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Science and Archaeology: 11 questions to David Harris and Cristopher Tilley

Question 1. *Accepting that archaeology contains elements of both science and art, do you think that it is succeeding as a multi-disciplinary subject?*

David Harris. Archaeology is, of its very nature, multi-disciplinary, i.e. it draws - often unevenly - on the assumptions, methods and data of longer established and/or more explicitly focused 'disciplines': anthropology, biology, geology, etc. Whether archaeology is regarded as the study of material remains of the human past, or as the study of past human behaviour, it cannot be defined in reference to one class of phenomena. It is inherently multi-disciplinary, more so than most other academic subjects, even such close (multi-disciplinary) neighbours as anthropology and geography. The question posed therefore becomes simply whether archaeology itself is 'succeeding'. In my view the answer is yes, to the extent that its practitioners recognise its inherently multi-disciplinary nature and have sufficient breadth of vision and knowledge to bring to bear on archaeological investigations the insights and evidence to be derived from the related disciplines. The problem is to decide which scientific *and* humanistic disciplines are most relevant to particular archaeological enquiries, which in turn depends on the questions which the archaeologist seeks to answer in any given investigation.

Christopher Tilley. One of the great potential strengths of archaeology as a discipline is its diversity of approaches and interests and the possibility of promoting a science of humanity embracing both cultural and biological perspectives. I do not think that so-called 'scientific' and 'artistic' approaches have been, or are, particularly well integrated in the discipline but this is not a particularly recent development. What I think we have at present is a fragmentation broadly equivalent to that existing within another comparable 'multi-disciplinary' subject, geography. Here there is human geography researching the social, symbolic and political manifestations of lifeworlds and a physical geography discussing landforms, river systems, ecological systems, etc., with little or no reference to meaning. These subfields exist side by side but rarely have much of interest to communicate to each other. A comparable division now, I believe, exists within archaeology in which people carrying out materials sciences, pollen analyses, etc., and interpretative analyses of material culture tend to talk past rather than to each other which is unfortunate. More dialogue is needed.

Q. 2. *Can material culture be adequately interpreted without drawing upon either materials science or a scientific interpretative methodology?*

D. H. A response to this question depends on what is meant by 'adequately'. Whether or not aspects or items of material culture can be *adequately* interpreted without recourse to materials science or a scientific methodology will depend on the aims of the enquiry. For one investigator, a symbolic interpretation of an item of material culture, say an archaeologically-recovered burial mask, which drew

on direct or indirect ethnographic or historical evidence could be regarded as 'adequate', if the stated aim was to elucidate the symbolic significance of the mask. Conversely, another investigator, wishing to determine the provenance of the materials of which the mask was composed, would need to use the analytical techniques of materials science.

C. T. It depends what issues you address and are interested in. If, for example, I'm interested in studying exchange systems then characterisation studies of raw materials to trace likely sources is clearly essential. If I'm interested in the sequence of decorations on a pot and looking at its contextual deposition then materials science is likely to be irrelevant. As regards a 'scientific methodology' I assume you are referring to some version of a 'hypothetico-deductive' method involving hypothesis testing. This is not only irrelevant but a positive hindrance if I'm interested in studying material culture as embodying social meaning as, say, constituting a non-verbal significative system. So long as we are dealing with a realm that has nothing to do with human meaning, trying to answer questions such as: is this a sheep or cow bone? how old was the animal when it died? then some version of a standard scientific methodology is, no doubt, appropriate and useful. The whole imperialist history of attempting to suggest that a methodology appropriate for the natural sciences ought to be extended to the human (interpretative) sciences, and provide a model for their procedure, has been a dismal failure.

Q. 3. *Do scientific techniques contribute substantially to the information derived from other archaeological approaches?*

D. H. Yes. The array of scientific techniques now (potentially) available to archaeologists, most of which have been developed by scientists working in cognate disciplines, is so great that few archaeological approaches can fail to benefit from their application, *provided* that the techniques chosen are: a) directly relevant to the aims of the archaeological enquiry, and b) applied in the knowledge of their technical limitations, e.g. errors inherent in radiocarbon and other methods of so-called 'absolute' dating.

C. T. They have a small, but significant, role to play as part of the technological apparatus of the discipline, a series of methods providing information which then needs to be interpreted and contextualized in relation to other evidence.

Q. 4. *In the current funding climate archaeological projects often have to emphasise the use of high-technology scientific techniques.*
a) does this necessarily lead to good archaeological - or even science-based archaeological - research?
b) is it right to divert fairly limited resources from other areas of archaeology to (often expensive) high-technology archaeological science?

D. H. a) Emphasis on the use of high-technology scientific techniques does *not* necessarily lead to 'good archaeological research', whether 'science-based' or

not. Many archaeological projects could benefit from the 'routine' application of low-tech, and therefore relatively low-cost scientific techniques, provided that standards of sampling, identification and analysis are high and maintained consistently from context to context. For example, a comprehensive investigation of plant or animal 'macro' remains recovered from an archaeological site using 'standard' techniques is likely to yield more abundant and reliable evidence of the activities of the site's human inhabitants (assuming that the acquisition of such evidence is the aim of the project) than the more scientifically experimental application of, say, ancient DNA analysis to a more limited sample of organic remains.

b) This is a largely hypothetical question (at least in the UK) because such (financial) resources as are available to archaeological scientists who wish to apply 'high-tech' methods come from sources - formerly, mainly, the SERC and prospectively, mainly, the NERC - whose remit largely restricts them to funding the development or application of novel scientific techniques. Given the present structure of archaeological-research funding in the UK it would not, in my view, be right to divert a greater proportion of the total resources, e.g. from the British Academy or other funding bodies, to high-tech archaeological science at the expense of more routine archaeological research. Indeed, it was the funding gap identified some years ago between SERC-funded archaeological science and British Academy-funded archaeological fieldwork that led to the establishment of the Fund for Applied Archaeological Science administered by the Academy, but funded also by English Heritage and other bodies. The question of how a balance should be struck between high-tech and more routine applications of scientific methods will arise again, in an acute form, if the Wellcome Trust does, as seems likely, decide to begin funding bioarchaeolgical research on a more generous scale than previously.

C. T. The use of a technique in itself can never lead to good research. It is often the case of the tail wagging the dog. In recent years I have the *perception* (although admittedly no hard figures to back this up) that far too much money is being diverted into high-technology projects to the detriment of archaeology as a whole. What I find personally extremely irritating is that if a project is 'dressed up' as hard science, using high technology, its chances of obtaining substantial research funding is far higher than if I, say, submit a proposal to carry out interpretative work on rock carvings or symbolic dimensions of landscape use and change. To address the question adequately it would be very interesting to know exactly how the total archaeology budget in Britain (or even in the Institute!) gets spent, on what and to whom? Some years ago I once sent out a questionnaire (anonymously) to archaeologists in British Universities asking about matters such as grants and research funding. Most didn't bother to reply or made useful statements such as 'that's my secret'. I don't think there is sufficient accountability or a willingness to discuss these matters openly.

Q. 5. ***Should archaeology borrow analytical approaches and scientific techniques (especially those still in the process of development, such as, e.g., the analysis of genetic material - DNA, etc.) from other disciplines?***

D. H. Yes, but with 'due care and attention'! The view, sometimes expressed, that archaeologists should 'wait' until a particular technique has been 'perfected' in a cognate discipline before applying it archaeologically is based on a false presumption that once techniques are perfected (which they never are in any absolute sense) they can be universally applied. In fact, scientific techniques are constantly being modified to suit particular investigations and archaeologists do, indeed must, contribute to their refinement for archaeological purposes. For example, most current research on how successfully DNA analysis can be applied to ancient bone is being carried out by biochemists in archaeological laboratories or in close association with archaeology departments; and, similarly, the main advances in luminescence-dating on ancient sediments (both thermoluminescence and optically-stimulated luminescence) have been made by 'archaeological' physicists.

C. T. Archaeology has always done this and it is inevitable since the discipline has no *distinctive* approach, method, or philosophy all of its own. We need to remember that disciplinary boundaries are entirely artificial creations and can do as much harm as good.

Q. 6. *How far does the increasing influence of science in archaeology exclude non-professional involvement (i.e. local societies, volunteers, etc.)?*

D. H. There is certainly a tendency for non-professional archaeologists to be excluded from 'scientific' archaeology, but this may be more a problem of how they perceive such archaeology than a necessary result of developments in archaeological science. There are many 'low-tech' scientific aspects of archaeological field and post-excavation work to which non-professional or amateur archaeologists can make valuable contributions. Those who already have a scientific background may be able to do so without any training; others will need some methodological and practical instruction. If the gap which already tends to separate the professionals from the amateurs is not to grow wider, greater effort will be needed by professionals to de-mystify scientific archaeology and encourage the amateurs to contribute to it.

C. T. It may often involve a wresting of the past away from ordinary people, and its production as the preserve of a professional elite who often say little that is comprehensible or of interest. What people are really interested in is narratives or stories about the past, a bringing of the dry remains to life, and a making of their understanding relevant to the present. An archaeology that merely describes or documents and does not actively interpret, is in my view irresponsible and lacks a social conscience. Especially in 'scientific' archaeology there appears to be a general inhibition on painting a picture or creating a story out of the remains. For example, one of the problems of most pollen analyses is that despite all the fine and rigorous documentation of plant and tree species, percentages of arboreal and non-arboreal pollen, etc., one all too often gets no sense of how an environment may have actually *looked* and what it might have felt like to live in it. If this alienates an archaeologist like me, it must surely have a similar impact on the non-professional.

Q. 7. ***Archaeology appears to many to be currently dominated by theoretical perspectives and scientific techniques/methodologies. Is field archaeology in danger of being pushed into a secondary role?***

D. H. While acknowledging that field archaeology is perceived by archaeologists as in danger of being side-lined by theoretical debate, and by the inexorable(?) advance of archaeological science, I think this view is based on a false dichotomy between field and other kinds of archaeology. Field archaeology consists of the application in field situations of techniques such as survey, excavation and on-site analysis: it is not a separate sub-discipline with its own agenda. Any field project has its own aims, whether or not they are clearly defined, and cannot avoid, at least implicitly, following some 'theoretical' orientation. Likewise all field projects use some 'scientific' methods however technically elementary they may be. The concern that field archaeology may be pushed into a secondary rôle is therefore not intellectually well-founded, although its ***relative*** importance in the overall archaeological enterprise has diminished in recent years. We are, in my view, entering a period when the scientific analysis of the results of field survey and excavation is becoming relatively more important and commanding a greater proportion of the resources available for archaeological research. This is likely to be beneficial; and if it leads to there being fewer field projects overall, and to more precise formulation of the research objectives and methods of those that ***are*** carried out, then archaeology as a whole will benefit.

C. T. I don't think that field archaeology should be thought of as a separate sphere of activity. It ought to be thoroughly integrated with reference to theoretical approaches and techniques. In the past many archaeologists have primarily thought of the subject as being about excavation and survey. If this is not the perception anymore I think that is a positive development.

Q. 8. ***How important are data in archaeological interpretation or in producing new theories?***

D. H. No archaeological interpretation - however bizarre - is completely data-free. What matters is whether the data invoked are relevant to the interpretation and whether their sources are reliable. The data may derive from survey, excavation, historical records, participant observation or other sources, but their authenticity should be demonstrable, not only to the investigator(s) but also to others. Data are inseparable from the generation of theory. Neither 'inductive' nor 'deductive' reasoning can be wholly 'data-free'. New theory can be produced without any explicit reference to data, but no individuals can free themselves from the mental baggage which necessarily affects any theoretical assumptions and propositions they may make. Scientific enquiry has tended to advance by a cyclical process of data acquisition, theory formulation, and the search for further data to corroborate or refute the theory; and archaeology can and should do likewise.

C. T. Essential. If we ignore data, evidence, whatever you want to call that on which we work and wish to comprehend, then archaeology wouldn't exist any

more. There would be nothing to interpret or produce any theories about. There must be a dialectic between theories, interpretation and information. The data constrains, but does not determine, what we can say about it. We *make* knowledge from data, we don't *find* it.

Q. 9. *How important is imagination in archaeological interpretation or in producing new theories?*

D. H. This question refers back to the previous one, if by 'imagination' is meant the intellectual process by which new insights are generated without explicit reference to 'data' demonstrably external to the mind of the thinker. If imagination feeds upon the individual's mental baggage to produce new and original insights, it may be a valuable source of theory, but if it *is* invoked in archaeological interpretation then it should be subjected to 'verification' by reference to external 'real-world' evidence; otherwise it amounts to story-telling not explanation.

C. T. Absolutely vital. Without the subjective element it would be impossible to interpret. Archaeological research involves bringing to bear contemporary imaginations and theoretical frameworks with reference to the fragments of the past. It is a theoretical labour and a subjective practice. It will never tell us how 'the past really was'. It rather creates new pasts in the present. The only things about the past that we can be absolutely certain about are trivial and relatively uninteresting. This creation of new pasts is what makes archaeology potentially so exciting and worthwhile.

Q. 10. *Should archaeology develop in future as an intrinsically scientific discipline, or should science be kept as a distinct field within (or even outside) archaeology, with scientific expertise accessed, when required, on a consultative basis?*

D. H. Archaeology is, I believe, becoming more intrinsically scientific and will, I hope, continue to do so. I do *not* think that science should be partitioned off as a distinct field within, or outside, 'mainstream' archaeology with scientific expertise obtained as and when it is judged to be needed. For that reason I dislike the fashionable phrase 'archaeological science' and do not believe that the establishment of departments or units of archaeological science distanced from 'ordinary' archaeology in our universities is desirable. So-called archaeological scientists should be as fully involved in the process of research design and implementation as any other archaeologists and should also participate fully in the training of archaeologists, at undergraduate as well as postgraduate level. Science offers a way of conceptualising and interpreting the human past which all archaeologists can follow; so, 'scientific archaeology' - yes, 'archaeological science' - no!

C. T. It depends on what you mean by that word 'science'. If you define it, as I would like to do, as a form of systematic study - a definition that is deliberately

vague - then clearly archaeology should be scientific. If you mean by science a set of analytical procedures in the form of studies of glass, wood, etc., the answer has to be different. These studies have a role as part of a larger whole. They should definitely be kept under the umbrella of archaeology since an archaeologist investigating these matters is much more likely to be attuned to the interpretative needs of the discipline than an outside expert consultant. However, at present, there is an unfortunate tendency that within archaeology these fields of study do tend to constitute a relatively insulated world of their own with glass specialists making statements of interest to other glass specialists but not necessarily to anyone else.

Q. 11. *Could you briefly describe an outstanding piece of research which exemplifies your own favoured approach to archaeology?*

D. H. At the risk of appearing to indulge in trumpet blowing on behalf of the Institute, I would nominate the archaeobotanical research undertaken (principally by Gordon Hillman) as part of the Abu Hureyra Project as an outstanding investigation which exemplifies the kind of approach in archaeology that I favour. The work focused on post-excavation analysis of the charred plant remains from the Epipalaeolithic levels at Tell Abu Hureyra in Syria, and the analysis was undertaken with the specific aim of determining the nature of the pre-Neolithic plant-food economy at the site. The great merit of this investigation was that it had clearly defined objectives, expressed as a series of key questions, which analysis of the assemblage of plant remains could be expected to answer. The questions were sufficiently specific to be addressed rigorously, but also of sufficiently general significance to relate directly to the much-debated problem of 'the origins of agriculture'. The three main questions 'asked' of the plant remains were: a) how diverse was the range of food plants exploited by the Epipalaeolithic occupants of the site? b) were they already cultivating any of their main food plants, particularly cereals? and c) at what season(s) was the site occupied? These questions were capable of being answered by detailed analysis of the plant remains *and* the answers to them could be expected to illuminate such 'big' questions as whether wild-type cereals were cultivated in the Epipalaeolithic before they were domesticated, and - of even greater significance - whether the site was occupied year-round, i.e. whether sedentary life preceded the establishment of an agricultural economy during the succeeding Neolithic occupation. The overall conclusions of the investigation (which was funded by a 3-year grant from the SERC) were that a very broad spectrum of wild-plant foods were exploited during the Epipalaeolithic, that the cultivation of cereals did not pre-date the Neolithic, and that sedentary life probably preceded agriculture at Abu Hureyra. The investigation is thus an example of the successful application of 'middle-range theory', in which standard techniques of analysis were applied to a rich database, to address major questions relevant to our understanding of the evolution of human society.

C. T. There are many pieces of research I have a great deal of respect for and I think it would be unfair to choose just one. Also I don't regard myself as having

simply one approach to archaeology but many, i.e. I am constantly experimenting with different interpretative approaches and theoretical frameworks. Gone, fortunately, are the days in which we had to think there was just one way to approach the past and gain knowledge from it. Just considering works published since 1990 I want to mention a number of publications. As a piece of active interpretation I like Ian Hodder's *The Domestication of Europe* (1990). Although I do not agree with all of the arguments, there is no doubt in my mind that this is the most interesting attempt, published to date, to produce a prehistory of Europe. One issue that is extremely important is the whole question of gender and a long overdue book here is *Engendering Archaeology* (1991) edited by Joan Gero and Meg Conkey. Tim Yates (1993) has also made a very important contribution in this area in a study of Scandinavian rock carvings (in C. Tilley (ed.) *Interpretative Archaeology*). Barbara Bender's recent work on Stonehenge published in her recent volume *Landscape: Politics and Perspectives* (1993) has been important in addressing the whole notion of heritage and who owns and controls the past. Recent works interpreting British prehistory, *Rethinking the Neolithic* (1991) by Julian Thomas and *Fragments from Antiquity* by John Barrett (1994) create pasts that I find stimulating and exciting to think about in relation to my own research.