaro et al. 2025), which developed an interdisciplinary workflow for the identification of Egyptian woods through the observation of macroscopic morphological features and the integration of historical and museological data. This approach allows preliminary screening to narrow down the possible species, although its effectiveness may be limited by reduced diagnostic resolution, intra-specific variability, and morphological convergence among different genera. These factors that complicate definitive attribution, particularly in cases involving altered or pigmented woods. Nevertheless, it constitutes an essential phase of the identification process, useful for distinguishing artefacts that can be classified more readily from those requiring targeted analytical investigations, potentially involving micro-sampling and microscopic analyses.

The next level of investigation is represented by micro-anatomical analysis with sampling, which remains the traditional reference technique for the scientific determination of wood species. As highlighted by (Wiedenhoeft 2006), optical microscopy on thin sections facilitates the precise recognition of cellular characteristics (vessel arrangement, parenchyma type, rays, ornamentation) and their comparison with reference collections, thereby enabling accurate identification at the genus level. However, the structure of the wood itself imposes insurmountable biological limits. Within the same genus, there exists anatomical variability that is comparable to that observed between different species, thereby rendering species-level determination frequently unfeasible. As demonstrated in the study by Geweely et al. (Geweely et al. 2023), the presence of these constraints is evident. The integration of optical and SEM microscopy with FTIR and XRD analyses enabled the identification of several species, including *Vachellia nilotica*, *Ficus sycomorus*, *Tamarix* spp. and *Cedrus* sp., in three Egyptian artefacts. This identification was made possible through micro-destructive sampling (2 mm³). Despite the fact that the results are extremely detailed, extending even to the evaluation of cellular degradation and cellulose

crystallinity, the method remains invasive and limited in its applicability to objects of high historical or ritual value, small dimensions, or to wooden components located within the structure where sampling is not permissible.

Finally, the most recent research based on X-ray microtomography (μ CT) represents an evolution towards a fully non-invasive diagnostic approach, capable of observing the wood microstructure in three dimensions without any physical alteration of the artefact. Recent studies conducted by a Belgian research group, composed mainly of scholars from the Royal Museum for Central Africa and Ghent University (Genbrugge et al. 2024; Dierickx et al. 2025), have demonstrated that, with resolutions between 3 and 8 μ m, it is possible to distinguish most of the diagnostic features codified in the IAWA lists, including vessel arrangement, parenchyma, and ray morphology. These studies also show that reliable identifications can be achieved up to the genus level or, in some cases, to the species level. Moreover, μ CT analysis offers unique advantages, including the possibility of virtually navigating within the wooden volume, observe internal regions that are inaccessible under the microscope, and detect structural defects or mineralised inclusions. However, the technique is also subject to certain operational constraints, which are related to both instrumental resolution, which must balance detail and field of view, as highlighted by Genbrugge et al., and to the interpretative complexity of three-dimensional images, which requires specific anatomical expertise and access to calibrated reference datasets. Since this is still a relatively recent research field, such datasets are not yet easily available.

In conclusion, recent studies (Haag et al. 2023) have indicated a growing trend towards the integration of μ CT and artificial intelligence, with the development of automated pipelines for species classification based on volumetric patterns. This development has the potential to pave the way for an objective and reproducible digital identification process. Nevertheless, in this instance too, the availability of representative volumetric databases suitable for AI training remains a limiting factor. Additional constraints of this technique, not yet mentioned, concern the availability of funding, facilities, and personnel required for the acquisition of microtomographic images, as well as the management and storage of the vast amount of data produced by such acquisitions. Indeed, at these resolutions, the scanning of objects larger than a few tens of cubic centimetres can easily generate outputs amounting to hundreds of gigabytes.

As demonstrated in this brief and non-exhaustive review, it is evident that wood diagnostics in the historical and archaeological field offer a variety of possibilities for species identification. However, the selection of the most suitable method depends not only on the analytical objective, but also on the historical value, state of preservation of the artefacts, and technological availability. This methodological framework delineates a clear description of the specific effectiveness of each approach within its respective boundaries.

Across all these approaches, the crucial role played by two factors in particular can be observed: the existence of comprehensive, effective, and reliable databases, and the subsequent communicative precision in the dissemination of results.

In light of these methodological considerations, the present study adopted a deliberately cautious and conservation-oriented strategy. Given the historical value and structural complexity of the sculptures examined, no micro-destructive sampling was undertaken.

Wood identification was therefore approached primarily at the macroscopic level, through direct visual inspection of accessible areas. In addition, the acquired computed tomography datasets were also exploited to enhance macroscopic assessment. Although the voxel resolution of these scans was not specifically calibrated for micro-anatomical investigation, the tomographic volumes nevertheless permitted the observation of internal structural features, growth patterns, density variations, and the morphology of concealed wooden elements. In this sense, CT imaging functioned as an extension of macroscopic analysis into otherwise inaccessible areas of the artefacts, enabling a more comprehensive evaluation of timber selection across different blocks and joining elements.

At the same time, an exploratory parallel study was initiated with the aim of assessing the feasibility of high-resolution microtomography for wood identification in Egyptian contexts. Small reference samples of known species (e.g. *Buxus* sp.) were scanned at resolutions compatible with the requirements of wood anatomists, in order to evaluate the visibility of diagnostic cellular structures and the practical limits imposed by field of view, scanning time, and data size. This preliminary phase was conceived not as a definitive identification campaign, but as a methodological testbed.

Should these experimental acquisitions prove sufficiently diagnostic, the long-term objective would be the progressive construction of a volumetric reference dataset of selected wood species relevant to the Egyptian material repertoire. Such a database could, in the future, support comparative analyses. Subsequent validation on archaeological artefacts would concern analytical resolution and data management.

Crivellaro, Alan, Flavio Ruffinatto, Monika Zöller-Engelhardt, Alma Piermattei, e Tina Beck. 2025. «Wood under the Lens: Unveiling Ancient Egyptian Heritage». *Journal of Cultural Heritage* 74 (luglio): 138–47. <https://doi.org/10.1016/j.culher.2025.06.002>.

Dierickx, Sofie, Hans Beeckman, Ivan Josipovic, et al. 2025. «Bridging Technology and Culture: X-Ray μ CT-Based Wood Identification of Sub-Saharan African Heritage». *Journal of Cultural Heritage* 73 (maggio): 110–21. <https://doi.org/10.1016/j.culher.2025.03.001>.

Genbrugge, Siska, Sofie Dierickx, Hans Beeckman, Wannes Hubau, Pierre Kibleur, e Jan Van Den Bulcke. 2024. «Non-Destructive Wood Identification Using X-Ray μ CT Scanning: Which Resolution Do We Need?» *Plant Methods* 20 (1): 98. <https://doi.org/10.1186/s13007-024-01216-0>.

Geweely, Neveen, Amira Abu Taleb, Shimaa Ibrahim, et al. 2023. «New Data on Relevant Ancient Egyptian Wooden Artifacts: Identification of Wooden Species and Study of the State of Conservation with Multidisciplinary Analyses». *Archaeometry* 65 (1): 165–83. <https://doi.org/10.1111/arcm.12815>.

Haag, Volker, Jannik Stebani, e Tim L. Lewandrowski. 2023. «3D Microscopy and μ CT. Wood Identification Based on Volumetric Images». Seminar. Thünen Institute of Wood Research & Fraunhofer IIS Joint Seminar, settembre 14.

Wiedenhoeft, lex Charles. 2006. «The Limits of Scientific Wood Identification». *Professional Appraisers Information Exchange*, 16–22.

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