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ARTICLES

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NO NARRATIVE SO GRAND

ABSTRACT

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Archaeology deals with many narratives, on a number of different levels. The most important is that of the narrative itself: archaeologists want to tell a story. Thus we frame our arguments within a narrative structure, with a beginning and an ending; we present our evidence and our conclusions, and link them all with arguments that are intended to show how the conclusions derive from the evidence.

Archaeological narratives have long been concerned chronologies: the narration of events in the order that they occurred. To some degree this narrative benefited from one derived from geology, which equated time *and* space stratigraphically. The limitations of such approaches become obvious when we want to know more than just the *sequence* of events within the limited contexts of an individual site, and try to extrapolate those into regional analyses or those "universal laws of human behaviour" processualists claimed it was our task to uncover.

Attempts at equating time and space are hindered to the extent that things cannot be related to one another in time as they are in space. In space things can be "near" one another, and we can model proximity in GIS. But how do we compare anything that is dated to *around* 350 AD, *ca.* 4th c. BC, "late Bronze Age," etc.? "Free text" entry of the temporal "location" of an object, site or context does not suffice for modelling complex semantic structures in a database.

This paper explores a solution for dealing with such problems of conceptualising and modelling temporal proximity.

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Archaeology deals with many narratives, on any number of different levels. The most important (and probably overlooked) is that of the narrative itself: archaeologists – and scientists in general – want to tell a story. Basically we take a lot of "facts" and try to link them into some kind of narrative sequence or causal chain. We start at the beginning – with an introduction ("Once upon a time") – and then we head towards an ending – a conclusion ("And they all lived happily ever after"). And in between we present our evidence – which is supposed to be the interesting part – and link it all with (hopefully logical) arguments that are intended to show how the conclusions derive from that evidence.

Although this may seem easy, we know it rarely is. Among other things, archaeologists generate a lot of facts (this has long been the goal; cf. Van Riper 1993, 34-35); a lot of data (cf. Snow *et al.* 2006, 959 for an estimate of storage space devoted to finds and documentation in US Federal agencies). So over time we have had to adopt or develop tools to make our job easier: drawings, photos, films, 3D laser scanning, the Harris Matrix, or the iconic images combining chronological and geographical information which V. Gordon Childe intended to provide synthetic overviews of European prehistory (Fig. 1). Although Childe's graphs have since become so familiar as to almost be clichés, his example is useful in part because narratives need heroes (or eponyms; cf. Merton 1993, 101).

Childe's graphs also illustrate one of the goals in archaeology: the need to correlate different stories – different narratives – some of which run in parallel while others intertwine. Such correlation is easy to illustrate graphically because images are simultaneous: the moment of a snapshot, for example (cf. Grenon and Smith 2004):

> Visual space is continuous, connected, homogeneous, and static. All the other senses make spaces that are quite different, totally discontinuous, non-homogenous, and dynamic, whether it's the sense of touch, smell, hearing, kinesis, or any sense whatever (McLuhan 2003a, 209).

It is more difficult to illustrate correlation with text, because text is linear, sequential; words have to be placed in a certain order in order to be meaningful (contrast Holtorf 2000, 174). Sense – meaning – is lost if individual words, paragraphs or pages are read in some order other than that in which they were intended (random, reverse, arranged by length or alphabetically, etc.; contrast *Finnegans Wake* [Joyce 1976] to *A Concordance to Finnegans Wake* [Hart 1963]; cf. Geertz 1993, 15, Deutscher 2011, 19). As an example, consider Woolley's definition of "Field Archaeology" as

> the application of scientific method to the excavation of ancient objects… it is based on the theory that the historical value of an object depends not so much on the nature of the object itself as on its associations, which only scientific excavation can detect… digging consists very largely in observation, recording *and* interpretation (Woolley 1961, 18 [added emphasis]; compare Woodbury 1954, 295, Willey and Phillips 1958, 2).

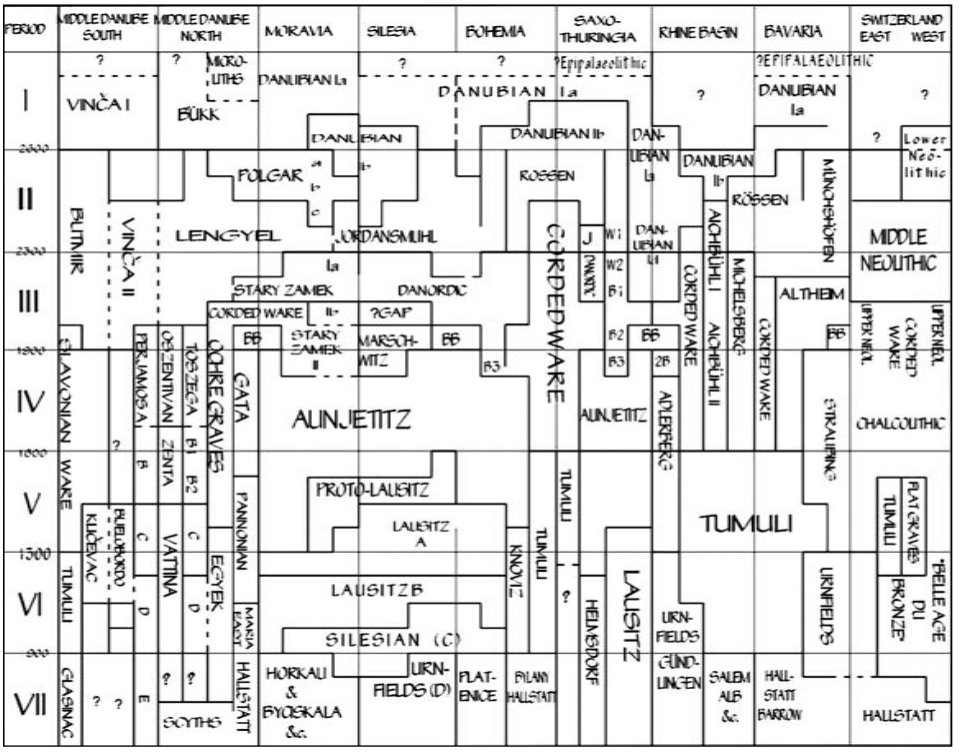

Fig. 1. One of Childe's diagrams illustrating his synthetic overview of European prehistory

Fig. 2. Woolley's view of the archaeological process

Although that "and" suggests that "observation, recording and interpretation" are equal, the simple fact that words must be strung together – one after another – subtly implies a sequence (as in Fig. 2) which, among other things, contradicts Hodder's assertion (1999, 68) that "The separation between description and interpretation is false."

Such problems of meaning and sequence are compounded in a database, where data can be recombined in any number of combinations in response to any number of search queries, and become even more complex in a database like *ArcheoInf*, which aggregates databases from any number of site archives (cf. Carver *et al.* 2013).

Even without adopting a stance as extreme as Derrida's "*il n'y a pas de hors-texte*" (cf. Journet 1993, 245) or subscribing to the analogy of archaeology being text (cf. Hodder

1989), despite discussing a database, the present study must be textual because archaeology – and science in general – has traditionally been reported as text, and the present study itself is text.

Textual primacy is evidenced in other ways. Although archaeologists are advised, for example, that "Wherever possible, reference must be given to a drawing or photograph where a relationship can be seen much more easily than in words" (Webster 1963, 135), using images to clarify text is somewhat different than the belief that "Photographs furnish evidence. Something we hear about, but doubt, seems proven when we're shown a photograph of it" (Bohrer 2011, 5).

The possibility that text might be overpowered by any associated imagery – and that Webster's relations might be reversed – is suggested by the belief that archaeological reports should either be composed of illustrations linked by text ("nowadays the main structure of a book on any descriptive science is its plates, and the text is to show the meaning and relation of the facts already expressed by form" [Petrie 1904, 114-115; cf. Wheeler 1954, 182]) or use "hypermedia," where "units of many different texts, images, sounds, etc. are linked with each other in a non-sequential and truly 'inter-textual' way, thus reflecting how the mind creates meaning of the world" (Holtorf 2000, 166; contrast McLuhan 2003c, 179; cf. Baines and Brophy 2006, 247-248).

It might also be easier to imagine that Webster never considered how we take the media we work with – both text and images – for granted, without taking this dialectic into account (i.e. the conflict between St. John [In the beginning was the Word"] and Aristotle ["the soul never thinks without a mental image" [Aristotle 1964, 176/177 [431a, 16])], as manifested in the different power relations between – and meaning imbedded within – text and imagery; cf. Harkness 1983, 32); never considered the extent to which the "material cause" of documentary and dissemination media shapes and/or constrains the messages we can transmit or the narratives we can tell or, perhaps, "how the mind creates meaning of the world":

> One of the problems of Western visual man is that he tries to translate everything into visual terms. It is very difficult for Western man to take things except in a visual, connected, rational mode. Modern physicists report all their findings in Newtonian terms, which are the old-fashioned visual language (McLuhan 2003d, 232-233; cf. Rudwick 1976, 182-183 [endnote 4], Molyneaux 1997, 2-3).

Either way, "separating text and graphic, even on the same page, usually requires encoding to link the separate elements" (Tufte 1990, 116); it needs Petrie's "text… to show the meaning and relation of the facts already expressed by form." Otherwise, as Susan Sontag noted (2011, 68), "Any collection of photographs is an exercise in Surrealist montage."

Issues of "relation" are, of course, particularly relevant to databases (which, if nothing else, formally structure data), but also raise issues of structuralism. Specifically, the opposition of a database entry to the entity it describes parallels that linking signifier and

signified in both written and graphic documentation. The graphical equivalents of signifier and signified are sometimes labelled representans and representandum (Le Poidevin 2007, 5) or representings and representeds (Savitt 2002, 163). Foucault (1983) highlighted the issues of both textual and graphical structuralism in his discussion of Magritte's *Ceci n'est pas une pipe* (cf. Tilley 1990, 282-283, Hodder 1989, 255), where neither the picture nor the text (despite that "ceci") is a pipe.

The example of surrealism shows that a type of meaning may be found through even the most random juxtaposition. As an example, consider a short sequence from the chase scene in "The French Connection" that used to be shown during the "Oscars" ceremony to illustrate what a film editor does. Basically Gene Hackman is driving a car, which is shown veering towards a woman crossing the street with a baby-carriage. The film cuts to a point-of-view shot of the woman's face; then to a shot of a foot slamming down on the brakes; then the car is shown swerving; then a hand shifts the car's gears and swings the steering wheel, etc., all with a counter keeping a running tally of how many cuts had been made in this short sequence of film. Simply listed like this, the individual elements seem boring and mundane ("foot slams on brake"), and many of the individual shots taken inside the car may have been taken in a studio and probably did not involve Gene Hackman at all, but when put together – *related* – in just the right sequence, meaning derives from this series (set?) of otherwise quite possibly unrelated images.

Although meaning in human activities is often the "intention" which separates a wink from a blink in Gilbert Ryle's example (1971b, 480-482; cf. Geertz 1993, 6; Flannery 1982, 268) of "thick description," it is common to infer meaning from relations in archaeology (i.e. the potentially random assemblage of artifacts recovered from any given context). The risk is that the results will be oversimplified (they will be too "thin"), not only because "witnesses" (cf. Flannery 1982, 275) but also because some concepts ("meaning *and* relation") cannot be expressed effectively either with traditional graphics ("the main structure of a book"), or with such new media as databases and hypermedia (or hypertext) –

> when the only access to a photo collection is through hypertext, it is almost impossible to develop and communicate certain themes that are thought to be important to the author. A hypertext format is not particularly useful, for example, in communicating a specific interpretation. Interpretations are, after all, based on arguments, and arguments are essentially linear in form (Dibble and McPherron 1997, 61; cf. Shanks 1997, 99) –

lacking as they do that linearity of narrative ("Functioning takes place in time, and must be explained in time. Only that which narrates can make us understand" [Bohrer 2011, 23]). Narrative linearity can only be expressed graphically with what are (as in Fig. 2), essentially, linear drawings: flow charts (i.e. the deliberate exploitation of drawing conventions).

Most importantly, perhaps, the tools available (ontological, etymological, etc.) for textual analysis generally *seem* better accepted and less subjective, somehow – more "hard"

or *scientific* (witness the recent emphasis on hermeneutics (cf. Hodder 1999, 32; Holtorf 2000, 167, etc.) – than their clearly "soft" art-historical or art-*interpretive* equivalents (as personified in the present discussion by Susan Sontag; cf. Rudwick 1976, 182-183 [endnote 4]). This perception may represent a remnant of the logocentrism which plagued 20th century philosophy (cf. Ryle 1971a, 271; Baines and Brophy 2006, 238), processualist pretensions towards positivism, or a lingering sense of unease (at least within English-language archaeology; German-language *Archäologie*, derived from Winkelmann's art-historical approach, provides a clear contrast) over relations linking antiquarianism to art history, but is convenient given the particular significance problems of terminology have for database design ("ontologies"), since even the use and analysis of graphical databases continue to be limited by reliance on potentially subjective textual "tags" for organisation and classification (cf. Dibble and McPherron 1997, 61; Howe *et al.* 2008, 48).

Ultimately, though, what we are discussing here are metaphysical issues. Despite having a bad reputation with most scientists (cf. Stephenson 2011, 95-96), we all use metaphysics under different labels. Explicit references to metaphysics have been rare in archaeology; exceptions include Clarke (1973), Meltzer (1979), and more recently Kobiałka (2014).

Aristotle's metaphysical causes provide a convenient example, both because they allow maintaining terminological and schematic consistency with later scientific explanation, and because they provide a framework – or a metalanguage – for explicitly labelling parts of a process: materials, aims, and means.

Aristotle (2007, 89-92 [V.i-iii; 1013a-1014a]) identified four causes: *material*, *formal*, *efficient* and *final*. As an example, imagine someone wants to make a statue of Aristotle. The "material cause" is the material something is made of: marble, wood and bronze all need to be worked differently in order to make a statue, and the results will differ accordingly. The "formal cause" is the set of processes employed for transforming the raw material into a finished product. The "efficient cause" is the force that changes something: the sculptor (Michelangelo or Picasso?) applying skills and knowledge to transform these materials in order to achieve a goal, which is the statue or "final cause."

An archaeological example might be the different types of tools or buildings that can be made from a given material (i.e. stone, bronze or iron). Similarly, the results of archaeological research will be different if the documentation is recorded on paper than if it is recorded digitally (i.e. "the medium is the message"):

> Each recording medium (text, digital and still photography, video and audio) forces an archaeologist to take a different angle from which to observe and discuss the subject (Stevanovic 2000, 238).

Ideally, the most efficient action would use the best material for a given task, but we are almost always forced to compromise (Feyerabend 1993, xi; cf. Lévi-Strauss [1966, 17] on "bricolage"; contrast Holtorf 2000, 174). So first we have to define what are our aims; do we intend "to acquire data" (Carver 1990, 77) or do we want and/or need Binford's (1964, 438)

"adequate, reliable, and representative data"? and what do we intend to do with that data (however "adequate," "reliable," or "representative" it may be) once we have it? to "show the meaning and relation of the facts already expressed" in Petrie's "plates," or turn it into "hypermedia"?

Metaphysics helps construct a narrative, as shown by comparing Aristotle's four causes with the literary critic Kenneth Burke's "dramatistic pentad" (Burke 1969, xv):

> five terms that constitute the grammar of action: the *act* itself; the *agent* performing it; the means or *agency* used; the *scene*, or context; and the *purpose* of the action (Lyne 1993, 146 [original emphasis]).

The five terms of Burke's pentiad answer common questions any narrative seeks to answer: *what* action took place, *who* did it, *how* did they do it, *where*, and *why*? Burke represents an advance on Aristotle because of his inclusion of location (where/scene), which, in archaeology, is important for questions of provenience and/or provenance (whereas in most sciences, theoretically "where" a given experiment takes place should not play a role in the results so long as all the other conditions remain constant, archaeology is largely concerned with what Petrie [1904, 50] labelled the "main evidences of position"). It should be obvious why this concept could be equated with metadata in a computing environment, and "reflexive methods" (cf. Hodder 1997; 1999; 2000b, etc.)

Archaeology is further complicated by the fact that it has a double narrative (cf. Binford 2001, 46): we need to consider both the metaphysics of the events in the past *and* those of the archaeological investigation. In that sense archaeology is like a detective novel (cf. Frank 1989), in that one narrative arc tells of the detection (by Sherlock Holmes, Miss Marple, etc.; this becomes very complex if we conceive archaeology itself as being "like" a text, while trying to reconcile this metaphor with the post-processualist "death of the author" meme [cf. Hodder 1992, 158, etc.]), the other the crime (cf. McLuhan 2002, 106, Blaise 2000, 223).

Francis Bacon's "idols" (2000, 39-42; cf. Jardine 2000, xix-xx) provide more nuanced extensions to Aristotle's "material cause." His Idols of the *Tribe*, *Cave*, *Marketplace* and *Theatre* refer, respectively, to constraints imposed by biological limitations (we need telescopes, microscopes and X-rays to extend our range of vision; cf. Freud 1930, 47-50; McLuhan 2003b, 48-49; Tucker 2005, 7), personal experience, language/jargon, and institutions (or tradition).

Our problems with *ArcheoInf* were compounded by the need to reconcile two parallel metaphysical structures: the assumptions, experience, language, traditions and goals of archaeology on the one hand and those of computing on the other (cf. Carver and Lang 2013). Hodder's criticism of "fragmentation" raises the additional problem that subdisciplinary specialisation, jargon and "traditional" division of labour lead to different – and limited – aims, and overlooks the fact that archaeology has never "unified." Despite David Clarke's assertion (1973b, 18) that "Archaeology is, after all, one discipline," archaeology has al-

ways been divided by on-site division of labour (photographer, excavator, draughtsperson, surveyor, finds specialist, etc.; cf. Collis 2001, 39-42, 44-45 [fig. 2.14] for an historical overview), and further divided by specialisations (faunal [further sub-divided into expertise on micro/macrofauna, etc.], flora, dendrochronology, geoarchaeology, region and/or period, etc.): Wordsworth (1994) contrasted the "unlettered ploughboy" who found an artifact, the antiquary who studied it, and the "bard" whose interpretation brings it alive.

The limited results of limited aims are often "fragmented" – poorly integrated (*surreal?*) – since, if you're too specialised, it is easy to lose track of the final cause: why we do something, or what anyone's place is within the archaeological process. The potential consequences of such divisions are illustrated by the differences between how farmers and archaeologists have adopted technology in the almost 200 years since Wordsworth wrote his poem. While some of today's "unlettered ploughboys" drive tractors equipped with GPS and GIS, many archaeologists still work with trowel, paper, and pieces of string.

Since computers were supposed to rectify this –

> The electronic ages seems to be abolishing the fragmented and specialist form of work called jobs and restoring us to the non-specialized and highly involved form of human dedication called roles (McLuhan 2003b, 50) –

the best solution to problems of "fragmentation" might be better database management (which Hodder tried to do at Çatalhöyük; cf. Hodder 2000a, 7; Conolly 2000, 55; Hamilton 2000, 121; Berggren *et al.* 2015: 441-443; cf. Hamilton 2000, 123 for a critique of the results) combined with an increased emphasis on reflexive methods and metadata.

Archaeologists have always recognised that "we have to have a kind of integrity most fields don't need. I need your data, and you need mine" (Flannery 1982, 276). Now that we can publish databases, spread sheets, etc., online – where "cellular isolation is no longer possible even were it desirable" (Clarke 1973a, 11; cf. Backhouse 2006, 51) – we not only have to address questions of what we want to publish, and how we make our data available to other researchers, but also to ensure that that data is "adequate, reliable, and representative."

Thus – "Before future LEAP-style publications can be produced," for example –

> a shift in the way archaeologists prepare, create and think about data must occur. Traditionally the archive has been something of an afterthought, pieced together after the fieldwork is finished. If the archive becomes part of the publication, however, more care from the outset of an archaeological project must be taken with regards to data creation. This means that full metadata and documentation of the data must be created. Putting the raw data alongside the publication may force data producers to take more care in creating their data. Archaeologists can sometimes create data knowing that few outside the project will ever see it. This new exposure will hopefully force archaeologists to break the uneven data management habits that have historically afflicted the discipline (Richards *et al.* 2011, 146).

The need to change the "material" by adding "full metadata" reflects new aims ("final cause") and altered *effective* cause (addressing "uneven data management habits"): we need to know if they were found by Wordsworth's "unlettered ploughboy."

The point is that if you change one element in this metaphysical framework, then everything else has to be changed accordingly; if you change the goals, then you need to change the means and the personnel; if you change the recording technology, then you also have to have right the means and personnel, and what you achieve at the end will potentially be different, even if your initial, *intended* goals stay the same.

On a large, disciplinary scale, archaeology has evolved away from its initial focus on the classification and chronology of finds towards context (cf. McAnany and Hodder 2009, 5; Larsson 2004; Papaconstantinou 2006, etc.); the present study is part of an attempt to move from where "archaeology is like a text" to "archaeology is like a database."

We have also been trying to shift the focus from finds classification and chronology towards context in a database. Just as Childe needed a way to correlate his chronologies, we have to find some conceptual and terminological consistency when we combine databases in *ArcheoInf*. With artifacts and site types this has proven to be relatively straightforward. With chronology, however, this is surprisingly difficult.

There are basically two issues. The first is with terminology (i.e. Petrie's "meaning"), and the problems W.W. Taylor identified (1948, 108) in terms of criteria for comparing a mouse with the Empire State building.

One problem is that such higher-level classifications as "Iron Age" or "Prehistoric" do not have the same meaning everywhere. For example: in Italy the "Iron Age" predates the Romans, and in Estonia it dates to around 1000 AD (Mägi 2004). In parts of the "Old World" "historical archaeology" stretches back to the Sumerians and Babylonians, whereas in North America it dates only to 1492.

Despite David Clarke's insistence that "the single most restricting factor in the development of archaeology as a discipline was the ambiguous and inexplicit terminology" (Clarke 1978, 23), terminology itself did not present us with too big a problem, because it was really just a matter of classification and labelling, and we had developed a hierarchical semantic thesaurus (Lang *et al.* 2013) to deal with this.

We had a webpage – a *uniform resource identifier* or URI – all written up in XML code – which listed different definitions of "Iron Age," and these were linked to different sources and geographic locales. So if you say "this is 'Iron Age'" according to Professor *X*, as published on page *Y* of some publication, and you are only referring to *this* part of Norway, then we had no problem: the whole thing was clearly defined, we could publish it on the web, and we could reference it so that everyone would know what you meant, and our database could query the data in a way which lets us get on with the fun stuff: telling a story (i.e. Petrie's "relation").

In some cases we could also arrange some of these events in a relative – *narrative* – sequence: what came first, what came last. On a large scale archaeologists have the three

ages: Stone Age, Bronze Age, Iron Age, followed by such historical periods as "Classical Antiquity," the "Dark Ages," the Middle Ages, Renaissance, etc., and we can model those fairly easily.

We can usually correlate them, too: reconcile the idea that the Iron Age in Estonia corresponds to the Early Middle Ages – or even the Viking Age – elsewhere.

Where we really started having trouble is at the smaller inter-site scale of our database. This can be illustrated by trying to scale down from Childe's overviews of European chronologies to a Harris Matrix, which also displays a relative dating sequence and multiple narratives.

On the one hand, everything would be really easy if – as is generally depicted – all the boxes could all be simply the same size, as though they're all equal; as though they all represent the same length of time. Or if, several boxes could be placed – arbitrarily – in the same level so they look like they're all contemporary.

But reality isn't like that, and such criticisms have been directed against the Harris Matrix for quite some time (cf. Adams 1992). The Harris Matrix was only intended to arrange strata in a relative chronological sequence; it was never meant to illustrate either the length of time a given stratum was understood to represent, or to fix it in absolute time.

Our problems with *ArcheoInf* started when we tried to work with some of the vague "dates" we get with some database entries. When someone says something happened *around* a certain date: *circa* 560 BC, *late* 4th century, etc.

As one way of finding a solution, consider the "matrix" Martin Carver suggested could replace – or improve upon – Harris (Fig. 3), and the parallels between Carver and Childe.

Martin Carver basically tried to get the Harris Matrix to do more than it was originally intended to do by adding an extra dimension – *time* in the form of duration – to the relative chronological sequence. There are a number of reasons why the Carver Matrix has not been as successful as the Harris Matrix, the most obvious being the fact that it is often very difficult to date the beginning and end dates of a given deposit – represented by the upper and lower lines on a profile drawing or in a Harris or Carver Matrix. The danger is that there will be a temptation to equate thickness with duration, without taking variables like rate of deposition into account. Also, the Carver matrix examples have essentially provided schematic views of profiles, but it would be difficult representing an entire site (land use diagrams provide a possible alternative; cf. Fig. 4 and Saunders 2004).

Relative dating isn't a problem – what comes first, what comes later – but fixing that relative sequence in absolute time has long been a major problem; for Childe, Harris, Martin Carver, and for our database.

Because ultimately we're trying to reconcile two very different concepts: *relative* and *absolute* time. This problem is compounded by questions of whether time should be conceived as being circular (not only Vico, Nietzsche and Spengler, but also Hutton and Lyell; cf. Collingwood 1927a, 1927b; Eliade 2005) or linear (as in Francis Bacon, Christianity and, ironically, evolution; cf. Bury 1920).

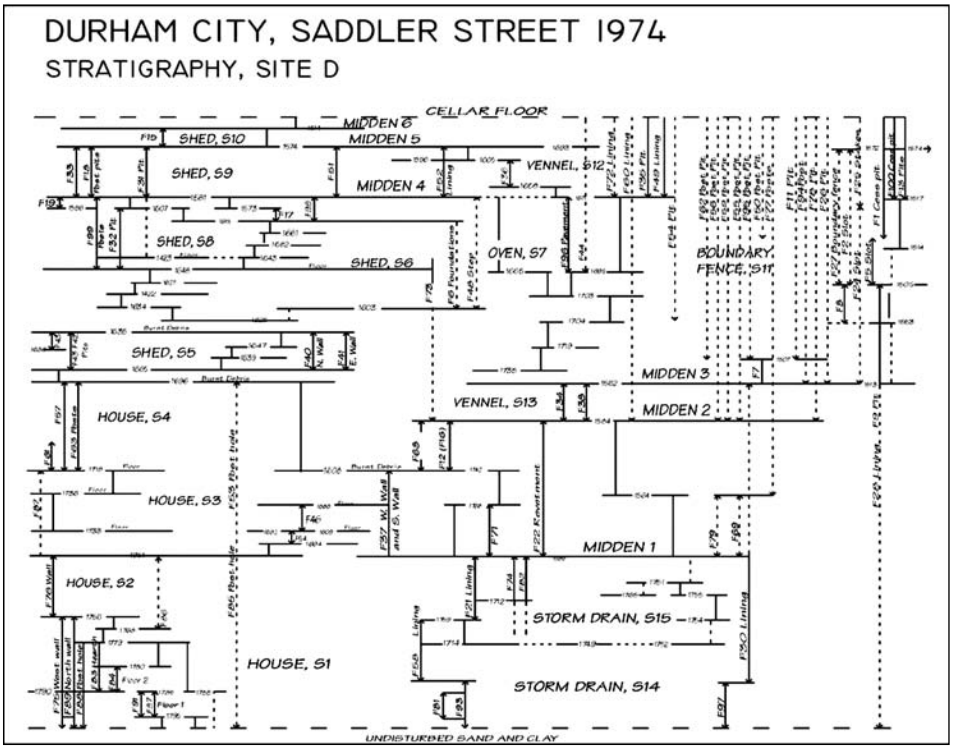

Fig. 3. The Carver matrix

Stephen Jay Gould discussed this conceptual problem in *Time's Arrow, Time's Cycle* (Gould 1987). Harris (1989, 42) misunderstood the "cycle" to refer to laws of nature which do not change over time (an assumption necessary for uniformitarianism; cf. Mill 1882, 223-234), but Gould had shown (1978, 150-151) how Lyell's "uniformitarianism" included a circular model of time that would one day see dinosaurs returning to Surrey (Lyell 1990, 123; cf. Rudwick 1975).

Some of these problems have recently been the subject of detailed discussion by both archaeologists (i.e. Lucas 2005; Lyman and O'Brien 2006; cf. Green 2009 for a discussion of integrating time into a GIS) and philosophers (cf. Callender 2002 for a general overview). Archaeologists, however, have not been referencing – and seem not to have benefited from – the philosophers.

With good reason, perhaps, since it turns out that even philosophers have trouble with time, even going so far as to argue that time does not exist (cf. McTaggart 1908). If this was true, of course, we would all be out of business. On the other hand, it is unlikely that Einstein, for example, would agree with the assertion that "Spatial time is uniform, abstract and commodified time, the time of capitalist production" (Shanks and Tilley 1987, 10).

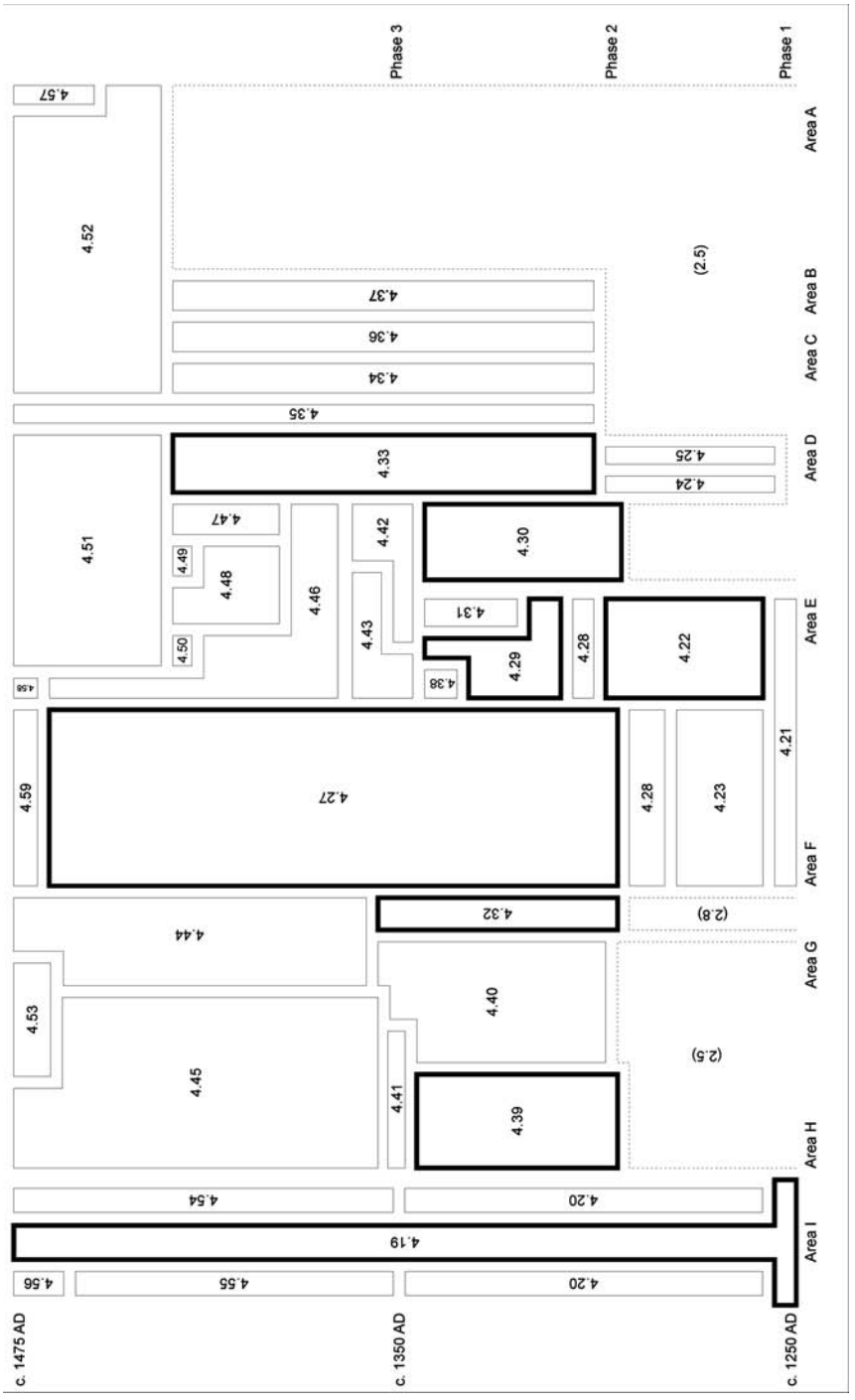

Fig. 4. Land use diagram

Since this philosophical approach seems to be a dead end, we decided to reconsider what we had been doing with *ArcheoInf*, and what we wanted to do. We essentially wanted to model temporal *proximity*; we wanted to know if one time period *overlaps* another, or if a date in one database *falls within* any of the ages, periods, epochs, cultures – or is basically contemporary with individual strata – in another.

Note that *proximity*, *falling within* and *overlapping* are all standard spatial relations in GIS. Since we are already working with GIS, these seem to offer the chance of addressing time as a spatial problem (despite – or perhaps because of – what Shanks and Tilley wrote about space, time and capitalism).

Anyway: because they provide an accepted standard as a starting point, let's go back and take another look at the Harris and Carver matrices, if only because they provide a solid framework we can build on. We don't want to have to reinvent everything.

The Harris Matrix gives us a series of time lines; a whole lot of individual stories. And, as we know, there are a lot of different ways to tell a story. You can tell a folk tale very simply, using just a few characters and little by the way of character development, and starts *Once upon a time* and ends *And they all lived happily ever after*. Or you can have more complex stories which involve any number of characters, sub-plots, literary allusions (and as Kristeva has argued, "Any text is constructed as a mosaic of quotations"; cf. Selzer 1993, 9), symbols, etc., and which require complex plotting and foreshadowing, or the kind of cross-cutting – and the different perspectives – that we find in novels and movies.

And as Childe and Harris remind us, we also see this kind of thing in archaeology, where different narratives also parallel – or intertwine – with one another.

So let's imagine that each one of the boxes in a Harris matrix – or each stratum that a box represents – represents an event, or the results of a process: a scene in our movie, or in the story we're trying to tell. And we can think of what we would need in order to fix each scene in time; in order to give the relative dates an absolute date. And to do that we have to look not at the box or stratum itself, but at its contents: we start dating with finds.

One of this study's co-authors (Carver) has been working on the rather circular problem that archaeologists often use stratigraphy to date finds and finds to date strata, as in Stein's example (1986, 507) of how, in the Mississippi delta, "geologists built their chronology on the basis of stratigraphic relations between archaeological sites on the one hand and river channels and delta deposits on the other… In turn archaeologists used the relations of river channels and delta deposits to date their archaeological sites."

Besides stratigraphy, there are essentially three ways we date artifacts: with coins or dendro-dates; with ^{14}C or other radiometric techniques; or by using typologies.

On one scale, a typology is just another relative dating technique: a classification schema arranged in a relative sequence. Type *B* came after Type *A* but before type *C*. Like the boxes in a Harris Matrix, a typology is essentially an evolutionary framework: not dating per se, because the relative sequence still has to be anchored in absolute time somehow.

Typologies present another type of problem that can usually be ignored if you are just trying to tell a story – but cause a lot of trouble when you are trying to build a database – because an artifact first has to be identified as being representative of or belonging to a *type*. That means that a comparison has been made to some exemplar, possibly in some reference work. So we say that an artifact is type *B*, which Professor *X* has dated to one period, Professor *Y* to another, etc. And for a number of reasons, the reasons for making that comparison need to be made evident (as metadata).

But it could be that all of these learned professors – and other experts – were wrong; that their typologies were based on nothing more than guesswork, on wishful thinking, and maybe they have no more basis than the folk tales we all learn, when we're children. *And we all lived happily ever after.* Like Indiana Jones you're basically saying "trust me."

With luck, we might find that the type was dated – *Once upon a time* – according to some association with coins or radiocarbon dates. But even then, there is usually a whole chain of reasoning hidden away behind – or beneath – any given typology, and this reasoning is usually edited out of our narratives. But that's something we have to access – somehow – if our database is to be of any use (in order to evaluate whether or not the data is "adequate, reliable, and representative").

So it's up to you to tell us why you have chosen one typology over another, so we can put this metadata into the URI we use to define our terms. Otherwise we won't know what basis there is for that dating,

Overall, though, typologies themselves are generally too vague to suit our purposes.

Archaeologists like coins because coins have absolute dates (Barker 1998, 205), and numismatics was once labelled "an important branch of archaeology" (Pettigrew 1848, 8). It's not always clear what these dates represent, however. Obviously the date they were minted (cf. Kemmers and Myrberg 2011, 89-90), but coins do not go out of circulation in their year of manufacture, and could have been carried around for a long time before being lost (Barker 1998, 205) – or they could have been hoarded for their value as metals – before entering the archaeological record.

Similarly, with dendro-dating we date when a tree was chopped down, but a piece of wood first used in a ship might have been reused in a building, or perhaps as a tool, before eventually being burned as firewood.

So we need to know about the context from which these finds came, and maybe something about artifact biographies.

Then we could consider any number of alternate scenarios. Maybe a piece of wood or a coin was lost or discarded shortly after manufacture (Fig. 5; while possible, this seems to be more likely for firewood, perhaps, than structural wood or coins). Or maybe the chance of loss increased over time (Fig. 6). Or maybe the chance of loss remained constant over time (Fig. 7).

Obviously there are a lot of scenarios we could model, and any number of factors could be taken into account: small, dark-coloured coins of low-value might be easier to lose than large, valuable coins of gold or silver.

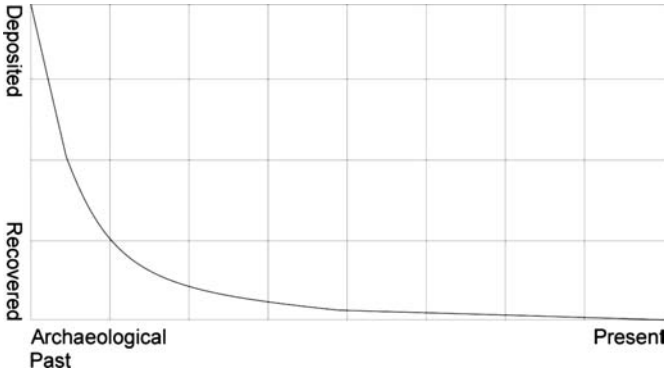

Fig. 5. Catastrophic loss or decay

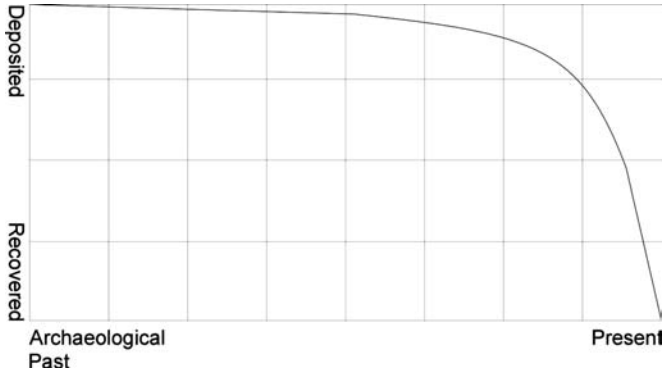

Fig. 6. "Last minute" decay

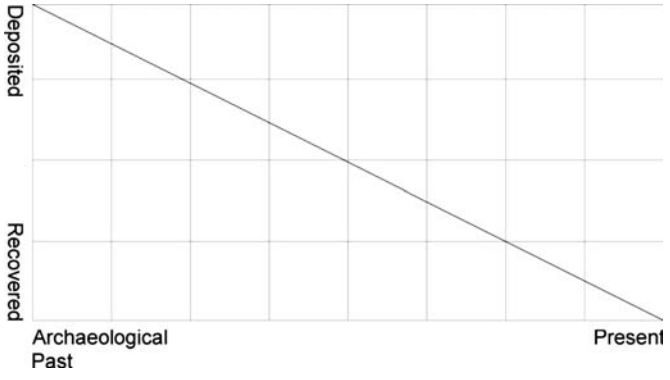

Fig. 7. Constant rate of decay

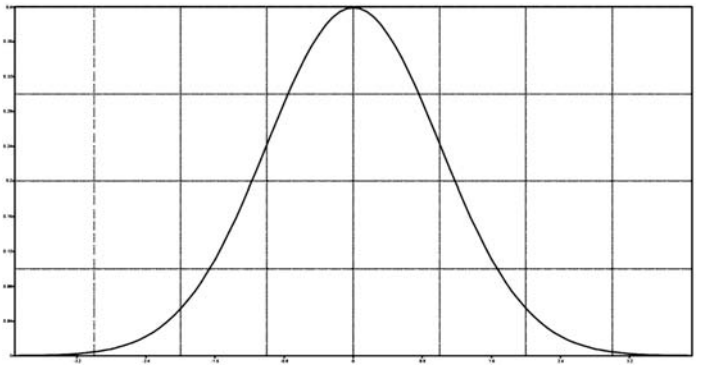

Fig. 8. Normal curve representing ^{14}C dates

This presents problems of interpretation: problems which lead to choices which we have to make. And when we're telling our stories, we probably give a "thick description" in order to explain why one character acted in a certain way but not in another – why our heroes did one thing and not something else – because we're interested in motivation: *why* people make choices, *why* people do things. But we don't always explain why *we* chose to tell one story and not another; what "meaning" we wish those stories to carry ("Only that which narrates can make us understand" [Bohrer 2011, 23]).

Now let's contrast coins with radiocarbon dates. ^{14}C dates present that same problem of determining what the dates indicate: the death of someone or something. And in some cases – again: bone or wooden objects may have been used for a long time *after* the death of a tree or material.

But for our purposes, the main point is that ^{14}C dates come with estimates, and that's a start. Because with these standard deviations, we know exactly what *you* mean when you write "*around* 200 BC" because here you have told us: ca 2168 BP plus or minus 20 years.

So we can have a plot (Fig. 8). Which is kind of nice, but we want to use this information in a Harris matrix somehow. And besides: *we* work with GIS, so we're used to looking at things in space.

So let's anchor that ^{14}C date on the matrix, along with any other ^{14}C dates we might have. And – if we're lucky – we might find that the ^{14}C dates all more or less coincide with the stratigraphic sequence (Fig. 9).

Now we can do much the same thing with the curves we generated for coins and dendro-dates. Here, though, we have to think about *why* we might choose one curve and not another, or which specific point on the curve we want to use (Fig. 10).

The result is not pretty; it is difficult to "read," and will require a lot of work to implement. There are a lot of underlying assumptions about dating and stratigraphy that were not mentioned in a vain attempt to not exceed the word limit. There are any number of

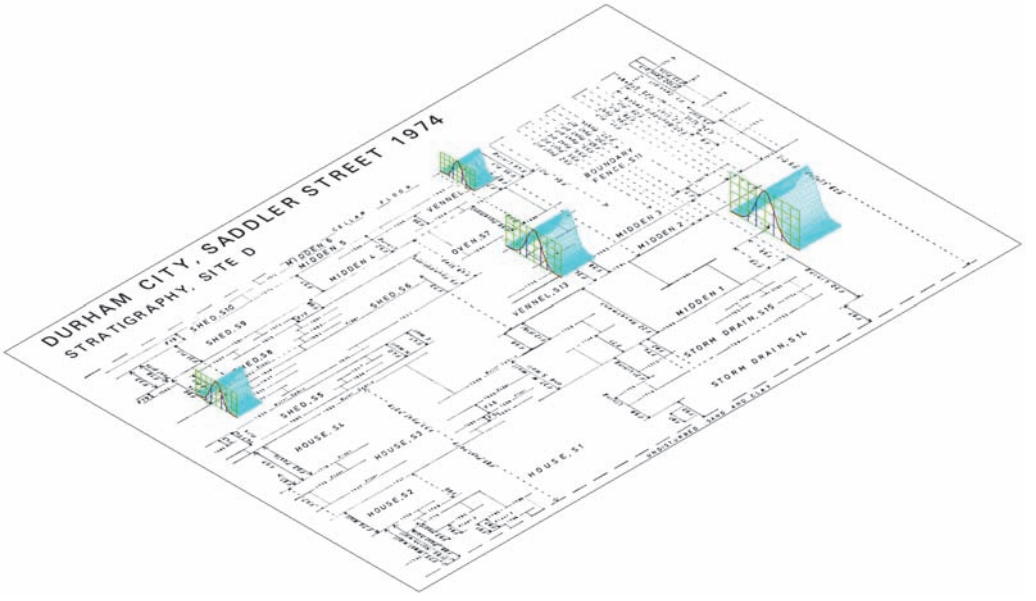

Fig. 9. Normal curve superimposed over Carver Matrix

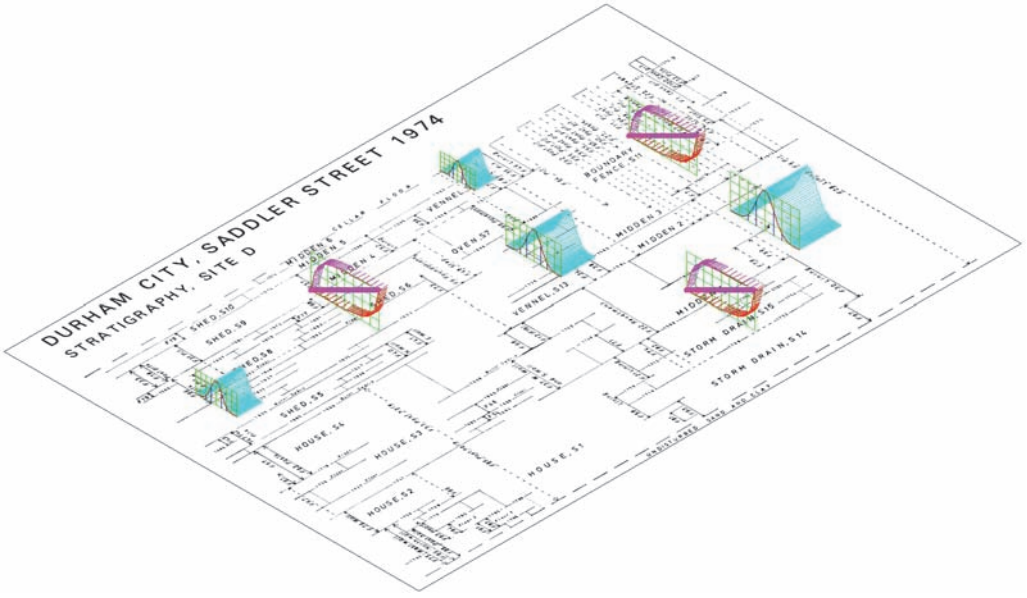

Fig. 10. Decay scenarios superimposed over normal curves and Carver Matrix

other problems with trying to build such fuzziness into "legacy" data which doesn't necessarily come with any estimates of – for example – accuracy or validity.

But basically this gives us a chance to start modelling the vagueness we get with the cryptic little entries in our database – *around* 400 BC, *ca.* 400 BC, *in the* 5th century BC – and let us start thinking in terms of ranges of dates, and probabilities – what that vagueness might mean in terms of ranges of years that we could measure and maybe model in some way.

Then we can use spatial tools for analysis – something like GIS – because eventually, hopefully, we will be able to build up a sort of abstract temporal *landscape*, where we can use the spatial tools available in GIS to test for temporal *proximity* – being near something in date – or to see if one time period *overlaps* another, etc. Although representing a major advance on what Childe, Harris, and Martin Carver were able to do; this is still far from perfect, because we are starting to run into other types of problems when we start to hit the limits of our technology.

This does however presents a strong image (cf. Carver 2010), and that's important partly because we are trying to *represent* what amounts to being a 5 dimensional model (3 Cartesian dimensions plus time and probability) on a 2-dimensional piece of paper (something which is easier to show in a lecture, where computer generated animations can run while someone is speaking).

Which brings us to the point we are trying to make: sometimes it's not just a question of *what* you tell, because we can tell stories about anything. With a few special effects and rhetorical flourishes we can even tell stories about designing a database, and maybe make that interesting.

It is also easy enough to mix facts and fiction derived from any number of unrelated disciplines if you can overcome problems of terminology and translation (cf. Kuhn 1996, 202 on the role jargon and translation within a given discipline has for a "scientific revolution"), whereas the science intends to explain (i.e. identify causes for and/or derive "meaning" from) causal *relations* – explain *why* these things go together – without which we might as well be surrealists.

More often, though, it's all a question of *how* you tell your story.

Because in some ways what you tell – and what you *can* tell – are limited by the materials and/or the media – you have available (i.e., in some ways, according to Marshall McLuhan's cliché: "the medium is the message").

And we wanted to use the example of what might seem like technological overkill in order to address metaphysical problems many archaeologists might never have thought about, take for granted – or preferred not to question – in order to draw attention to questions of whether we want the stories we tell to reflect what might have happened in the past, or if they're really just supposed to be nice little bedtime stories that archaeologists tell each other so we can all live happily ever after?

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