



RESEARCH ARTICLE

Chronologies and the Materiality of Time in Ancient Egypt

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Abstract

Since the earliest days of Egyptology, chronology has always been a key research topic. The past 200 years of chronological research have produced different approaches to assessing the progress of time in Ancient Egypt and how this reflects on the dating of places, monuments, and artefacts. This paper aims to draw attention to current issues with the dating of archaeological evidence in Egyptology, specifically to the problems with using historical chronology for dating material culture and archaeological evidence in the Nile Valley and Delta. It calls for the establishment of an independent relative chronology that is based on modern archaeological methods and archaeological science. In particular, the paper defines the concept of the 'materiality of time' for Egyptology and its potential for understanding material culture formation processes and for building a stronger chronological system that involves a combination of relative, historical, and absolute chronologies.

Keywords: material culture, relative chronology, archaeological science

التسلسل التاريخي والطابع المادي للوقت في مصر القديمة

الملخص

لطالما مثل التسلسل التاريخي موضوعاً بحثياً رئيسياً. حيث أبرز البحث التاريخي على مدار المائتي عام الماضية طرق مختلفة لتقييم تقدم الزمن في مصر القديمة وكيف ينعكس ذلك على تأريخ الأماكن والآثار والقطع الأثرية. إذ تهدف هذه الورقة البحثية إلى جذب الاهتمام إلى المشكلات الحالية المتعلقة بتأريخ الأدلة الأثرية في علم المصريات، خاصة المشكلات المتعلقة باستخدام التسلسل التاريخي في تأريخ الثقافة المادية والأدلة الأثرية في كل من وادي النيل والدلتا. كما تدعو إلى وضع تسلسل تاريخي نسبي مستقل يعتمد على المناهج الأثرية الحديثة والعلوم الأثرية. إذ تعمل أيضاً هذه الورقة البحثية بشكل خاص على تعريف مفهوم الطابع المادي للوقت في علم المصريات، وإظهار جهوده في فهم عمليات تكوين الثقافة المادية، إلى جانب جهوده في بناء نظام تسلسل تاريخي أقوى يتضمن مزيجاً من التسلسل الزمني النسبي والتاريخي والمطلق.

الكلمات الدالة: الثقافة المادية، التسلسل التاريخي النسبي، العلوم الأثرية

1 Introduction

Museums with ancient Egyptian collections are full of artefacts that cannot be readily dated because they were acquired on the antiquities market or excavated in the early days of Egyptian archaeology when excavators paid

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little attention to context and taphonomy. Unless such artefacts were beautiful objects, made of precious materials, or inscribed, they would hold little aesthetic or scientific value in and of themselves for many museum visitors. A museum label '*pottery vase, Qau, Old Kingdom*' will not trigger a great deal of emotional reaction even in most Egyptologists. And that is exactly the issue, because a major research problem is hiding in plain sight on this label.

How can a single pottery vessel possibly be dated to a period defined as 'Old Kingdom', especially when it comes from a multi-period provincial site like Qau in Middle Egypt? The viewer must assume that this dating is more than just a happy guess and that the curators have done an excellent job in comparing it with existing typologies or tracking down the acquisition history and archaeological context of this artefact, and that the excavator has left behind a comprehensive excavation journal and has recorded the context in multiple photographs, sketches and plans so as to ascertain the jar's precise taphonomic history and association with features and other artefacts. With the latter being the least likely option—given that the site was excavated and published almost 100 years ago—we must begin to ask: what is the basis for such a chronological assessment? What does the term 'Old Kingdom' actually signify for the chronology of an artefact? In order to address these questions, and to offer solutions, it is first necessary to consider the concept of chronology.

2 What is chronology?

Chronology is vital to establishing timelines of events and processes. It helps to relate objects or places to one another beyond a three-dimensional space of X, Y, and Z axes, i.e., to tell their 'age', whatever this term may mean, e.g. Bronze Age, Pyramid Age, 4700 BP. The terminology is indeed one of the most complex and challenging aspects of any chronological inquiry, and yet, it is essential to comprehend. The same can be said for its methodology.

Ancient Egyptian chronology is a complex web of several different concepts, sources, and methods. In this author's view, it is a Gordian knot that requires urgent untangling, because until now, chronological research in Egyptology has not yet achieved a satisfactory outcome, even after 200 years of intensive research and some 3500 related entries in the OEB database. As will be argued below, Egyptology has probably been much impeded by its own approach to chronology.

To illustrate this, it may be opportune to begin with the terminology of time, because there are indeed many ways to perceive time. In recognising the multiplicity of time, Gavin Lucas has identified an essential dichotomy and tension that is directly relevant to how historians and archaeologists conceive of time and chronology (LUCAS, 2004, 2021). This tension can be observed in a number of ways, e.g. between physical time and felt time, natural time and cultural time, or chronological time and narrative time. Chronological time is measured by physical and astronomical principles used to peg a point in time to an objective time scale and to determine duration. Narrative time is expressed using different criteria, notably descriptive labels that mark important events and their sequences, e.g. 'post-Amarna'. While such events may of course be regarded as broadly understood chronological dimensions, they are not necessarily applicable to every aspect of life or for every person in Ancient Egypt. What is considered an important event is also a matter of historical analysis, construction, and interpretation (i.e. it is usually in hindsight that an event or a period are defined as being of historical significance). Narrative time is rarely an objective means to determine a chronological relationship as it is always subject to perspective, context, relevance, and interpretation.

Modern archaeologists clearly distinguish between these concepts in defining two different kinds of chronology, namely absolute and relative. Absolute chronology is based on natural and chronological time, and it is measured by modern scientific, i.e. chronometric, methods such as radiocarbon (^{14}C) dating, which permits

dating of artefacts and contexts in relation to an absolute time scale. Conversely, cultural or narrative time in modern archaeology is usually determined by archaeological narratives and the well-established methods used for relative chronology, such as stratigraphic or typological sequences, which relate different aspects of archaeological evidence to each other in time, defining them as earlier or later. Together, and in a synchronised approach, these two concepts of absolute and relative chronology, of chronological and narrative time, normally represent a chronological system.

3 The chronologies of Ancient Egypt

The situation in Egyptology is obviously somewhat more complicated. Old World archaeologists long regarded Ancient Egyptian civilization as an area with a firmly established chronological system. But this chronology is primarily based on historical narrative time, i.e. the sequence of pharaohs as documented in ancient annals and king lists that allowed scholars from early on to establish the historical, i.e. dynastic chronology of Pharaonic Egypt. This chronology was considered so reliable that, before chronometric dating methods made an entry into archaeology, many neighbouring regions in the eastern Mediterranean used interregional synchronisms as chronological anchor points for their own chronologies, be it via Aegean ceramic imports in Egyptian tombs or Egyptian artefacts with royal names in Levantine contexts. When radiocarbon dating was first introduced just after World War II as a novel method to date archaeological materials, it was again samples from historically well-dated Egyptian contexts, such as timber from Old Kingdom pyramids (ARNOLD and LIBBY, 1949), that helped to test and improve this new method for archaeology. From the beginning, it was acknowledged that these large-scale synchronisations were not without problems, and it was obvious that a foundation of sound regional relative and absolute chronologies was needed to support such systems. As a result, many synchronisations were subsequently reappraised in these regions when established chronometric dating methods were either increasingly more refined or new complementary methods were developed in the late 20th century. Nevertheless, the one region that was long considered the benchmark for such synchronisms, Ancient Egypt, is now lagging behind in the pursuit to refine its chronologies. This is an issue that is not yet sufficiently acknowledged within Egyptological discourse and one that probably has its roots and causes in the history of the discipline.

The distinction between the two crucial concepts of time - chronological and narrative - has rarely received the necessary attention in Egyptology, the origins of which are deeply embedded in historical research and text-based approaches to the past. For a long time, Egyptology was mainly a philological discipline, within which archaeology was essentially a means to an end, namely to procure new and 'important' materials that could be deciphered, read, and used to reconstruct the history of the Pharaohs, and ultimately, to find Egypt's place in the universal history of humanity (BEDNARSKI et al., 2021: 15; GARCÍA, 2021). Very often, the terms 'absolute' and 'relative' are being applied to historical dating, e.g. when a royal name and regnal year provide an 'absolute' date for a monument or when the order of kings and dynasties are understood as relative sequences (e.g. HORNING et al., 2006). While these are perfectly acceptable historical concepts, they cause confusion as soon as archaeological evidence is taken into consideration, which is why this author would prefer to distinguish them as *historical chronology*. But numerous authors who have dedicated their time to historical and chronological studies have early on highlighted the many specific problems embedded in this historical chronological framework, especially for periods of poor textual coverage or where there is no continuous politico-historical narrative, such as during the so-called Intermediate Periods.

Although this situation has started to change with Egyptology gradually transforming into a truly interdisciplinary enterprise that includes philology, narratology and linguistics, modern archaeology, archaeological science, and art history, its early history as a discipline still casts long shadows over modern research, creating a

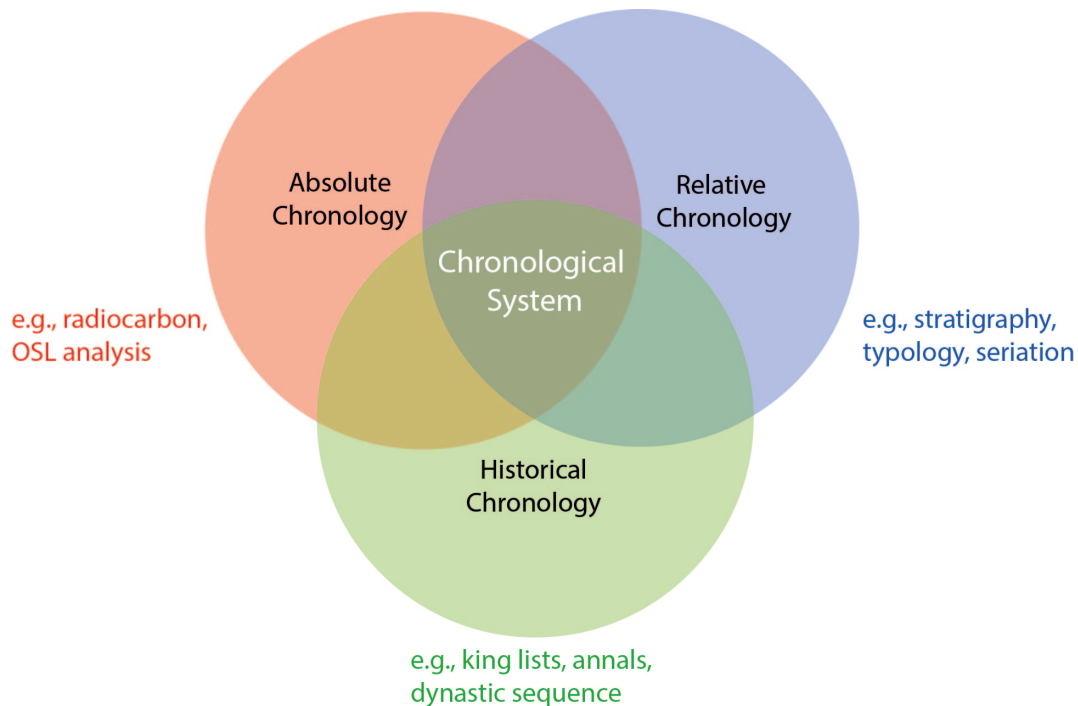


Fig. 1: A chronological system for Ancient Egypt

situation that particularly impacts discussions on chronology. It also reflects Lucas's identified tension very well, which probably results from an uncritical entanglement of narrative and chronological time and from Egyptology's neglect of modern archaeological concepts. Indeed, the fact is that Ancient Egypt is possibly the only major archaeological culture without a coherent relative chronology in its strict archaeological meaning, and consequently, without a modern chronological system that actually comprises all three chronological principles. This is highly regrettable because Egyptology of today does have the ability to build a chronological system that archaeologists in neighbouring regions would indeed envy us for; a system that is not only based on archaeological relative and absolute dating but that also utilises historical chronology where it is appropriate. In other words, a chronological system that benefits from the combination of data from absolute, relative, and historical chronology (Figure 1). Some would now argue that this is what we have been doing all along, but—in the view of this writer—it is the modern archaeological relative chronology that is really lacking here and that leaves the museum visitor wondering about labels like *'pottery vase, Qau, Old Kingdom'*. Surely, Egyptology can do better, but for this to happen, it is necessary to critically review our chronological terminology and methodology.

The concept of time in Egyptology is mainly built upon an historical chronology (which is itself structured by 19th and early 20th century artificial periodisation, e.g. "Old Kingdom", "Second Intermediate Period", "Late Period") and the sequence of kings and their dynasties. Indeed, the historical chronology of Pharaonic Egypt is an excellent example for narrative and cultural time as it is largely based on written sources whose authors intended to follow and contribute to royal ideologies and decorum; it is both an ancient and a modern cultural construct (ASSMANN, 2011; DER MANUELIAN and SCHNEIDER, 2015; SCHNEIDER, 2008, 2014, 2017).

Since its beginning, Egyptology has been very much preoccupied with the reconstruction of this historical chronology and its synchronisation with absolute time, which has benefitted from the scientific developments in chronometric dating during the last few decades. However, the historical chronology and the absolute dates

arrived at via synchronisation with Near Eastern historical chronologies or astronomic phenomena have long been regarded as a 'gold standard' for Egyptian chronology, and chronometric dating was, by comparison, often considered too imprecise and thus inadequate (VON BECKERATH, 1997: 4; BIETAK, 2013, but see KITCHEN, 2013).

Consequently, there have been attempts in recent times to test and adapt chronometric analyses so as to demonstrate their usefulness also for research on Pharaonic historical chronology (BONANI et al., 2001; BRONK RAMSEY et al., 2010; DEE et al., 2013; HÖFLMAYER and MANNING, 2022; SHORTLAND and BRONK RAMSEY, 2013). However, by the time that modern scientific archaeology had arrived to Egyptology only in the late 20th century, the historical chronology had become so entrenched within our discipline that archaeological evidence continued to be dated within (one could even say forced into) the pre-existing historical framework. A very good example is the research on New Kingdom ceramic phases. The New Kingdom is arguably the best-understood historical era in Pharaonic Egypt and its material culture is well represented by numerous historically well-dated contexts. As a result, a number of scholars have tried to devise ceramic phases using the historical boundaries and royal reigns as chronological brackets by setting the first phase with king Ahmose, first ruler of Dynasty 18, and the final phase with Ramses XI, last king of Dynasty 20 (see summary in ASTON, 2003). But what does this historical chronology signify for ceramic production? Or more generally, what even is the "New Kingdom"? As noted earlier, this term was conceived of during early Egyptological research on the history and chronology of Pharaonic Egypt by scholars such as VON BUNSEN (1844), LEPSIUS (1849) and WIEDEMANN (1884–1888). It was used to describe a new glorious era following the liberation from the foreign rule of the Hyksos in Egypt—of course within the 19th century's concept of ancient history. The New Kingdom is not only an entirely modern historical construct, but also subject to ongoing reinterpretation. For example, in his comprehensive study on the beginning of the New Kingdom, Daniel Polz proposed not to set its commencement with the first king of Dynasty 18 as is still wide consensus today, but significantly later with the reign of Hatshepsut, i.e. almost 100 years thereafter, which Polz regards as the true historical turning point and start of a new era (POLZ, 2007). Consequently, what has previously been defined as ceramic phases of the early New Kingdom would have to be re-labelled. Moreover, it is acknowledged today that the material culture traditions of the late Second Intermediate Period likewise did not significantly change until the reigns of Hatshepsut/Thutmose III, again calling into question the aforementioned ceramic phases of the New Kingdom (SEILER, 2005, 2010). The same ought to be said about the end of the New Kingdom and beyond (ASTON, 1996). Furthermore, there is a good deal of modern archaeological evidence suggesting that there was a high degree of regionalism which similarly challenges such general historically dated ceramic phases (see below).

The last three decades of focused chronological research in Egyptology, together with significant progress made in better understanding and interpreting of historical sources, have flagged a range of problems that cannot be solved by perpetuating the current approach to chronology. Given its intellectual origins in early historiography, the broad periodisation of Pharaonic Egypt should no longer be considered a useful framework for dating archaeological evidence. Nor is the dynastic sequence, which reflects a political narrative that is not only open to interpretation when applied to the political landscape of the Nile Valley, but that also has no bearing on a vast majority of data, such as non-elite, provincial, and domestic archaeological evidence. Equally problematic is the postulate that certain events like the political integration of the Nile Valley under a central government may have resulted in greater economic control and thus, potentially, in a standardisation of manufacturing industries and material culture. But there is consistent and clear variability in the archaeological evidence which resists such inferences. Numerous studies of the past 30 years have positively demonstrated such limitations for Egyptian archaeology: the development of archaeological evidence in the Nile Valley does not coalesce with the historical chronology and many contexts or artefacts still cannot be reliably dated (e.g., ASTON, 2007; BADER, 2021; BOURRIAU and ERIKSSON, 2010; SEIDLMAYER, 1990, 2005; SEILER, 2005, 2010). Additionally, owing to

a lack of written sources, the entire prehistoric period is obviously not covered by this historical chronology. Yet Egypt's Prehistory also suffers from the early history of the discipline, namely a traditional culture-historical paradigm, i.e. a postulated sequence of Prehistoric cultures or ethnic groups (e.g. 'Badarian', 'Lower Egyptian Culture', 'Naqada Culture') following one another over time by conquest, migration, or acculturation, is often used to express chronological progress. This paradigm still determines prehistoric and early Pharaonic relative and absolute chronologies (DEE et al., 2013; HENDRICKX, 1996, 1999, 2006; KAISER, 1957), even though such narratives are once again not reflected in the archaeological evidence (KÖHLER, 2011, 2016, 2020).

Despite all of these issues having been acknowledged over the last few years, one can still identify a degree of circularity in a number of attempts at synchronising archaeological evidence with traditional chronological concepts in Egyptology. It is common practice to date material culture by associated inscriptions or via extant examples from elite contexts, e.g. pottery types found in royal tombs and thus dated to a particular Dynasty or even reign of a king. When such pottery types are also attested in other archaeological contexts, such as in a stratified settlement, they serve to date and anchor the settlement phases to the historical chronology. Such apparently well-dated contexts often produce samples for radiocarbon dating which are then utilised for synchronising absolute and historical chronology and for establishing not only the chronological framework of such settlements, but sometimes also for providing chronological anchor points for the historical chronology itself (ASTON, 2018; BIETAK, 2003, 2013, 2021; BIETAK et al., 2012). This practice reduces archaeology again to a mere means to an historical end. And sometimes, thus generated results have even invited challenges to the validity of chronometric methods and results in the first place, which obviously caused fierce yet healthy debates in the field (BIETAK, 2013; HÖFLMAYER, 2018; HÖFLMAYER and MANNING, 2022; KUTSCHERA et al., 2012; STROBEL, 2022).

The underlying circularity lies in the uncritical application of historical chronology for archaeological contexts and in using archaeological and chronometric data delivered from such contexts to validate and chronologically anchor historical chronology. This circularity is a profound problem because it postulates two (somewhat invalid) assumptions: 1) that historical chronology is a viable approach to dating non-elite, provincial, and domestic archaeological evidence, and 2) that material culture develops along the same linear trajectory along the entire Egyptian Nile Valley and Delta and in all socio-economic segments of ancient society.

This is again why the museum label '*pottery vase, Qau, Old Kingdom*' is so flawed. Egyptology needs to move beyond this problem and arrive at a more valid, more precise and more scientifically determined chronological system by overcoming this kind of circular thinking and reconsidering its approach to chronology. In particular, what is needed is a modern archaeological relative chronology by which all material culture, including non-elite, domestic, and provincial archaeological evidence can be dated independently and on modern scientific grounds.

3.1 Relative chronologies in Ancient Egypt

There have been early attempts by archaeologists at devising relative chronologies and identifying chronologically diagnostic assemblages of archaeological evidence for certain time periods. Following W.M.F. Petrie's ground-breaking development of the Sequence Dating method in Predynastic archaeology using novel mathematical modelling techniques (PETRIE, 1899, 1901, 1920, cf. GEERTZEN and GRÖTSCHEL, 2012), and his persistent attempts at collecting, sorting and dating Pharaonic material culture, there have been several later investigations to compile ancient Egyptian material culture and archaeological data relevant to chronology. The most notable such studies are (ASTON, 1996, 1999, 2003, 2004, 2009, 2012/2013; ASTON and ASTON, 2010; BOURRIAU and ERIKSSON, 2010; HENDRICKX, 1996, 1999, 2006; KAISER, 1957; KANTOR, 1965; MÜLLER-KARPE, 1968, 1974, 1980; SCHIESTL and SEILER, 2012; SEIDLMAYER, 1990, 2005; VANDIER, 1952, 1954-1955).

Yet even these works are either limited in chronological scope, too generalised, or now simply outdated. Furthermore, they each either take the culture-historical paradigm or the historical chronology as a point of reference, thus compounding and perpetuating the now age-old problems with ancient Egyptian chronology. By continuing such concepts and methods, our Gordian knot will not be undone.

As problematic as the Old Kingdom vase from Qau may be, the pot and its label are not only concealing a major research problem, but they are also hiding its solution in plain sight. The key to solving most of these issues is a modern relative chronological framework for dating material culture in Ancient Egypt; a framework that is independent of (culture-)historical chronology and that integrates the tried and tested methods of archaeological dating (typology, stratigraphic analysis, seriation, correspondence analysis etc.) with modern chronometric methods. It would be a framework that is entirely based on material remains, i.e. what this writer would propose as the materiality of time in Ancient Egypt (for the concept in general, see [LUCAS](#), 2021). While this idea may seem to be a gargantuan task, it can be achieved if it is pursued in a comprehensive, methodically sound, collaborative and—above all—interdisciplinary approach.

4 The Materiality of Time in Ancient Egypt: First tentative steps

The first step is to develop a modern reference corpus for Prehistoric and Pharaonic Egypt which compiles high-quality, chronologically diagnostic evidence of material culture from different sites along the Nile Valley and Delta. This reference corpus would be subject to typological, stratigraphic, and chronometric analysis, various statistical analyses, and Bayesian modelling so as to be integrated into a methodical and terminological framework by which archaeological assemblages and contexts can be more accurately placed within a specific geographical region and chronological phase. The corpus would be dated by modern chronometric methods, i.e. radiocarbon and optically stimulated luminescence (OSL) dating (for the application of the latter method in Egyptian archaeology, see [HOOD](#), 2017; [HOOD](#) et al., 2019; [HOOD](#) and [SCHWENNINGER](#), 2016; [HOOD](#) et al., 2017), and thus anchored in chronological time. Following that, the foundation of a relative chronology could be established that dates material culture at archaeological sites and in different regions of the Egyptian Nile Valley and Delta by carefully defined archaeological phases that make it unnecessary to perpetuate the aforementioned chronological issues.

Although most of this work still needs to be done, a brief collation of relevant chronological and material studies from Egyptian archaeology may be used here to illustrate what this relative chronology of the Egyptian Nile Valley could eventually look like for the time span between the first settled villages of the early 5th Millennium BCE and the end of Pharaonic culture towards the close of the 1st Millennium BCE. Such a relative chronology could subsequently be extended to include earlier and later phases or be synchronised with directly adjacent regions surrounding the Egyptian Nile Valley and Delta as well as further beyond in regions such as the Levant and the Aegean (see for example the synchronised chronologies of the 3rd Millennium BCE devised by the ARCANE project, ARCANE: Synchronizing Cultures and Civilizations of the Ancient Near East and the Eastern Mediterranean in the 3rd Millennium BC [↗](#)). This writer has already assembled a large database of well-dated material culture from her own excavations and from dozens of well-published other archaeological sites, like settlements, well documented cemeteries, and certain artefact assemblages from closed contexts (e.g., intact tomb assemblages, foundation and floor deposits) that could provide the contextual basis for a relative chronology. There are numerous local Egyptian artefacts with chronologically diagnostic significance and known typological sequences, especially ceramics, but also various stone tools, stone vessels, ornaments, funerary equipment etc. that would be included as index types forming individual data sets and relative sequences.

The quantity of such evidence to be integrated in the reference corpus may initially seem overwhelming, but can be significantly reduced by close observation of the archaeological context and its documentation by the

excavators assisting in the exclusion of large quantities of material from poor contexts and thus of little chronological value. This process of quality assurance has been routinely practiced by this writer and enables a diagnostic ranking of data and thus identification and selection of those materials that provide sufficient confidence in their association and context, similar to the Waterbolk criteria established for radiocarbon dating (WATERBOLK, 1971). The ranking involves four levels describing the quality of an archaeological context and any materials directly associated. The top Level 1 comprises primary contexts (e.g. an intact tomb with grave goods), Level 2 secondary but well-preserved contexts (a disturbed tomb that also contains well-preserved contexts such as deposits of pottery vessels), Level 3 secondary and very disturbed contexts (a disturbed tomb without any original deposits) and Level 4 tertiary or worse contexts (e.g., a highly disturbed tomb with multiple sequential burials). The higher the level, the better the context quality and thus a smaller data pool, with material falling into Levels 1 and 2 comprising only a small fraction of the total. Only material that has undergone this rigorous quality assurance process and that ranks Level 1 or 2 would be subjected to further assessment and chronometric dating, both at ongoing excavation sites and in international museums.

Particularly diagnostic ceramic index types would be subjected to material and technological analysis (i.e. raw materials, manufacture, *chaîne opératoire*) so as to identify local specimens for typological and OSL/pOSL analysis. Indeed, pOSL can be applied with relative ease in the field in Egypt (with a portable reader and expertise) to both sediments and mudbrick architecture, and, with some caveats, to ceramics, to assist in establishing relative chronological sequences. The museum pottery vase from Qau could be assessed for its context quality and potentially be subjected to typological, material, technological as well as laboratory OSL analysis; any organic remains of its content could be radiocarbon dated, thereby providing a *terminus ante quem*, and the thus dated vessel be integrated into the reference corpus. With each diagnostic pottery vessel analysed in this way, the density and resolution of the data contained within the reference corpus is increased. Multiple sites in one region will produce regional artefact typologies and regional phases anchored in chronological time. These regional phases will finally be compared with each other and integrated in a dynamic model of relative chronological phases for the Egyptian Nile Valley and Delta.


It can be expected that, given measurement uncertainties, there may be some conflict between the radiocarbon results, the OSL results and the relative sequences of certain index types or of cemetery phases. In order to harmonise these potentially diverging results, all the data collected will be subject to Bayesian modelling, which will search, computationally, for the absolute dates with the highest statistical likelihood given the various sources of data and their associated uncertainty. This will enable the refinement of an absolute chronology of archaeological phases and their boundaries. The precision to which we can date the latter is a matter of three factors: data density, measurement certainty and archaeological coherence. Where no clear cut results can be achieved, the boundaries between the archaeological phases would be vaguely defined and blurry. Conversely, where a boundary is clear and well defined, for example where several sites in one region show simultaneous changes in their material culture at a certain point in time, a line could be drawn. It is anticipated that in the final relative chronology for the entire Nile Valley, covering almost 5000 years and three different regions in the north, middle, and south, there may be a combination of blurry and clear boundaries between the phases, depending, for each phase, on the three precision factors described above. If there is a differentiated development, for example with a new phase beginning earlier in the north than in the south, the boundaries will be drawn obliquely, accommodating their different absolute dates (the synchronised table of the ARCANE project can be used as a potential model for its visualisation .

Figure 2 shows a hypothetical model of how an such an integrated relative chronology could be visualised for Ancient Egypt. As an example, it employs the different cemetery phases and material culture formations defined by Seidlmayer (SEIDLMEYER, 1990, 2005) for the late 3rd and early 2nd Millennium BCE, although these studies used only funerary data and the historical chronology as a point of reference. The formations characteristic

of the late Old Kingdom (light green), First Intermediate Period (green), and early Middle Kingdom (turquoise) are represented in site phases (Figure 2A). In an ideal situation, diagnostic artefacts from these different sites, like Beni Hassan or Gurob, stored in international museums and from Level 1 and 2 contexts, would have been included in the reference corpus and fully analysed as described above (i.e. in terms of absolute dating, typological sequencing, material and technological analysis), potentially complemented by pOSL and radiocarbon results from new excavations in Egypt. All these data would be subject to Bayesian modelling and the individual site phases would be anchored on the absolute time scale. Following that, regional archaeological phases involving cemeteries and settlements (Figure 2B) would be established and integrated within a general absolute (Figure 2C) and relative chronology (Figure 2D). The different archaeological phases of the general relative chronology will be structured within a basic numerical sequence (see below) allowing for clear or blurry boundaries. Especially the combination of cemetery with modern stratified settlement data in the different regions, supported by pOSL and radiocarbon-dated archaeological layers, would enable a more tightly controlled relative sequence.

As Seidlmayer had noted, the regional material formations appear to have developed along very different trajectories, with some areas lagging behind in the adoption of new elements. The observed changes are generally not in accordance with the historical boundaries of this time. For example, although many of the tombs at Beni Hassan and other sites in Middle Egypt would be dated 'Middle Kingdom' in historical terms, much of their material culture can be characterised within the 'First Intermediate Period' formation. Significant changes only occurred during the advanced Dynasty 12, which is somewhat later than at other sites in the north and south. The synchronisation with historical chronology (Figure 2E) would result in a geographically differentiated picture of material culture along the Nile Valley. These regional chronological differences would be visualised in oblique phase boundaries for the general relative chronology.

This writer postulates that the material culture developed gradually and dynamically, and without major breaks or hiatuses throughout Egypt's ancient cultural history which is well reflected in many stratified settlements. Hence, while the colours of this graph have obviously been chosen for the purpose of illustration, they are also well-suited for this new chronology as their transitions may better represent this gradual development. The different coloured phases would be complemented by a numerical system that also comprises sub-phases depending on the data density. It could start, for instance, with 10 at the beginning of the 5th Millennium BCE allowing for the inclusion of earlier material in the future. In this hypothetical sequence, Beni Hassan's earliest groups would then be attributed to the green coloured formation, or late Phase 16. The pottery vessel from Qau may perhaps be placed in Phase 15, and could thus well end up not dating to the 'Old Kingdom' at all, but belonging to a material formation phase in Middle Egypt that had not changed until much later.

When building the regional phases around ceramic typologies and sequences, it is important to not only consider the morphology of the vessels, but also their technological properties, such as their method of manufacture, and especially the materials from which they were created, i.e. ceramic fabrics. This is a valuable, but still underused tool in studies in Egyptian archaeology that employ certain diagnostic types for chronological purposes. This can be exemplified by the so-called Meydum or carinated bowls of the early 3rd Millennium BCE. These bowls very frequently occur at sites along the Egyptian Nile Valley and Delta and have long been regarded as a characteristic Old Kingdom artefact even though Petrie had already observed them in Early Dynastic contexts (PETRIE, 1903: 39, pl. XLII(40)). Many scholars have tried to employ these vessels for chronological purposes and have observed that their early variants tend to have a smaller opening and taller appearance while they later develop into wider and shallower forms. Nevertheless, they have resisted various attempts at proportional and metric analyses as they do exhibit a high degree of morphological variability over time and in different regions (BALLET, 1987; HENDRICKX et al., 2016; HENDRICKX et al., 2002; OP DE BEECK, 2000, 2004; STERLING, 2004, 2016). This may be because their technological properties have not always been sufficiently taken into consideration.

Carinated bowls can be made in three different manufacturing techniques; by hand, on a slow turning device and by forming them over a convex mould. These techniques were often used contemporaneously suggesting that different workshops may have employed different modes of production which also resulted in different vessel qualities ranging from coarse utilitarian vessels to fine table ware. This variability is further highlighted by the observation of the many different clay fabrics (i.e. different potters' pastes of Nile or Marl clay and mixed clays) and numerous possibilities of surface treatments (e.g. plain, red slip, white slip, wet smoothed or polished) by which carinated bowls were made. A comparison of early carinated bowls from six different sites between the Nile Delta and the 1st Cataract (KÖHLER, 2022) showed that there were at least seven different combinations of such materials and techniques with most sites exhibiting at least four of them, although their identification very much depends on the excavators' or ceramicists' attention to detail.

A chronological analysis showed that carinated bowls started in northern Egypt around 2900 BCE with three different varieties made of Nile clay which continued to be used for an extended period of time across the Nile Valley. Carinated bowls of Marl or mixed clays, however, started to be produced significantly later in southern Egypt and with a distinct morphological development. At first sight, this very heterogenous picture of carinated bowl production during the early 3rd Millennium BCE may seem to be a hindrance to using this vessel type for chronological purposes, but it is indeed vital to developing distinct regional phases, especially when chronometric or other, complementary methods are added to their analysis. Once the different fabric groups and vessel qualities have been determined, they can individually be subjected to morphological and metric analysis thereby producing their own individual typological sequences. Indeed, it is quite possible that these carinated bowls may be used as one index type defining what is here suggested as Phase 15, which obviously transcends the historical boundaries of the Early Dynastic, Old Kingdom, and First Intermediate Periods. In combination with other index types, it will most probably assist in defining further regional and supra-regional sub-phases thereby increasing chronological resolution. Even without a reliable archaeological context, if our museum pot from Qau were of this type, the identification of its clay fabric, manufacturing technique and shape, and the comparison with the regional, chronometrically dated reference corpus, would enable museum curators to determine far more precisely how this vessel should be dated. This potential captures the materiality of time in a nutshell.

The phases indicated in Figure 2 are entirely hypothetical because developing an all-encompassing relative chronology for the Egyptian Nile Valley and Delta, covering some 4500 years, would obviously require intensive collaborative and interdisciplinary research. And while archaeological data may still be incomplete for certain periods or sites, this could be a beginning for the materiality of time in Ancient Egypt. It could build the foundation for a relative chronology by which material culture and archaeological sites would be dated far more accurately and scientifically soundly than what is possible today. While the archaeological phases may initially be broad and long, an open access database interface, where archaeologists could add new data, could assist in refining the relative chronology and increasing its resolution over time.

The expected results from comprehensive material, typological, technological and, chronological analyses would provide unique insights into many different aspects of material culture formation and variability within the Egyptian Nile Valley and Delta. This level of understanding as to when, where, and how certain items of material culture were first developed, manufactured, adapted, utilised, and disposed of in ancient Egyptian society will provide a most profound empirical basis for further interpretive material culture studies. Capturing these nuances in the materiality of time would probably allow for telling very different narratives in comparison, and in addition, to the current one as it would be told with the historical chronology. In Egyptology, this is a still developing area of investigation with great scholarly potential (see for example BERGER, 2009; BUCHLI, 2002; KALTHOFF et al., 2016; MAYNART et al., 2018; SAMIDA et al., 2014; TILLEY et al., 2005; WOODWARD, 2007). It would also allow for exploring new avenues to synchronise material culture with other chronologically sensitive areas and systems, like the different palaeographic phases of Ancient Egyptian hieroglyphic writing and the stages

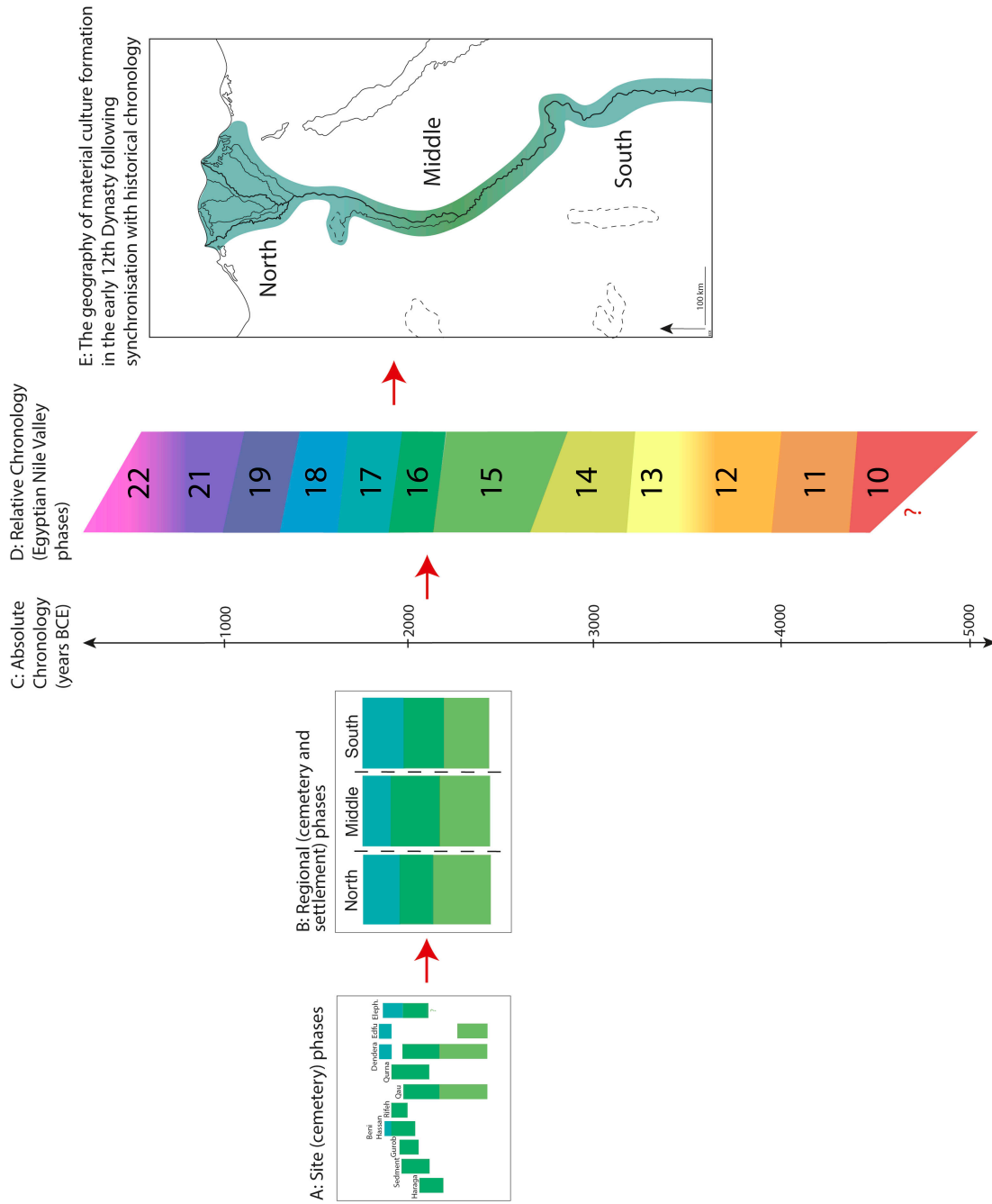


Fig. 2: A hypothetical model for a relative chronology of Ancient Egypt

of Egyptian language where inscriptions are directly associated with archaeological evidence.

Moreover, this knowledge and the relative chronological phases can be synchronised with historical chronology and examined for a subsequent socio-cultural, socio-economic and historical contextualisation of sites and phases. This would enable us to arrive at even broader interpretations of the archaeological evidence and, importantly, to build a solid chronological system for Ancient Egypt.

5 Concluding Remarks

Of course, there are still numerous unknowns and questions surrounding the choice of data that need to be addressed in order to build this new chronology. The easiest part will be to establish a reference corpus of high-quality archaeological material on the basis of publications. Somewhat more challenging may be the archaeological science component of this research. Considering that the new relative chronology requires significant numbers of samples for chronometric analysis, and thus significant amounts of funding, a key issue that needs to be dealt with is the selection of samples from Level 1 and 2 contexts and facilitating access to them in Egypt and in international museums. In the context of her on-going Abydos project, the writer and her team have had mostly positive experiences in cooperating with curators and conservators at various international museums where materials from old excavations are stored. In addition to the archaeological documentation of museum artefacts, it was possible to obtain large quantities of samples, also involving destructive sampling methods, for various scientific analyses. This obviously requires a joint effort in carefully assessing each artefact individually and a decision as to if and how to extract samples on a case-by-case basis. Work with the authorities and laboratories in Egypt has also been very constructive, with different materials having been successfully analysed in Cairo.


Analysing newly excavated materials from relevant sites requires the support of other archaeologists willing to contribute to this research so as to seek permission from the Ministry of Tourism and Antiquities for the transfer of samples from their archaeological sites to Ministry-approved laboratories in Egypt, such as at the Centre for Scientific Research and Conservation or at the Institut français d'archéologie orientale (IFAO) in Cairo. The archaeological evidence from new excavations needs to be assessed for its context quality by the excavators and transparently recorded at the necessary methodical standards. Materials from Level 1 and 2 contexts would be assessed for their potential for local scientific analyses (e.g. radiocarbon dating, petrography, and pOSL), and then analysed by expert personnel in Egypt so as to be integrated into the database, overall analysis, and modelling. This is all possible and feasible, and should this challenge be accepted by the wider archaeological community, it could ultimately serve as a litmus test for the role that archaeology plays in Egyptology today, and indeed as a catalyst to advance modern scientific standards in our archaeological investigations. This can only be of benefit for Egyptology as a whole.

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