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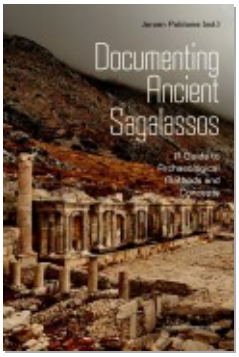

How do we document time?

Jeroen Poblome

Time is very much a mystery

Being an archaeologist sometimes feels like being a magician or a wizard of sorts. We are the profession that can pick up an object from the past and comfortably state that it dates to the fourth century CE, for instance, or can be associated with one or other cultural period, such as the late Bronze Age. At some point in their academic training, aspiring archaeologists become miracle workers who can predict, or rather postdict time in the past. This chapter wishes to look into how this can come about. How do archaeologists deal with time?

It is a truism that the five 'W's make good journalism: Who, What, Where, When and Why are questions best answered to make a journalistic piece appropriately informative. When reporting on the results of their work, archaeologists too would be best off taking these basic questions to heart, as the answers to these provide essential information understandable to everybody. More often than not, however, circumscribing an answer to the questions Who and especially Why proves difficult for archaeologists. In contrast, What, Where and When are questions referring to particular and factual conditions resulting from archaeological fieldwork, meaning that these answers seem to be more easily within reach. Indeed, finds of all kinds and types manifest themselves in given locations and archaeological contexts as a result of fieldwork. Even though positioning these remains in time is at least as much the essence of archaeology as determining the location and nature of finds or structures, unfortunately chronology does not reveal itself so easily. Archaeology, as a historical discipline, will always be needing to work with time, however. The crux of the matter is that archaeology would not exist without chronology, but that time does not present itself readily.

As things stand, not only archaeology finds it difficult to deal with time. At the most fundamental level, time remains much of a mystery. The greatest of human minds, conceiving of the General Theory of Relativity and the Second Law of Thermodynamics, have approached time as bound to matter and gravity as well as time and space as two sides of the same coin. Both, for instance, separate things and events from one another in each or both of these dimensions.

One of the crucial differences between time and space, however, is that we can move freely in space, albeit theoretically, but time enforces directionality, from past to present. Physicists consider this directionality, the arrow of time, to be related to the concept of unavoidable and increasing entropy in the universe, from its pure state at origin towards increasing disorder, of which entropy is the measurement. An archaeological excavation, for instance, cannot be undone or redone; there is a before and after the moment of excavating, and the conditions of the site are clearly different before than after the excavation. Yet entropy is a concept related to the Second Law of Thermodynamics, which stipulates that this process is active in closed systems with a constant total amount of energy. Science seems to be in agreement that the universe is not such a closed system. So, how to explain the difference between the dimensions of time and space and what if there is no such thing as the arrow of time?

In antiquity too, time was an experience requiring deep thought. πάντα ῥεῖ, as attributed to Herakleitos of Ephesos (544/35(?)–483/75(?) BCE) in Achaemenid times, encapsulates a common ancient metaphysical approach to time. "Everything flows" and "no man ever steps in the same river twice" are citations attributed to Herakleitos, which represent his views on the essential role of change in understanding nature and the universe. Everything is constantly affected by change and in opposition to something else. The movement of the water of the river is in contrast to the situatedness of the riverbed, for example. This unity of opposites allows change to foster becoming and progress, ultimately creating unity. The Herakleitian perception that everything flows corresponds to a fundamental experience in human lives related to the appreciation of time as infinite: the stream that transports us from a past we cannot revisit to a future we cannot know.

When Augustine of Hippo Regius (354–430 CE) reflected upon the nature of creation and of time as well as its relations with God in Book 11 of his Confessions, he concluded that only God was infinite and eternal, whereas time could only be experienced in the present, hence being finite. The present in any case was different from the past and the future; if that were not the case, time would be equal to eternity. In this way, Saint Augustine considered time to be something changeable, but beyond interaction when it came to the past and the future. Although the difference between a finite or infinite appreciation of time is fundamental, Augustine remained unsure whether he had come to a clear and complete understanding of the nature of time, as revealed by this citation from Book 11.14.17: "What, then, is time? If no one ask of me, I know; if I wish to explain to him who asks, I know not."

Clearly time is more than a range of physical or philosophical concepts. The experience of time is different for children than for adults, for example, and while time flies when you are having fun, it can also move extremely slowly in dramatic circumstances such as during a traffic or other accident. Time, in other words, is not only an abstract phenomenon, but is wired in the human brain in ways that have not been completely elucidated yet.

Solving the mystery: Step 1 – conceptualisation of time

It should be obvious that in archaeology, the concepts of time and place form part of the core DNA of the discipline. The object of study of archaeology as a scientific discipline is the human past, with a particular focus on constellations of past communities and the historical processes in which these are embedded. By definition, archaeology takes a long-term perspective and aims for a fundamental understanding of human behaviour and human evolution. In order to do so, the conceptualisation of time and space are essential.

Time, to be clear, is a theoretical concept. As a result, the way time is considered affects the way archaeological interpretation is constituted. In this respect, it is striking how little conceptualisation of time is represented in professional archaeological literature. More often than not, historical narratives are approached in a uniform, linear way based on a variety of divisions in discrete units feeding comparison and interpretation.[1] Prehistory is something different from the Bronze Age and the latter is different from the Iron Age, and so on. To put it bluntly, the world evolved from the savagery of prehistory, towards the feuding of protohistory to the (blessed, yet still bloody) epochs of civilisation in historical periods, with agricultural and urban revolutions feeding the changes in society from bands to tribes, chiefdoms and states. It feels natural as an archaeologist to be able to divide time and societies into such exclusive units following a 'logical', linear order, and draw a comparison between these units. It is important to recognise that this (quite often implicit) understanding of time sustains models for historical explanation in similar terms. In this way, the linear order of exclusive units of time is at the basis of much, if not most, historical research.

The Annales School problematised this linearity and the duality of history as both continuity and change.[2] Instead, historical processes are considered to be constituted by unique combinations of the short, medium and long term, on different yet concurrent wavelengths.[3] Very slow-moving processes, such as environmental change or world views, are considered to be the structures of the long term, which both enable and constrain continuity and change. The con-

junctures of the medium term, on the other hand, are at the basis of the history of eras, regions and peoples, translated into typical constellations of social and economic organisation, or the demographic effects of diseases such as pestilence. The short term, finally, is characterised by events noticeable at the individual scale, quite often forming the focus of traditional political or military historical research, such as the life and works of Alexander the Great (356–323 BCE), or various processes of contingency, such as chance, uniqueness, unpredictability and unexpected change. In survey archaeology – the study of regions and places based on non-interventionist methods such as intensive surface survey – for instance, the Annales perspective has become one of the dominant frameworks to explain changes in the surface record (the *conjoncture*), as this follows from the interplay between the *histoire événementielle* of historical sources, the more stable background of the landscape (*longue durée*) and the *mentalités* of individuals and societies.[4] It is the task of the historian and archaeologist to present the evidence of processes at the different time scales, and then analyse retrospectively how these interacted to create unique and unpredictable outcomes (Fig. 1). As a result, the archaeological record encompasses multi-temporality and its reconstruction should be an act of interpretation. Contingent and/or predictabilist processes operate at a variety of temporal and geographical scales. Changes on these different scales require different explanations and, by extension, different units of analysis. Such an approach does more justice to the variability in data as recovered by archaeological fieldwork, allows these to be evaluated more critically in the light of the history of events and introduces a more flexible way to approach aspects of regionality, which is more often than not the typical scale of archaeological analysis.

More recent considerations of time and history have been introduced by G. Lucas[5] and M.G. de Molina and V.M. Toledo,[6] underscored by non-linear, metabolic models of change, punctuated by cycles or periods of rapid transformation, creating unique and unpredictable outcomes. In this sense, time is at least as multi-dimensional and dynamic as space, containing the dualism of continuity and change, and of process and event. Time is not a fixed structure in which changes simply take place, but is as multi-layered as these changes, and is moulded by them as much as it moulds them. Time simply cannot be an independent dimension, a homogeneous measure or a container for events. Instead, time-linked processes form part of social-ecological metabolic processes, with the concepts of change and emergent properties forming the framework for historical explanation, and the present is seen in a combination of relations with the past (no relation (yet) and/or (in)directly related).

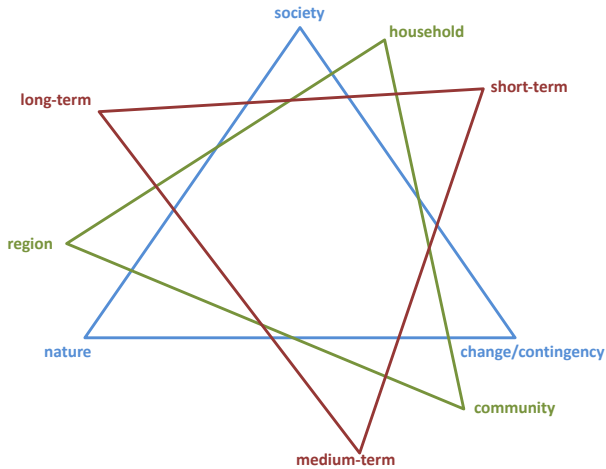

Fig. 1. The overlapping triangles help to situate events and processes in time and to determine their nature and reach. This scheme was developed for the Sagalassos Project in order to document change at the regional scale. It mostly works as a heuristic tool. Events and processes are compared and situated in the fields of tensions each triangle represents. An individual action preserved in the archaeological record will be situated in the ranges of short-term, household and society, whereas climate change is best situated in the ranges of long-term, nature and affecting the region. Most processes and events are not so clear-cut, and that is how the overlapping triangles help structure thinking in time and effects.

To be sure, any theoretical approach to time should avoid the oftentimes very suggestive links between time, evolution and progress. Allowing ourselves to judge the (non-)complexity of prehistoric human behavioural patterns, for instance, is not only politically incorrect, but at a higher level such thinking places a straitjacket on the understanding of processes of social evolution and change, as if the arrow of time follows a unique, predestined and basically teleological path. Even though early Modern period European imperialism, for example, would like us to consider this 'benign' state of affairs to be a direct result of the implementation in society of the fruits of the golden age for democracy in Classical Athens, combined with insights into the governmental genius of Imperial Rome, these views are not based so much on historical interpretation, but rather on ways of appropriating and 'owning' history. Such arrows of time simply miss their marks; they are pointless.

Solving the mystery: Step 2 – building chronologies

In order for time to find its place in the epistemological processes in archaeology, chronologies need to be constructed. The result of studying chronology is typically expressed as in: "The Pisidian *coloniae* were founded in 25 BCE", "Layer 3 is older than Pit 6" or "These pithoi are typically associated with Bronze Age funerary practices". Archaeological chronologies provide dates, or at least determine whether an event or a stratigraphical feature can be dated before, after or at the same time as another event or feature. To be clear, what chronologies do not do is interpret such events or features, no matter how precise the date may actually be. It is of crucial importance to be aware of what archaeological chronologies can and cannot do; it is not that difficult to spot deficient uses of chronologies in professional archaeological literature (including in the output of the Sagalassos Project, as it happens). Basically, dates, as resulting from chronological studies, should not feature as an element of a conclusion, but feature as one of the elements in wider archaeological reasonings, leading towards interpretations and conclusions.

In order to make this point clear, let us look in more detail at what archaeological chronologies do and are. Within the large variety of chronological systems, the key difference is between absolute and relative chronologies. Relative or ordinal chronologies are systems without direction, which determine whether a feature or event is older or younger than another feature or event, in a similar position, or with no relationship to such events or features. The units of such relative chronologies are non-specific and therefore not necessarily of the same nature. Moreover, relative chronologies are based on the interdependence of the data being studied. Typical methodologies to establish relative chronologies involve the creation of typologies of series of archaeological material culture, the statistical seriation of find assemblages and the study of archaeological stratigraphies. Periodisation, which stands for attributing given artefacts or events to cultural periods, such as the Iron Age or the Roman imperial period, is often the result of exercises in relative chronology. In this sense, *pithoi* can for instance be attributed to the early Bronze Age, and as a result these large storage vessels receive the dates attributed to the cultural phase, without being dated in and of themselves. This is an important difference to understand: following relative archaeological chronologies, dates are projected onto objects, features and events, without these intrinsically providing their own dates (Fig. 2). Oftentimes, scholarly discussions in professional archaeological literature originate from an incomplete understanding of this specific and intrinsic nature of relative chronologies, when 'projected' or 'borrowed' dates of cultural periods are taken for granted and as being meaningful in and of themselves.

Fig. 2. Fragment B of the early Hellenistic inscription found near the Upper Agora. According to the ancient historians, difficult to date, yet attributed to the late fourth and third centuries BCE (Vandorpe 2000; Vandorpe and Waelkens 2007; Eich *et al.* 2018, 21–28). This date is not established by a time framework independent of the inscription, such as the mentioning of a Hellenistic ruler. The inscription also does not otherwise present equal units of measurement of time. Hence, the date for the inscription is not an absolute one, but an example of relative chronology. Indeed, the attribution in time is partly based on palaeographic criteria, considering the shape and style of the characters in comparison with other inscriptions, as well as the absence of such elements in earlier or later inscriptions. Another element in the chronological reasoning is also comparative, namely the fact that only autochthonous names are mentioned on the stone, not yet including royal names, as will be customary later, in Roman imperial Sagalassos. Both comparative reasonings are an example of cross-dating in relative chronological terms. More Hellenistic inscriptions at Sagalassos itself would help tighten this comparative framework. The nature of the date implies that it cannot be established what the date range implies: an equal distribution according to which each year within the range is as likely for the erection of the stone, or a central tendency distribution, with likelihood of attribution following a bell curve. Other options are possible, but none is more valid than the other.

Absolute chronology

Absolute or interval chronologies, on the other hand, are systems with direction based on specific, equal units of measurement, albeit without a point zero. Absolute chronologies are based on a time framework that is independent of the data being studied. In this way, a range of absolute dating techniques is available to support the construction of chronologies of materials and sites.[7] The most well known of these 'scientific' dating techniques are dendrochronology and radiocarbon dating.[8] Dendrochronology is the scientific method of dating growth rings of trees to the year in which these were formed. Each tree ring marks one year or a complete cycle of the seasons of that year, with the nature and thickness of the ring being dependent on the environmental conditions of that year. As tree ring growth is environmentally sensitive, trees of the same species and from within the same region tend to develop similar patterns of ring widths. Dendrochronology compares and matches such regional tree growth patterns on a ring-by-ring basis between different trees. When tree ring growth patterns match between trees, a dendrochronology can be constructed. This chronology can vary when the age of the wood cannot be determined, in which case this technique results in the creation of a relative chronology. Absolute tree ring dates can be established when an object or a structure provides a date one way or the other, such as a painting on wood panelling which mentions the date of painting, or a building inscription which can be historically dated providing an association for the beams found within that building. Matching the tree growth patterns of these dated wood panels or building beams with similar tree ring patterns in other objects or structures makes it possible to cross-date the latter. In this way, entire series of dated tree rings can be reconstructed for specific tree species and regions.

When historical dates cannot be associated with tree rings, in many cases radiocarbon dating can be used to provide dates for the otherwise floating dendrochronology. Radiocarbon or carbon-14 is a radioactive isotope of carbon present in organic matter in exchange with the environment. As soon as this plant or animal dies, the environmental exchange stops and ^{14}C starts decaying, with the half-life of the isotope around 5,730 years. Upon measuring the remaining quantity of the carbon isotope in dead organic matter, the moment when the atmospheric exchange came to a halt can be determined. This data is compared to the changing proportions of ^{14}C in the atmosphere, providing a date at death of the object, plant or animal in question. ^{14}C dates should be considered as statistical descriptions, dependent on calibrations, and expressing a range within which given dates are plausible. Moreover, unlike tree growth rings, ^{14}C dates do not correspond to calendar years. Further caution is war-

ranted, as the element which is carbon-dated is not necessarily equal to the totality of the archaeological event or process which is considered for dating, but often only represents a part thereof (Fig. 3).

Fig. 3. The sieving of excavation soil in order to recover small animal bones which were deposited as pellets by an eagle owl, Bath-Gymnasium, 2005. The remains of the pellets were radiocarbon dated and calibrated, indicating that the bones were deposited during the period of the second half of the sixth to the first quarter of the seventh century CE (De Cupere *et al.* 2009). Similar owl pellets were found at the bottom of the stratigraphy which had accumulated within the ruined Frigidarium 1 of the Bath-Gymnasium, immediately on top of the mosaic floor and before the structural debris of the building had started to come down and form part of the layers on top. The eagle owl(s) can only have started to live inside this large hall upon its abandonment. Whereas the date provided by the owl's pellets was originally associated with the period after the major earthquake which struck Sagalassos around this time, and thus provided a *terminus ante quem* (period before which) for the event of the earthquake, continued excavations indicated that from the second half of the sixth century CE onwards at least this part of the bathing complex was abandoned and stripped of its valuable and recyclable building materials. As a result, the eagle owl(s) could also have started to live inside this hall of the baths upon its abandonment and stripping, yet before the earthquake. The calibrated radiocarbon dates in and of themselves do not hold further information on either of the options, necessitating further archaeological reasoning.

Irrespective of the analytical costs involved or the difficulties in obtaining or exporting relevant samples for dendrochronology or radiocarbon dating, the truth of the matter is that most archaeological studies or projects, even those that have interdisciplinarity written into their DNA, make mostly 'targeted use' of these absolute dating techniques. Indeed, considering the total amount of stratigraphical units even a fairly simple excavation produces, it is impossible to

document every meaningful stage in the relative chronological build-up of an archaeological site with absolute dating techniques. Other archaeological data generation methods, such as surface surveys or museum studies, typically lack the framework of stratigraphical context associated with excavations, making the outcome of such analysis comparatively difficult to interpret. As a result, most archaeological studies are very dependent on the outcome of typological and other chronological analyses of collections of finds, providing the ABC of how to arrange the relative sequence of events and therefore the narrative of the studied sites and regions.

Apart from the dating techniques discussed above, absolute chronology can also be determined by historical association. For instance, in Roman imperial times, the detail of the titulature of emperors, as is for example present in inscriptions (Fig. 4) or on coinage, quite often provides fairly narrow chronologies. In the event that such an inscription can be associated with a given building, the monument and its context can be dated accordingly. With coins, the matter is most often more complicated, as the date implied actually refers to the moment of striking the coin, and does not incorporate its circulation or its loss and becoming part of the archaeological record. In a lot of archaeological sites, however, even Roman imperial ones, the opportunities for applying dates from historical association are few and far between, further stressing the strategic importance of building relative chronologies.

Fig. 4. Restored statue base with inscription for the emperor Caracalla (211–217 CE) on the Upper Agora, in 2017. The fact that the name of the emperor is mentioned, together with details of his political and military career, allows the text of the inscription to be dated within the year 212 CE (Devijver and Waelkens 1995, 115–16; Eich *et al.* 2018, 87–88). This is an example of absolute chronology, as the inscription refers to the external framework of the career of the emperor, which is well documented from a range of other sources.

Relative chronology

Stratigraphical analysis based on Harris matrices,[9] typological analysis of material categories, and seriation of find assemblages form the backbone of relative chronological systems. Before we look at these methods in somewhat more detail, it is – considering how often the understanding of time in archaeology is more often than not based on relative chronologies – of crucial importance to conceptualise what these chronologies do. In and of themselves, they should serve the interpretation of the diversity and multiplicity of temporal experience in the past. Obvious as this may sound, the meaning of relative dates is not always that clear. If a Sagalassos red slip ware drinking cup is dated to around the start of our era, for example, do we then date a moment in time when this vessel was produced, a period during which the vessel is supposed to have been in use, a *terminus post quem* (period after which) when, upon being discarded, the vessel became part of the archaeological record, or a normal distribution within which range the production, use and discarding of the vessel are considered to have taken place (Fig. 5)? The fact that most archaeological structures and finds experience a lifecycle on their own, combining genesis, change and endedness or recycling, does not make answering this question any easier. In most cases this is difficult to tell and that is why the creation of a relative chronology is best when it retains elements of stratigraphical, typological and seriation analyses.

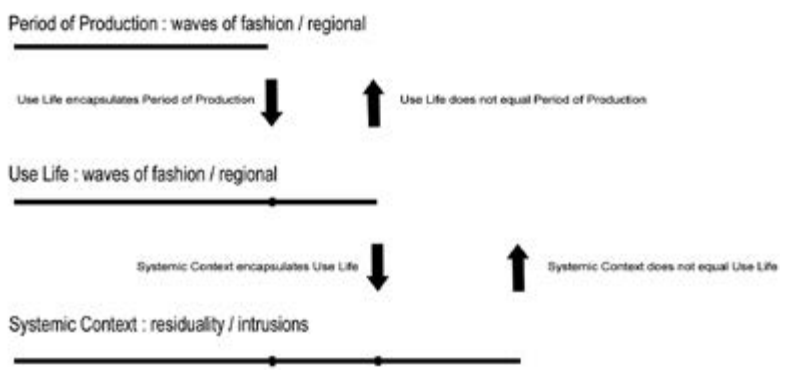

Fig. 5. Scheme of possible date ranges for a Sagalassos red slip ware vessel. As Sagalassos was a prolific production centre of pottery tableware, most of the pottery found on site was locally made. The chronology of this Sagalassos tableware is partly based on the excavation and study of potter's workshops in the Eastern Suburbium. As a result, most of the dates provided for this pottery refer to the period of production. The issue is that these dates cannot readily be projected onto other excavation contexts, as this pottery, during an unknown/able period of time, was acquired and used, discarded and became part of the archaeological record.

The principles of stratigraphy and how we apply these at Sagalassos are explained elsewhere in this volume, as is our approach to studying material culture. As to the latter, when the themes of classification and typology of material culture are concerned, the material specialists of the Sagalassos Project have agreed to make a conscious shift from 'traditional' type/variant-based classifications based on morphological central tendencies to following a joint, pre-designed taxonomic system based on functional categorisation,[10] allowing the integration of results in research-efficient ways.

Even when generally considered boring as a field of research, the at times very detailed discussions on aspects of classification and typology of finds in professional archaeological literature go the heart of the matter. Without typologies of artefacts, archaeological chronologies could not be constructed, and in most cases the stories of the studied materials and by extension of the archaeological sites or regions where these were found could not be told.

In general, archaeological typologies contain types. Obvious as this may seem, the challenge at hand is to logically and consistently organise the total collection of finds an archaeological study/excavation/survey/project generates, in order to reflect some aspect(s) of the reality it seeks to describe.[11] In conceptual terms, typologies of archaeological materials should be ontologically grounded, in the sense that types need to represent more than the mental construct introduced by the analyst but be relevant for revealing aspects of the past. In practice, a typology is a kind of classification. When applying classification, a compilation of finds is ordered in units based on morphological similarities and differences. Units should be structured in the sense that membership (or not) is based on criteria of inclusion/exclusion. The same units should be falsifiable and replicable, and the set of types must be exhaustive. The systematics of ordering is arbitrary, implying that the number of ways to define units is infinite and no one arrangement is better than any other; all depends on the research questions/aims. Following classification, a typology wishes to go further and attribute meaning: "a typology is thus a way to represent systematically the patterning imposed on artifact material by the makers and users that has subsequently been uncovered analytically by the archaeologist".[12] This implies that typologies are explanatory, in the sense that types have non-random associations that have to do with context (spatial, chronological, social, functional, ideological, etc.), choice, causal processes and/or relationships.[13]

At Sagalassos, best practices in typology and chronology were developed, with the locally produced tableware or Sagalassos red slip ware (SRSW) providing the most abundant and at the same time most sensitive information.[14] In applying the principles of polythetic description,[15] an SRSW type has a consistently recurring range of (measurable) attributes which consider both the

actions required to produce the object and the range of past usage behaviour. What started as an ethic exercise, has grown towards an emic context of interpretation, illustrated by how SRSW formed part of a meaningful supra-regional koine or common language of material culture in a production/economic and consumption/social-cultural sense.[16] The chronological reconstruction based on SRSW allows stratigraphical analyses to induce the grouping of types and loci as assemblages, which, in a next step, are ordered by applying the method of frequency seriation, based on differences in proportional representation of types between loci. Based on the analysis of SRSW, the relative chronological sequence of find materials at Sagalassos contains nine phases between the end of the first century BCE and the seventh century CE.

However, even though the methods of typological and chronological analysis seem to work fine, the continuing fieldwork combined with recent efforts at integrated digital data management at Sagalassos[17] results in steady streams of data which are increasingly beyond our human analytical capacities. 78 types and variants, representing five functional groups, quantified by two parameters, and 36 seriated ceramic assemblages were incorporated in the original study on the typology and chronology of SRSW.[18] In the meantime, 351 types and variants quantified by eight parameters and representing 60 functional groups are included in more than 1,400 pottery templates (Fig. 6). In the original study, layers were hardly functionally interpreted and sequenced based on three relations, whereas now 16 relations can govern 15 locus types and 38 functional subtypes of the 1,400 loci for which pottery templates were tabulated. Even if the methods seem to work fine, are we sure we are catching up? Clearly, the available data has grown beyond human analytical capacities. This could imply that the potential of interpretation is underexploited. When tried and tested methods are being applied repetitively, this can lead to too narrow an understanding of variation, possibly resulting in wrong assumptions, and a poor narrative of historical change in this ancient community as a result.

The Sagalassos Project has therefore recently decided to bring on board best practices in Visual and Data Analytics. From a data analytical point of view, the understanding and interpretation of this Sagalassos archaeological dataset constitutes a so-called 'wicked problem',[19] i.e. one that exhibits the following characteristics: (1) finitude of resources/knowledge (e.g. one cannot travel back in time, or excavate every single existing piece of pottery); (2) complexity (i.e. archaeological finds are influenced by a host of factors that might interact, from the time of deposition up to the moment of excavation); and (3) normativity (i.e. interpretation of archaeological finds is dependent upon the background and values of the researcher). Clearly, the problem at hand requires the algorithmic, data analytical support of the human researcher, where each play a crucial

part. This process of interaction between a human analyst and data is referred to as Visual Analytics. We eagerly await these new research results!

	FUNCTIONAL LEVEL				TYPE LEVEL				COUNT				WEIGHT			
ID	General Functional Category	Functional Category	Specific Functional Category	Object	Fabric	Functional Group	Type/Variant	Description	R	B	BS	H	R	B	BS	H
	Personal Ornaments	Jewellery		Bead												
				Pendant												
		Dress Accessories		Button												
		Cosmetic Articles		Unguentarium												
	(Household) Implements	Kitchenwares	Preparation	Mortarium												
				Krater												
				Jar												
				Jug												
				Bowl												
				Strainer												
			Cooking	Chytra												
				Kakkabos												
				Lopas												
				Tagénon												
				Lid												
				General												
		Tablewares	Serving	Jar												
				Jug												
				Askos												
				Oinophoros												
				Krater												
				Pedestal												
				Plate/Tray												
				Funnel												
				Stopper												
				Lid												
				Strainer												
			Consumption	Cup												
				Bowl												
				Dish												
				Tondo Dish												
				Ledge Handle												
				Appliqué												
	Furnishings	Lighting		Wheelmade Oil Lamp												
				Pedestalled Oil Lamp												
				Mouldmade Oil Lamp												
				Candleholder												
				Figurine												
				Soldier's Mask												
				Terracotta Plaquette												
				'Theatre Mask'												
		Sewing & Spinning Equipment		Loomweight												
		Leisure Articles		Music Instrument												
				Gaming Piece												
				Toy												
		Miscellaneous		Religious Item												
				Incense Burner (?)												
	Architectural & Structural Fittings	Construction		Tile												
				Brick												
				Hypocaust Tile												
				Brick & Tile												
				Waterpipe												
				Wall Fitting												
	Agricultural Production	Storage		Pithos												
				Pithos/Container												
				Lid/Stopper												
				Amphora												
	Production	Pottery		Kiln Fragment												
				Kiln Spacer												
				Mould												
				Slag												
				Stamp												
				Patrix												
				Matrix												
				Waster												
				Tool												
				Cassette (?)												
				Lining (?)												
		Glass		Crucible												

Fig. 6. Summary overview of the pottery templates used at Sagalassos. The pottery of each excavation unit considered worthy of detailed study is inventoried according to this scheme. The level of types and variants is not incorporated in this summary. The classification is based on presumed functions of the material. This template is shared between the material categories of pottery, glass, worked bone and metals, allowing combined analyses.

Solving the mystery: Step 3 – link with the dynamic archaeological record

When all is classified, analysed, calibrated, tabulated, quantified and/or seriated, in one way or the other dates are established for archaeological facts and features. The next step is to re-integrate the chronological information with the archaeological record, as surveyed, excavated or otherwise studied, in order to establish a chronological framework for a (part of a) site or study region. Sometimes even a chronological narrative can be reconstructed for specific archaeological episodes, although the many methodological caveats expressed above make clear that such attempts are always open-ended. Amongst others, G. Lucas[20] has argued that the archaeological record is always dynamic and part of the systemic context.

To make this abstract notion more tangible, let us look at an example: vaulted Tomb V, excavated in 2012 at the site PQ 4, which is a burial compound located at the far eastern end of Sagalassos' Eastern Suburbium (Fig. 7).[21] The tomb was situated partly underneath the northern and eastern walls of the burial compound, which meant that it was part of the original design and execution. Other factors indicated that the compound was destined to contain a family. Although the excavation revealed an undisturbed structure of the vaulted tomb, the remains of the buried female of between 30 and 40 years at death had been disturbed by rodents, the remains of which were also found inside the tomb. Presumably shortly after burial, the rodents disturbed what otherwise could have been a pristine burial. During excavation the context of the burial was already dismantled in order to retrieve the human remains and the burial gifts for conservation, study and preservation. All in all, these represent fairly drastic actions (never jeopardising the condition of the remains and finds), as a result of which each type of find is studied by a respective conservation and find specialist and the human remains by a bio-archaeologist. Following study, the storage of these finds and remains was arranged in separate depots, with regard for the optimal preservation conditions of the finds and remains. This implies the burial will never be recomposed in its entirety, reducing the window of opportunity for the entire burial to the single moment of excavation. As the burial was found disturbed, this sequence of actions means that the original conditions of the burial can never be approached. Even though the excavation was executed in line with the best professional archaeological norms and practices, this is a hard conclusion to reach and also one with repercussions for the detailed understanding of the burial (Fig. 8).

Fig. 7. General view of the site PQ 4 under excavation in 2012. Vaulted Tomb V is located in the upper corner of the burial compound.

Fig. 8. The process of excavation of the vaulted Tomb V in PQ 4. Dismemberment of an already disturbed context, with each material category and the human remains packed separately for transportation to the conservation laboratory in the excavation house.

One such aspect of understanding the burial is its positioning in time. The skeletal remains were radiocarbon-dated to 130–340 CalCE. This provides an indication, albeit not a very precise one. Typically, burial gifts can also provide chronological indicators. In standard practice, such finds are studied and dated by respective material specialists. As a result, the question arises as to which find will actually date the burial. In this case, a copper-alloy mirror was found, along with a ceramic *unguentarium* or ointment flask, two glass *unguentaria*, one containing an iron pin, seven worked bone hair pins, one bone spatula, two bone spinning tools, two golden earrings and a silver ring with gem stone (Fig. 9). Most of this material is very difficult to date and is best attributed to the Roman imperial period. The ceramic ointment flask was dated in relative chronological terms to the first/second century CE, and the same goes for its glass counterparts. It is actually surprising how a relative variety of objects which we know were deposited at one moment in time – the burial of the woman – are mostly

datable at a fairly crude resolution which provides overlap but also differences in range. Moreover, the mirror was found broken. The study of the break revealed this had already happened in antiquity, most probably implying that this object was shattered at the moment of the burial, symbolising the end of life. It is possible that the mirror formed part of the daily utensils used by the deceased, and therefore its own object biography might imply that its date is not compatible with the rest of the gifts, as it was already existing and in use before the moment of the burial. It is unclear whether this complication also counts for some if not most of the other objects. The wire of the pair of golden earrings, in contrast, was found closed in such a way that it could not be opened, indicating that these were never worn during the lifetime of the woman, but only given to her as part of the burial ceremony.

Fig. 9. The collection of burial gifts found in association with the adult woman interred in vaulted Tomb V, site PQ 4.

In this way, the archaeological record of this burial does not represent a single event in the past, as is traditionally presumed for such archaeological contexts. On the contrary, vaulted Tomb V at the site of PQ 4 is a palimpsest of events, objects and time scales, linking with the life of the deceased, the moment of burial, the disturbances upon burial and the excavation of the context, along with the study of the remains and finds.

Considering this tomb in isolation, for instance in function of its chronology, would be creating stasis and/or a single event where there was none. This tomb reveals how chronology is always dynamic, as is the archaeological record, incorporating multi-temporality. By approaching the archaeological record too much as a simple (causal) sequence of building blocks, we run the risk of reducing archaeology to an understanding of sequencing points in time, whereas time is active, diverse and multiple, if not much more. As archaeologists, along with all colleagues in other disciplines investigating time or time-related processes, we will perhaps never really get our heads round the enigma of time. It is up to each of us to judge whether this is good or bad news.

Notes

1 e.g. the otherwise cunning Harari 2011.
2 The Annales School refers to a highly influential group of 20th-century French historians who changed the way history was conceived and written at the time, with particular attention to social themes and methods. Globally, Fernand Braudel (1902–1985) is the school's most well-known protagonist.
3 Bintliff 1991.
4 Bintliff 1991; Knapp 1992.
5 Lucas 2005.
6 de Molina and Toledo 2014.
7 Blain and Hall 2017.
8 Manning and Bruce 2009; O'Brien and Lyman 1999.
9 Harris 1989.
10 e.g. Poblome and Bes 2018, for an elaboration of these principles based on the study of Sagalassos red slip ware.
11 Banning 2000.
12 Read 2007.
13 Bortolini 2017.
14 Poblome 1999.
15 Clarke 1968.
16 Poblome and Fırat 2011; Poblome *et al*. 2017.
17 Dangol *et al*. 2021.
18 Poblome 1999.
19 Farrell and Hooker 2013.
20 Lucas 2005.
21 Cleymans *et al*. 2018.

References

Banning, E.B., 2000, *The archaeologist's laboratory. The analysis of archaeological data*, Cham.

Bintliff, J., (ed.), 1991, *The Annales School and archaeology*, Leicester.

Blain, S., and C. Hall, 2017, Direct dating methods, in: A.M.W. Hunt (ed.), *The Oxford handbook of archaeological ceramic analysis*, Oxford, 671–690.

Bortolini, E., 2017, Typology and classification, in: A.M.W. Hunt (ed.), *The Oxford handbook of archaeological ceramic analysis*, Oxford, 651–670.

Clarke, D.L., 1968, *Analytical archaeology*, London.

Cleymans, S., Talloen, P., Beaujean, B., Van de Vijver, K., and J. Poblome, 2018, From burial plot to dump site. The history of the PQ4 compound at Sagalassos (southwest Anatolia), *Anatolica* 44, 123–163.

Dangol, A., Hacıgüzeller, P., and J. Poblome, 2021, Spatializing the Sagalassos Integrated Information System, in: C.H. Roosevelt (ed.), *Spatial webs: mapping Anatolian pasts for research and the public*, Istanbul, 77–87.

De Cupere, B., Thys, S., Van Neer, W., Ervynck, A., Corremans, M., and M. Waelkens, 2009, Eagle owl (Bubo bubo) pellets from Roman Sagalassos (SW Turkey): distinguishing the prey remains from nest and roost sites, *International Journal of Osteoarchaeology* 19, 1–22.

de Molina, M.G., and V.M. Toledo, 2014, *The social metabolism. A socio-ecological theory of historical change*, Cham.

Devijver, H., and M. Waelkens, 1995, Roman inscriptions from the Upper Agora at Sagalassos, in: M. Waelkens and J. Poblome (eds.), *Sagalassos III: Report on the fourth excavation campaign of 1993*, Leuven, 115–125.

Eich, A., Eich, P., and W. Eck (eds.), 2018, *Die Inschriften von Sagalassos* 1, *Inschriften Griechischer Städte aus Kleinasien* 70, Bonn.

Farrell, R., and C. Hooker, 2013, Design, science and wicked problems, *Design Studies* 34(6), 681–705.

Harari, Y.N., 2011, *Sapiens. A brief history of humankind*, London.

Harris, E.C., 1989, *Principles of archaeological stratigraphy*, London.

Knapp, A., (ed.), 1992, *Archaeology, Annales, and ethnohistory*, Cambridge.

Kohler, T.A., 2012, Complex systems and archaeology, in: I. Hodder (ed.), *Archaeological theory today*, Cambridge, 93–123.

Lucas, G., 2005 *The archaeology of time*, London.

Manning, S.W., and M.J. Bruce (eds.), 2009, *Tree-rings, kings and Old World archaeology and environment: papers presented in honor of Peter Ian Kuniholm*, Oxford.

O'Brien, M.J., and R.L. Lyman, 1999, *Seriation, stratigraphy, and index fossils: The backbone of archaeological dating*, New York.

Poblome, J., 1999, *Sagalassos red slip ware. Typology and chronology*, *Studies in Eastern Mediterranean Archaeology* 2, Turnhout.

Poblome, J., and N. Fırat, 2011, Late Roman D. A matter of open(ing) or closed horizons?, in: M. Cau, P. Reynolds and M. Bonifay (eds.), *Late Roman fine wares: solving problems of typology and chronology*, Oxford, 49–55.

Poblome, J., Özden Gerçeker, S., and M. Loopmans, 2017, Different similarities or similar differences? Meaning constituted in the mix of koine, oligopoly and regionalism, in: A. Van Oyen and M. Pitts (eds.), *Materialising Roman histories. Beyond instrumentalism and representation*, Oxford, 85–100.

Poblome, J., and P.M. Bes, 2018, This is how we do it. Methodology of pottery processing at Sagalassos, in: S. Biegert (ed.), *Rei Cretariae Romanae Fautorum Acta* 45, Bonn, 731–740.

Read, D.W., 2007, *Artifact classification. A conceptual and methodological approach*, Walnut Creek.

Robb, J., and T.R. Pauketat, 2013, From moments to millennia. Theorizing scale and change in human history, in: J. Robb and T.R. Pauketat (eds.), *Big histories, human lives. Tackling problems of scale in archaeology*. Santa Fe, 3–33.

Vandorpe, K., 2000, Negotiators' laws from rebellious Sagalassos in an early Hellenistic inscription, in: M. Waelkens and L. Loots (eds.), *Sagalassos V: Report on the survey and excavation campaigns of 1996 and 1997*, Leuven, 489–507.

Vandorpe, K., and M. Waelkens, 2007, Protecting Sagalassos fortress of the akra. Two large fragments of an early Hellenistic inscription, *Ancient Society* 37, 121–140.