Stratigraphy after Harris: Some Questions

by Max Adams

"Why should it take an infinite amount of logic to figure out what one tiny piece of spacetime is going to do?" (Richard P. Feynman, The character of physical law, 1967)

Introduction
Ed Harris wrote the last word on the subject of archaeological stratification. He defined in archaeological terms the principle of superposition, and the circumstances in which it offers law-like confirmation of relative chronologies. He suggested guidelines for the denotation and analysis of stratigraphic relations, based on various systems in use in archaeology between the 1940s and 1960s, and his Matrix is enshrined in archaeological systems everywhere.

Stratigraphic analysis provides a mechanism for understanding the formation of archaeological deposits. It offers images of a chronological universe which, but for blurred edges and the odd equivocal relationship, allows the archaeologist to arrange entities in the order in which they were created. Indeed, so essential is this type of analysis now regarded, that it has become for many a simple routine.

Only, there is a problem with stratigraphy. In the same way that physicists and mathematicians have realised that the mechanical universe of Newton and Einstein may be a limited case of cosmic behaviour, Harris’s stratigraphy turns out to be a limited case of archaeological formation. A symptom of this problem, as Feynman was to discover in theoretical physics twenty-five years ago, is that the closer you look at stratification, the more complex it becomes. Infinitely. Interfaces cannot be resolved, impacts are no longer diagnostic, there are so many processes operating at so many scales that the little box in the matrix with the number and the two-dimensional relations becomes a parody of itself.

The stratigraphic matrix
In fact, the stratigraphic matrix, as it is commonly used, reflects the multi-dimensional archaeological record in precisely the same way that the London Underground map reflects London. In other words, the matrix is an exercise in topology, that branch of geometry which deals with place and position, rather than quantity and measure. It is concerned with those properties of a figure which remain when given elements are removed. Just as the human brain readily deals with the idea that all stations which lie between Turnham Green and Blackfriars are not equidistant, and do not precisely align with each other in the real world, it is equally able to understand that the order in which one would pass from one station to the other on the District Line is accurately reflected in the familiar diagram. The London Underground map is entirely inadequate for an understanding of drainage patterns, or the best way to drive across town. It selects an aspect of a system and reduces it to the bare minimum for it to remain understandable.

Archaeologists learn how to interpret matrices with the same critical scepticism. They know that the surfaces of fills in a ditch are unlikely to lie equidistant from one another, just as they know that three-dimensional aspects of archaeological sites cannot be displayed in two dimensions (although there are some archaeologists who persist in the belief that crossed lines on a matrix indicate either a mistake in constructing the matrix, or a mistake in excavating the site!). But they can exploit its reductive aspects to allow an understanding of critical phenomena.

The stratigraphic matrix combines two powerful analytical tools. The first of these is the denotation of concepts which the philosopher Frege (1848-1925) recognised as critical to logical analysis of any non-quantitative, but basically mathematical, information. In creating the stratigraphic matrix we denote two fundamentals of the archaeological record: discrete archaeological events are accorded individual identities, and the order in which they must have been created is denoted by a linear succession in which the earliest event is at the bottom, and the latest is at the top; it is therefore analogous to the logic of superposition.

The matrix itself does not do anything; it has no mathematical or logical function, and it cannot of itself generate archaeological inferences. Its power lies in its capability for displaying concepts, without which stratigraphic analysis is a mere numbers game. The analysis existed for many years before the matrix gave it life. In just such a manner in molecular biology, the idea of DNA only became a reality with the building of the model of the double helix, which reduces the massive complexity of genetic structure to a tangible and accessible model.

The second tool, rarely explicitly recognised, is the application of metaphysical inquiry to archaeologi-
cal entities. The philosophical parent of topology, metaphysics, deals with problems of identity and change. In archaeology this allows us to examine the relationship between traits, the things that we perceive about archaeological entities, and attributes, the things which make an entity what it is (Adams 1991). In stratigraphic analysis metaphysics allows us to determine the difference between deposits and interfaces, to identify the discreteness of entities and the processes which have led to their formation. Since the artificial division between the subjective and the objective has become such an issue in archaeology, it would be unwise to dismiss metaphysical analysis; after all, the identification of change relies very much on the identification of no change, as it were.

Some problems
It is clear, though, that archaeologists are now concerned with a wider range of concepts than they were when the stratigraphic matrix was first developed during the 1970's, as Harris himself recognised in the second edition of Principles. The processes of formation, recovery and inference are under closer scrutiny, and the role of the archaeologist in the creation of the record is an issue of great importance. Why, then, is there a reluctance to use the same powerful analytical tools which led to the development of the matrix, to examine with the same rigour the new questions that archaeologists ask of themselves and their data?

Part of the reason must be that there are difficult questions to confront which might at first appear to expose weaknesses in the accepted method of stratigraphic analysis. How do deposits and interfaces behave under different conditions: how fluid can relationships be between depositional entities? How are we to deal with the often fractal nature of processes and interfaces, with boundary effects and non-linear dynamics? We see structure in the debris of human behaviour, and we see correctly, but do we ignore the apparently small problems of fuzziness and uncertainty at our peril? To deduce the structure of an archaeological site simply from examination of its topological characteristics risks a tautological crisis, for in fact very often we are inferring the operation of processes in order to reconstruct them. All archaeological inferences must begin with the recognition of formation processes, but stratigraphic analysis often seems to skip a few inferential steps.

Let me illustrate the point. What is the box that we confidently put numbers in? Is it an event? Is it an archaeological fact? Is it an inference? What information does it carry, and, more importantly, does the reader receive the same information that the writer intends?

What of the lines between the boxes? Are they the passing of time? Do they represent succession, or physical position? Do they imply interaction between boxes?

So what does the matrix mean? What does my matrix mean? Answer: you only know if there is an explicit key to the code. Normally, we assume that we know the key, but there is every reason for the matrix to mean anything that its author wants, so long as the information is correctly received by the reader. The boxes and the lines may mean different things to different archaeologists, so long as those meanings are explicit, and relate to real concepts.

Solutions
It may seem that the solution is standardisation of display and rigorous implementation of ideas, but I think that is not the answer. The matrix is, after all, a tool, and the archaeologist should use it as he or she sees fit. The solution lies rather in extending the power of the tool that we have, to allow access on a variety of levels to much more than just a sequence of events.

We can, in fact, use the ideas behind the matrix to analyse archaeological data in a logical and explicit way, but in order to do so, we must use the matrix to view the archaeological process itself. One problem facing us is that by the time data are ensnared in a stratigraphic matrix all the important inferences have been made. We have to accept that topological denotation as a truth. However, the matrix denies us access to two essential processes of the archaeological operation. Firstly, the process by which equivalences in the ground are rationalised, and entities given identity, is lost. This means that the crucial phase, in which the diagnosticity of physical traits is determined, goes either unrecorded or is not available for analysis. If you want to know why archaeological decisions about entities were made in the field, you have to consult unwieldy text in a notebook or on context sheets, or you have to directly consult the excavator.

Secondly, inferring the archaeological processes which have led to the formation of deposits and interfaces is left to a textual analysis whose explicitness is often difficult to determine. This is odd, because using the tools which give the stratigraphic matrix so much analytical power would surely lend the same authority to assessments of the quality of data retrieval and inference generation.

Once the principles of archaeological straitigraphy were recognised as a canon in their own right, it was generally accepted that the recording of physical relationships observed in the site record was a superfluous operation, to be skipped in favour of the structural, take-it-or-leave-it matrix. That was an essential process of development, because it forced
archaeologists to recognise the power of the new tool, and it made the order of the past accessible. I think that this is now inadequate. As a tool in post-excavation analysis, and as a systematic record of the processes of retrieval, the physical, or trait matrix ought to be indispensable. It is a reflective concept, and should therefore image the following types of information: - type of entity, deposit, interface, lamination, spit, perceived quality, and conferred status. It should also reflect uncertainty and the ‘subjective’ elements of recording. It images the archaeologist at work in the field.

In this system all relationships ought to be denoted, because although not all may be relevant to the logical succession of events, each relationship has its own archaeological significance in terms of processes: there is potential for each entity to have interacted in the past with all those with which it is in contact; it is a dynamic past that we are confronting.

This raises a wider point, echoed in Feynman’s words above. At the smaller scales on which we are increasingly concentrating, boundaries and horizons which cannot be resolved in infinite detail need to be recognised and confronted, or we are in danger of merely caricaturing the past. So with the physical matrix we are recognising the process of retrieval, with all its attendant problems.

I also believe that there is a powerful case for the use of a second intermediate form of denotation, which one might call the metaphysical, or attribute matrix, if this is not too offensive a term. This analysis might consider inferential aspects of the archaeological process: - enhancing and reducing cultural processes; enhancing and reducing environmental processes; operational processes; status of retrieved material; types of event denoted. This set of concepts images the archaeologist in the process of generating the most basic inferences required for archaeological analysis.

It might denote processes which are inferred to have formed deposits and interfaces, including, perhaps especially, the operational process itself. It is at this stage, also, that depositional status ought to be assigned, reflecting the potential for material retrieved in context to be integrated with the structural record. So if the shreds of pottery retrieved from a deposit reflect primary or secondary refuse, this needs to be mirrored in the matrix. Perhaps this sounds as if I am calling for a standardisation of procedures, for a bureaucracy of stratigraphic thought, but really the opposite is true. By using this logical approach, there is much more potential for individual archaeologists to reflect their personal concerns, research interests, and questions. It is an adaptive strategy.

It is at this stage that I think we have the chance to assess the potential, or inference quality (IQ), of an archaeological resource. This intellectual process of assessment of the archaeology and the archaeologist both defines and informs subsequent processes of analysis.

There is, finally, the more familiar topological matrix which distils the essence of the archaeological record into its structural sequence. Topology is reductive, minimal, logical, and ruthless. It is the edited version of the process of inference, but it has little validity if the processes leading to it are not available for examination and critique. It is the equivalent of reducing the Old Testament to just the ‘begats’.

We are now in a position to genuinely analyse the archaeological record as a record. There follows a vast potential for such denotation and analysis: multi-media access to sites; a key to GIS, to relational aspects of archaeological data, and perhaps especially to the archaeologists themselves.

I have deliberately not provided graphics to illustrate the three sets of denotation which I have suggested above. This is because current debate tends to concentrate on semantics of graphic convention, about which most archaeologists have strong opinions; instead of looking at the ideas behind the graphic. This paper seeks to avoid that debate by emphasising the theoretical aspects of denotation. It is hoped, however, that a collaborative project in the near future will be able to provide a practical demonstration of the ideas contained here.

Conclusion

The stratigraphic matrix may be seen as the essence of stratigraphic analysis, and with good reason. However, the crucial analytical processes involved in its production are often unstated, implicit, and frequently vulnerable. The denotation of concepts must play a more prominent role in the way we analyse entities, or we are in danger of creating a mere caricature of the past. Implicit notions of boundaries, discrete events, and concepts of transformation and change become fossilised in graphic displays, and here there is danger. Matrices are graphic conventions, and whilst they possess great inferential value, they can only be as good as the concepts which lie behind them. It matters little, in the end, how we choose to display these notions, so long as they are explicitly determined, and based on a comprehensive understanding of the role of topology and the metaphysical dilemma.

If we are to continue to distil archaeological entities into two dimensions (and there are still many advantages to doing so), then it is important to enhance the value of the tools of analysis. This may be done by introducing two additional forms of matrix, both with specific roles. The first of these, the trait matrix, displays information relevant to the collection of data in the field, and also reflects the often
equivocal nature of observation. It is axiomatic that all physical relationships are expressed, since we know that it is possible for supposedly discrete entities to interact with each other. On the crudest level, this may involve movement of artefactual material between deposits which have a physical, but not necessarily a structural relationship. On a more subtle level, Tony Barham's paper in this volume amply demonstrates the dangers inherent in the 'discrete entity' mode of thinking.

The second of these matrices, the attribute matrix, reflects processual components of the archaeological record, and must, in addition, account for the intermediate inferences which link what we observe about entities in the field with what we think we can know about them: in other words, it reflects the relationship between traits and attributes. It is only then that there is justification for producing the structural, or more properly topological, matrix.

Reference
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