

THE POST HOLE

Issue 31

Heritage skills in education:
multidisciplinary approaches
to conservation

New methods for sharing and exhibiting 3D archaeology

Reclaiming narratives: A response to De Mola

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A montage of images from issues of The Post Hole over the last year

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Editorial: My end but *The Post Hole's* beginning

I do not exaggerate when I say that I have been dreading this moment for the last 15 months! If you follow our Facebook or Twitter pages for the latest news from *The Post Hole* team, you will already be aware that with the release of this issue I will be stepping down as Editor-in-Chief and handing over the reins to a new student, just as my four predecessors have done before me.

Few other journals enjoy the same rapidity of change in staff as *The Post Hole* does. It has been an honour for me to lead the fifth brilliant group of students who have innovatively brought engaging debate and fascinating perspectives on the past to thousands of students, academics and other people interested in the past. Being Editor-in-Chief of *The Post Hole* has been a very developmental experience for me as I have met hundreds of inspirational people from across the world, learnt first-hand about the amazing array of research different people carry out, and the ways they use their work to assist communities in connecting with their heritage and feeling of identity.

The past matters to us all. An early indication of that to me was discovering the extent people spread awareness of *The Post Hole* to others and the ever-growing number of submissions we have received from a truly diverse range of people. In the last six months *The Post Hole* has gained 10,000 brand-new readers via its website, and as each month has passed, the task of selecting five articles to feature in the next issue has got more and more difficult. *The Post Hole* is successfully breaking down barriers in the dissemination of research and views on the past, not just for under-represented groups like students and non-academic specialists, but now also for people from across borders over the world. In this month alone, *The Post Hole* has received submissions from Argentina, Australia, Ireland, the Netherlands and the U.S., as well as from closer to home in the UK.

The Post Hole also has its own unique set of challenges. Most significantly, it is run by undergraduate students who have to simultaneously balance their studies, and in some cases also their jobs and families. I still think it remarkable that a group of only five or six people can do all that and still release a new edition of a journal almost every month! Each issue involves three editors to review and proof-read submissions, as well as format and upload content onto the website, someone to design our fantastic covers, and at least one person juggling a Facebook page, Twitter page, and plenty of other advertising opportunities.

Having revealed to you for the first time just how chaotic running this journal can sometimes feel behind our (hopefully!) calm and confident facade, I hope you will share my huge appreciation of the people I have been fortunate to work alongside during the last 15 months.

There are two additional people I wish to credit for the remarkable success of *The Post Hole* this year. The secret behind much of the journal's growth this year has been its website, masterfully (and patiently!) redeveloped by Pat Gibbs of Heritage Technology, based at the University of York. The financial support from our Department towards the major redevelopment of our website, and even more importantly, the moral support from its staff, especially the Head of Department, Dr John Schofield, for everything we have done has made our ambitious plans for the year all the more achievable and enjoyable.

Emily Taylor, who is commencing the third and final year of her BA in Archaeology at York, aims to build on the now-proven capacity for *The Post Hole* to expand the limits of the discipline and increase discourse throughout all levels of archaeology. Emily has served as PR Officer during the last year and I have every confidence that she will help *The Post Hole* go even further over the year ahead. The contributions from our PR Coordinators at other universities should not be overlooked. I would urge them, and also everyone who enjoys reading *The Post Hole*, to continue supporting the aims of this voluntarily-run not-for-profit journal by sharing awareness of it with those, like you, who value and take an interest in the past, whoever and wherever they are.

So here are the final five offerings from the retiring 2012-13 editorial team...

Marco Barrettara introduces us to the startling volume of new technologies and their archaeological applications that have come about since Anthony Masinton's guide only four years ago (Issue 6). Barrettara rightly argues that all archaeologists should always keep a close eye on new developments in other fields of research and technology. The diversity of questions archaeology can address require equally eclectic poaching from other fields, otherwise it will be far more limited than it is at current.

Alistair Galt, now starting a Masters degree at the University of Southampton, explains the creativity and resourcefulness of undergraduate students of different disciplines at the Universities of Durham, Newcastle and Northumbria. I know first-hand the tremendous potential undergraduate students can achieve if they are trusted with a challenging yet rewarding project, and Galt and his fellow students were given just that by the North of England Civic Trust when they evaluated the condition of historic buildings in and around Durham.

The advantages of cross-disciplinary collaboration, both for the outcome of a project and the intellectual development of its participants, are very apparent from Galt's article, however, **James Preece**, suggests in his thoroughly interesting response to Paul Joseph de Mola's critique of narrative in archaeological theory and interpretation (Issue 30) that pluralism has its limitations for the discipline. Whilst I would agree that it does in contexts similar to the examples Preece provides, I would assert that there are many instances where a pluralistic approach to the past is extremely beneficial for ensuring comprehensive and diverse narratives are included in understanding and interaction with the past, both for archaeologists and the public.

It is clear from what I've written above that this view of mine is shaped from my experiences with running *The Post Hole* which aims to widen a discipline that can never be taken for granted as being sufficiently open. However, I fundamentally agree with Preece's conclusion that archaeology should be framed as a holistic and accurate discipline, as that overlaps with my favoured side of pluralism.

I think when I co-organised the 1st Annual Student Archaeology Conference at the University of York in June, a few of the attendees may have confused its theme of 'Integrated Archaeology' as being explicitly associated with community archaeology. To me, an integrated archaeology incorporates the skills and views of a diverse range of people in order to build a more extensive and robust impression of the past.

This may include the involvement of any kind of person. **Phoebe Haigh** and **Sophie Austin**, undergraduate students at the University of York, reveal some of things they found during their excavation field school at the famous Mesolithic site of Star Carr in North Yorkshire. Their work highlights how the active inclusion of students in the learning and feedback processes of the excavation can make it an even more worthwhile endeavour for all involved.

Finally, **Nikolah Gilligan**, an independent researcher from near Cork, Ireland, introduces us to the methodologies, theory and applications of archaeobotany in archaeological research. This article by Gilligan is the first of two parts and I look forward to finding out more about her field of research in a future edition of *The Post Hole* by the next editorial team.

All that is left for me to say is thank you for your support and keep reading and writing!



The departing members of the editorial team after their graduation in July (L-R): David Altoft (Editor-in-Chief), Taryk Rawlins-Welburn (Managing Editor), Alison Tuffnell (Submissions Editor) and Tristan Henser-Brownhill (Editor)

David Altoft

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New methods for sharing and exhibiting 3D archaeology

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In Issue 6 of this publication, my dissertation supervisor, Dr Anthony Masinton, contributed an article detailing some of the latest and most exciting intersections between archaeology and 3D graphics (Masinton 2009). In my experience, articles of this type do not appear as often as they ought to in archaeological publications. The digital humanities have a tendency to 're-invent' themselves on a regular basis to keep up with continuing advances in computer hardware and software, and it seems as though this deters some potential writers. After all, it is difficult to make definitive statements about a discipline which remains in a state of flux.

Be that as it may, this article presents some new developments in computer software in hardware which may be of use to digital archaeology, both now and in the near future. I feel it is important for archaeologists to follow emerging technologies, and begin the critical process of asking "how can this be used for archaeology?" as they appear. I have also been dwelling recently on an article by Llobera (2011, 217), who states that, "there has been limited effort to inform archaeologists on how IT [Information Technology] may be integrated within current archaeological discussions ... [and] foster a deeper conceptual understanding of how ... IT may precipitate new ways of doing archaeology beyond what is readily available". The purpose of this article is, in part, to help combat this perceived lack of effort, whilst bringing to the attention of the reader some of the latest happenings in the computer graphics subset of IT, and exploring their applications within the discipline of archaeology.

My current research surrounds 3D archaeological visualisation – its application in the archaeological process, data transparency, best practices, and so forth. This is sometimes referred to as archaeological VR (virtual reality), VRM (virtual reality modeling), or, within the umbrella term, 'digital heritage'. The subject matter presented below is comprised of new gadgets and applications which reflect this interest, and enable the creation, display, and distribution of archaeological 3D content. Some of the issues attached to what is presented will also be introduced. This is by no means a complete 'taxonomy' of potential visualisation technologies, but a rather heavily curated selection.

3D models on the web

A great deal of time and effort goes into the creation of complex 3D models, and that effort is poorly represented if the model ends up represented only by a mere handful of images in a journal article. Rather, it is more rewarding to have a platform with which models themselves may be shared, and experienced fully by their intended audience.

In the information age, the most efficient way to deliver content to a wide audience is to make it available on the internet. The methods for hosting 3D content online may be divided roughly into two categories: making files available for download, which must be viewed on the user's machine; and giving users the ability to view content directly within a web browser. The former option allows the highest degree of control over how the model is viewed and manipulated, but can also be problematic as downloaded models often require some kind of specialty software to view. On the other hand, the latter makes content much easier to access, but allows less freedom of interaction with the subject.

In recent years, a number of platforms for sharing models directly within internet browsers have been developed and refined. One of these is the Unity Web Player, which allows interactive 3D content to be displayed in an internet browser with the installation of a special plug-in. The player was used recently to present a visualisation of the Guild Chapel in Stratford-upon-Avon in Issue 32 of *Internet Archaeology* (Giles *et al.* 2012). Another is the integration of 3D content directly into web pages through the use of WebGL and HTML5, which has the significant advantage of running in any modern browser (such as Google Chrome or Mozilla Firefox) without the need to install any plug-ins. This platform is utilised by CyArk's online archive of 3D content (archive.cyark.org). However, in my opinion, the most exciting new platform for sharing models online is Sketchfab, which builds upon the 'out-of-the-box' HTML5 solution used by CyArk.

Sketchfab is a complete service aimed at facilitating the quick and easy sharing of models on the web. It is free for non-commercial use, but an upgrade to its 'Pro' version with a monthly subscription fee is required for those hoping to publish larger, more complicated content. The Sketchfab website also features a wealth of documentation to help users optimise their content for use with the service, which includes instructions for importing models created using free software like Blender or SketchUp.

This powerful sharing platform has not escaped the notice of digital heritage professionals, a point which may easily be proven by visiting the Sketchfab model portal, and searching for content with the term, 'archaeology'. The results include a number of models of small artefacts, and even buildings created by both professionals and hobbyists. One example is a model of the Forteviot church bell created by Watterson (2013) for the University of Glasgow's Department of Archaeology (Figure 1).

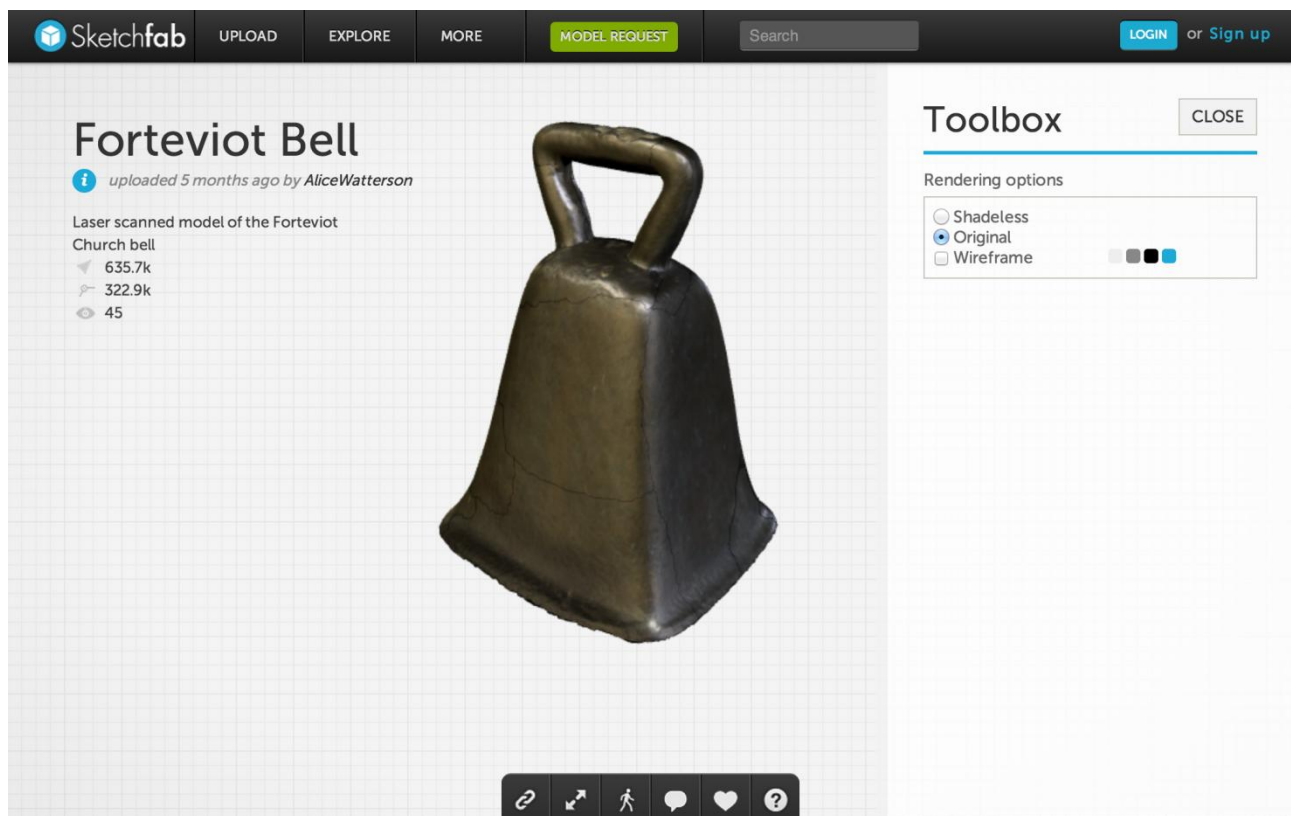


Figure 1: *Interacting with the Forteviot Bell model using Sketchfab*

(Reproduced with kind permission of Alice Watterson, Glasgow School of Art, Digital Design Studio)

While the solutions outlined above offer exciting ways to distribute content to a wide audience, the issue of sustainability should be considered when discussing any online sharing method. One of the goals outlined by the London Charter – a set of best practices for computer-based visualisations – is the sustainability of digital heritage content. The charter states that “strategies should be ... implemented to ensure the long-term sustainability of ... visualisation outcomes and documentation, in order to avoid loss of this growing part of human intellectual, social, economic and cultural heritage” (Denard 2009, Section 5.0). While the degree to which the London Charter is accepted and utilised by heritage professionals is subject for debate (and has been considered elsewhere, such as in

Hermon *et al.* 2007), it often serves as a useful starting point for discussion, as I believe it does here. Thus, it is possible to derive a question from the London Charter in this context: Is making visualisations available on the internet a sustainable practice? Content will only be available to users so long as it is hosted, which requires financial backing – albeit not a considerable amount.

A consideration of the article by Masinton (2009) mentioned in my introduction provides a miniature case study for the sustainability of content on the web. Of the several projects mentioned in his discussion of 3D archaeology, two (the Venus Project, and IBM’s Forbidden City Online) no longer appear to have any active online presence. While only four years have passed since their mention in publication, it would seem that shifting priorities in either research interests or funding have no longer made them viable.

However, in contrast to these are projects which have stood the test of time, and continue to remain online. For instance, the Rome Reborn project (romereborn.frischerconsulting.com) has remained online, and has since been updated with an abundance of new content. It would seem that, like the results of any academic endeavour, the continued availability of project outputs is dependent upon maintaining outside interest, and capitalising upon opportunities to update content.

Upcoming gadgets

The recent announcement that gaming aficionado John Carmack has assumed the role of Chief Technology Officer for tech startup, Oculus VR, caused quite a stir within the gadget and gaming communities. For the uninitiated, Carmack is one of the founding members of id Software, which pioneered 3D gaming in the early 1990s with the release of *Doom* and *Wolfenstein 3D*. As for Oculus VR, the company is currently working to revolutionise the world of gaming with its creation of the Oculus Rift (Figure 2), a wearable VR headset. This happening may seem unconnected to the world of archaeology, but I believe the long preoccupation of digital heritage professionals with creating virtual realities grants it some significance.



Figure 2: A promotional image of the Oculus Rift headset unit; the final product may look different from what is pictured here (Produced with kind permission of Oculus VR)

Wearable VR technologies tend to surface now and again, only to fade quickly into obsolescence or disinterest. This tends to be because the output is bulky or otherwise uncomfortable, and in many cases it is difficult to create content for them to display. However, the Oculus Rift has thus far managed to avoid the fate of its predecessors, and has exhibited an inordinate influence over the market. The Kickstarter crowd-funding campaign that the company opened to fund the project received over *ten times* its initial funding goal of \$250,000 USD, and a number of big names in the gaming industry (including Valve, Epic Games, and Unity) have expressed an interest in adopting the technology (anon. nd).

Should the Rift continue to enjoy this level of success, it has the potential to become an ideal solution for enabling more accessible archaeological virtual realities. The cooperation with 'out-of-the-box' development kits facilitated by its industry partners should allow archaeologists to spend less time cobbling together do-it-yourself hardware setups, and more time creating and enriching the content that they want to display.

Keeping within the realm of gaming technologies, the forthcoming Xbox One console from Microsoft is due to be released some time in the final quarter of this year, and with it will ship an updated version of its 'hands-free' controller, Kinect. Although originally marketed purely as a gaming experience, a bit of creative 'hacking' has allowed the Kinect to evolve into an inexpensive 3D scanner, and has been put to use as such by archaeologists.

One solution, created by researchers at the University of California, San Diego, is called ArKinect, and was developed in order to create quick scans of excavation sites in the field (Boyle 2011). Another, associated with the MayaArch3D project (mayaarch3d.unm.edu), explored the possibility of using Kinect to navigate a 3D Mayan cityscape (Richards-Rissetto *et al.* 2012) (Figure 3). As the new Kinect will feature significantly higher degrees of accuracy and fidelity, it, too, has the potential to become an effective, low-cost archaeological recording tool.

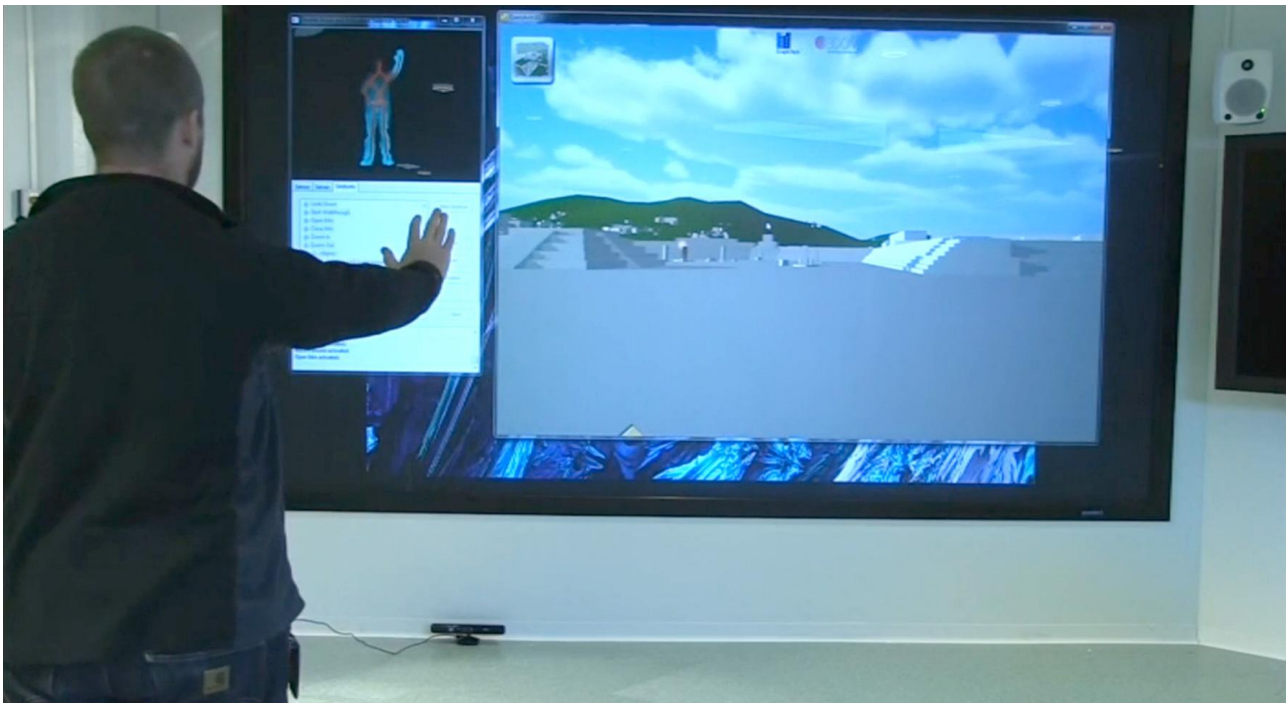


Figure 3: A presenter interacts with the MayaArch3D city using a Kinect-enabled interface; raising a hand towards the screen moves the user forward in virtual space (Image Copyright: Jennifer von Schwerin)

Conclusion

For some, looking at emerging technologies and asking what they might have to offer to the discipline of archaeology has a somewhat paradoxical undertone. It can be argued that in doing so, one runs the risk of carrying out work which is more a valorisation of new and exciting technological approaches than an attempt to choose technology that will best suit pre-existing research aims (Earl and Wheatley 2002, 5; as cited in Watterson 2012, 21).

It is my opinion that an up-to-date awareness of which technological solutions are available to undertake a given task is essential, and that so long as new methods are engaged with in a critical fashion, there is no reason to assume that technological approaches will be chosen in an arbitrary fashion. Archaeology is very much a multidisciplinary practice, and as such it would not do to avoid the latest offerings of a discipline with the potential to provide a fresh new outlook on traditional archaeological subject matter.

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The Heritage Skills in Education project: How to connect and engage educational charities, students and listed buildings in a multidisciplinary approach to conservation

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The Heritage Skills in Education project began last year, inviting teams from Durham, Newcastle and Northumbria Universities, in addition to colleges and schools, who selected a building, performed various activities in relation to a listed building's conservation and future use. What makes this project unique is the size of the project and the explicit multidisciplinary approach; each University had a different department taking part in the project, directly bringing different views and opinions into the project. The conservation plans also involved multiple elements of different disciplines.

Additionally, the project has a community benefit; by involving the opinions of the public, the conservation plans suggest future uses for the general public, so these listed buildings may well get a much-needed new lease of life. The project is set to continue for at least two more years, giving other buildings the chance to be selected and investigated in this way.

Introduction

The Heritage Skills in Education project (HSEd) is an on-going charity project organised by the Heritage Skills Initiative (HSI), which is part of the North of England Civic Trust (NECT), an educational charity based in North East England. They actively promote the use of conservation skills in listed buildings and landscapes, particularly in relation to the use of traditional building skills and materials. In conjunction with three universities, colleges and schools from North East England, they have worked tirelessly to show participants how to select a site, how to approach conservation, what practical methods should be used, how to assess the significance of the property in its context, particularly in relation to the public's perception of the building, and how to write this into a professional report that can be used to assess the state of the building in years to come.

This article will highlight Durham University's take on the project, with some contributions by teams from Newcastle University's School of Architecture, Planning and Landscape, focusing on the interdisciplinary nature of the project. While this is not a new phenomenon to archaeology, the scale of this project shows how an interdisciplinary approach can be achieved in the real world for archaeologists, while also giving something back to their local communities.

Durham University's Department of Archaeology received an email from the NECT in the summer of 2012, inviting people to participate in the HSI project. This email was passed on to Durham University Archaeology Society, and other teams from Newcastle and Northumbria Universities had also been invited to participate. The competition element made it particularly interesting because the other teams that we were competing against were architecture and construction students, so each university was going to bring their own vested interests and specialisms to the challenge!

The teams from these universities chose various listed buildings; Durham University's two teams chose the South Street Mill (Figure 1) in Durham and the Head of Steam museum in Darlington, while Newcastle University chose St James's church in Benwell, Newcastle for one of its buildings, which will be included in this study. A conservation plan would then be written based on the team's findings and presented to the owners of the properties.



Figure 1: *The South Street Mill (right) and the adjacent mill house (after Davies et al. 2013)*

Methodology

The buildings were approached in very different ways. South Street Mill, an old fulling mill that fell out of use in the 19th century but has origins with Durham Cathedral since the 14th century (Emery 1996), is today used as storage for the Durham Kayak Club. This made access inside the building difficult to commence a full survey because the kayaks fill up the space. Furthermore, large areas were inaccessible, with later wooden additions to the mill being potentially unstable and inaccessible.

In this way, each team approached each site differently, using different techniques and surveys on the buildings, producing some very interesting results; the South Street Mill for example may well still have medieval foundations, although the two surveys suggest two different starting dates for the foundations (medieval or 18th century).

Recommendations for conservation have been included in the conservation plans. For the South Street Mill, a building with a very complicated history and some severe structural faults, it was clear that any conclusion would involve a recommendation of immediate maintenance to the building. The report noted that it may be possible to have alternative uses for the mill; the survey's major responses included "historic", "picturesque" and "neglected" (see Figure 2). Clearly, this represents a varied scene, and somewhat reflects perhaps more on the exterior fabric of the building and the lack of information concerning the building more than anything else!

This also helped to convey to the public our work that we were doing with the Cathedral. The South Street Mill, while used as storage for the kayak club, could be converted into a café, or even be included as part of the World Heritage Site. The Head of Steam team concluded that little immediate action was needed to the museum, although it deserves more recognition for being the oldest railway shed in the world (Watkinson *et al.* 2013).

The schools and colleges which were involved in the HSEd projects had smaller, but no less important, tasks; secondary schools from Alston, Durham, Sunderland and Newcastle were challenged to find a historic building and assess its state of disrepair, create a model of the building, and research the careers involved in the heritage sector (Davies *et al.* 2013). Colleges in the area also had the opportunity to conserve buildings, using a more hands-on approach by writing a specification of works that would be used to bring the building back into use (Davies *et al.* 2013). These colleges in particular already ran courses in construction, so the HSEd project was a good fit for their practical skills.

Explicit multidisciplinary conservation in action

What has linked the teams together is the practical aspect of the HSEd; the university and college teams were given two to three hours of demonstration of, how to make, store and use lime mortar in historic buildings. Schools had a different set of practical demonstrations that involved other materials. Although neither team would be able to use lime mortar to restore any of their sites immediately, it gave us an idea of the many skills needed to conserve the buildings in the future; for the South Street Mill, using concrete on the stone would damage the stone and compromise its water retaining properties. In contrast, lime mortar complements these properties and it is more flexible.

Conversation in this way is also an interdisciplinary approach, needing not only the knowledge of how to build a house (construction and engineering), but how to put it up well (architecture), how to maintain it, how to recognise and research what used to be there, and its significance or importance (history and archaeology) as well as many other skills; often multidisciplinary projects like this in the real world of industry tend not to emphasise this aspect.

This is also reflected in recent university courses and projects that are offered at the International Cultural Centre for Heritage Studies (ICCHS) (School of Arts and Cultures 2013) and the Northumbria Community Heritage Project (Arnott 2011), both running independently of the North of England Civic Trust. Both of these projects have used the interdisciplinary nature of conservation to achieve different aims; the ICCHS brings the experience of galleries, museums and the heritage sector to Master students from around the world, while the latter project is aimed at discovering the history of Pandon and Newcastle, in the context of the Northumbrian Kings, by using the resources at Newcastle City Libraries and connections with local history experts and interest groups (Arnott 2011).

What makes the Northumbrian University project stand out is the skills that are sought after; anyone with skills in photography, art, media, IT and performance are being used to present the findings of the project effectively. It is a good sign of the modern age that we are appreciating our different skill sets within traditional boundaries, and how they can complement each other to maintain buildings and cultural heritage for future generations to enjoy. A multidisciplinary approach was also used in finding, analysing and presenting the remains of Richard III at Leicester recently, showing that this multidisciplinary approach, when used effectively, is a powerful tool, and is here to stay.

The St James's team felt that the project is interdisciplinary, because their team had individuals from different disciplines, although these are mainly from architecture, town planning and urban design. They also learned new concepts as a result of the project. It can also be argued that their methodology was in itself multidisciplinary; the historical research of a property and the assessment of the significance sit next to the site elevation plans in the conservation plan.

A caveat of the approach is the effective team working skills needed to pull all the results together; each team from the different universities will come in looking at each of their projects with the vested interests of their societies first and foremost; the Durham Archaeology Society, for example, was more concerned with the history and context of their buildings than what the building was actually made out of, and where they got the building materials from! The Newcastle team meanwhile was made up of urban planners and architecture students; while there is some overlap with archaeology, their vested interests are dominantly non-archaeological.

Conclusion

Nonetheless, in summary, comprehensive multidisciplinary conservation plans have been made and will be used by Durham Cathedral, Darlington Borough Council and St James's church, to assess their properties in years to come. Furthermore, the surveyed sites will be used for the benefit of the local community. Since the Cathedral is visited by thousands of people a year, the potential for the dissemination of the information we have collected is enormous. The project will keep going within the Durham Archaeology Society for at least two more years, looking at other listed properties. Future students will be able to participate in preserving the many wonderful historic buildings that County Durham has to offer, in a multidisciplinary approach which will make more effective use of these disciplines working together.

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Reclaiming narratives: A response to De Mola

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“Western civilisation has moved towards an intellectually confused and thus morally disordered state” Paul Joseph de Mola writes in the last issue of *The Post Hole* (de Mola 2013), “we should pause and ask ourselves if it was reasonably the best course for society to undertake”. By this, de Mola means to single-handedly question the gains that archaeological theory has made over the past 20 to 30 years – the turn away from the pompous grand-narratives of the past, the assumptions of ‘truth’ and ‘progress’ that have been mostly discredited by post-processual doctrine, the very idea that there can *be* objective goals for well-ordered Western institutions to discover. de Mola (2013) demands a “correct structure” within archaeological theory that “cannot be arbitrary”.

I cannot agree more with de Mola’s intentions. His concluding remarks offer a serious challenge to the complacency of the postmodern trend within archaeology, and any fresh attempt to critique the malaise of the postmodern orthodoxy should always be welcomed. On the contrary, my problem with de Mola’s article is that it is *not ambitious enough*. The methods the author uses to explore postmodernism are insufficient, and loosely connected; de Mola’s own response to the philosophy is vague, verging on the uncritical; the scope of his argument is limited, and refuses to tie itself to the broader campaign of anti-postmodernism. I argue that while none of these factors render his conclusions useless, they do threaten to obscure them. While I intend this article to be read as a critique, it should also be read as complementary to the argument expressed by de Mola – a response rather than a riposte.

Vantages to vistas

The bulk of de Mola’s article is structured around three ‘vantage points’ which aim to flesh out the incursion of postmodernism into archaeology. The first of these is an economic discussion of the phenomenon of ‘McDonaldization’, or the centralisation of capital from small private companies to larger corporations. The second describes a concomitant process called ‘Corporatotoxication’, a socio-economic bi-product of the first that is characterised by the depersonalisation of production and consumption. The third and final viewpoint is a little more removed from these arguments, and concerns the effects of postmodern dissemination strategy – the loss of central narratives and a growing trend of eclecticism within archaeological displays and heritage as a whole.

Yet it is not clear what advantage these vantage points enjoy over the debate. Given that the heritage and archaeological aspect of the article is limited discussion about displays and narratives, a general examination of postmodernist socio-economic narratives seems disproportionate. Nor is it clear why an economic view should be delineated from a socio-economic view, or how these relate to the debate about heritage displays.

Of all these vantage points, only the latter is considered critically. This is vexing, given that the lack of a counter-narrative to the postmodern line described in the first two sections risks presenting it as a legitimate, uncontroversial argument. This is an important clarification – either de Mola doesn't agree with the narrative, or he does. If he doesn't agree, he must explain how unsound postmodernist reasoning is on this issue, or risk ambivalence. If he does agree, then he has already conceded the most fundamental premise of postmodernism – that the centralisation of economic forces, cultural creativity and social activity are all the result of modernism.

The implication this has for archaeology is *huge*; what is the point of studying, practicing, teaching or simply disseminating archaeology if by doing so we are merely reinforcing a system that ultimately robs people of their trades and drains the colour from their lives? More specifically, how can we say that chronological displays are superior to thematic or eclectic displays in a world that is done with linear definitions of 'progress' and grand-narratives that provide context?

I find it important, therefore, to address this argument before even considering the archaeological debate. In his section on 'corporatoxication', de Mola eloquently sketches the generations-long process of telescopic capitalism, in which small private businesses get swallowed into larger and larger businesses until only multinational corporations exist. I do not disagree that this process occurs, but I distrust the postmodern explanation that this force within capitalist economy is linked to forces of modernisation (in contrast to Orser 1996); after all, it was a phenomenon identified most distinctly by early communists in the first half of the 19th century (for example, Engels 1845, 19-20).

In other words, to agree with the claim that Western economic climate promotes centralisation of capital does not necessarily tie one to the argument that this is ultimately because of 'modernism'. For one thing, postmodernist historians and archaeologists are profoundly divided on what drives modernism, what modernism itself consists of, and how it can be traced through history (see Preece 2011, 15-16).

The argument that Western societies have moved into some sort of exalted 'post-industrial' condition seems distinctly undesirable this side of the recent credit crunch, and arguably, it under-estimates the fundamental industrial basis of supposedly transcendent countries like the United Kingdom (Preece 2011, 13-14). Meanwhile, as the diversity of postmodern viewpoints is commonly celebrated as a mark of intellectual freedom, this state of affairs is due ultimately because of the lack of consensus over what 'postmodernity' really means. Proponents have therefore tended to coalesce around a handful of popular characteristics; for example, the 'post-industrial' argument that underpins 'McDonaldization' and 'corporatoxication' (expressed first by Bell 1974, among others), and the reaction against grand perspectives or 'metanarratives' from both sides of the political spectrum (see Lyotard 1984; Hicks 2004, 135-171).

Archaeology and authority

It is this last characteristic of postmodernism – the collapse of principle – that holds the greatest relevance for archaeology. Discussing this in his third vantage point, de Mola rightly criticises the postmodern influence over archaeological displays through questioning the effectiveness of eclectic and narrative-destroying displays. He does this by building his point upon a case study of the Tempe Historical Museum, Arizona, before turning postmodernist logic against itself in an elegant twist (emphasis original):

“Postmodernity is a cultural condition that claims objectivity is a fallacy. If this is true, then the following question must be posited - from what *objective* premise are postmodernists drawing their (quite authoritarian!) conclusions regarding positivism?”

Yet he fails to recognise that this is only one symptom of the vast amount of disruption that belief in a ‘condition’ has generated; the problem is broader than just heritage displays. Archaeologists, students and heritage workers are now told to throw professionalism and objectivity in order to take their cues from popular culture and the demands of the market (for example, Shanks and McGuire 1996; Holtorf 2007) and give up the pursuit of becoming authorities in fields in order to facilitate pluralist debate (for example, Hodder 1999, 3-7); they are told that instead of making statements about the material world for others, they should retreat inside their own heads and concentrate on their personal bias (for example, Thomas 2001). Although these are stultifyingly poor stratagems that can never be adhered to wholesale within either archaeology or heritage, they nonetheless raise important issues academic debate should encompass.

In this respect, de Mola’s contribution to this debate demonstrates a refreshing willingness to engage in what has traditionally been a one-sided debate dominated by post-processualists. Explaining how his chosen display adopts the theme of water while abandoning all chronological context, he explains:

“does a canteen really have anything in common with an olla? Were the ideas, aspirations or interests of the miner the same as the Hohokam farmer? We understand their mutually shared environmental need for water.”

A further opportunity for critique presents itself; isn’t the theme of ‘water necessity’ a tributary of ‘environmental determinism’? This then presents a contradiction in aims, given that environmental explanations are thought to be too determinist, processual, modernist and positivist (Johnston 1998). Contradictions are not unprecedented; the Jorvik Viking Centre in York, for instance, has simultaneously been both praised and derided by post-processual critics for being populist and market-driven (Holtorf 2007, 24-25), and for being positivist and market-driven (Shanks and Tilley 1992, 86-88)! Such contradictions are the inevitable result of poor definition of beliefs and principles.

Aside from a commentary on this internal inconsistency, de Mola evades a larger argument about the principle of eclecticism. Eclecticism has, at its heart, the principle that everything is equally weighted in value, and in this sense can be closely identified with the post-processual commitment to pluralism. The problem is that this principle is based on unsound reasoning, and is totally impractical. For instance, the Hodderian conception of pluralistic archaeology entails “closer integration and mutual understanding” with groups as diverse as metal detectorists, ley line hunters, druids and creationists (Hodder 1999, 6-7), despite the substantial differences between these groups regarding their beliefs, internal dynamics and capacity to effectively interrogate the evidence of the past.

It is not for archaeologists to regulate the narratives of others, of course, but then archaeologists have never done so anyway; there is instead every reason for them to lend the weight of their authority on the more accurate and responsible groups. As yet, no post-processualist has been inclined to even consider the role of authority in relation to archaeology; archaeologists are supposed to facilitate the input and perspectives of others (for example, Moser *et al.* 2002).

Possibly this has gone ignored because of a curiously materialistic attitude among many post-processualists toward archaeologists – the notion that they are merely people who dig, and that the praxis of digging alone defines archaeologists rather than any especial quality of their views (see Yarrow 2006; Edgeworth 2011; Nilsson 2011). This view comports better with a pluralistic conception of public engagement strategies, as Meskell (2005, 85) has put it: “This is not to say our accounts are implicitly better [than others], but they are grounded in different ways”.

But there is every hope that this argument for *authority*, rather than *plurality*, is starting to gain traction in the archaeological community. Nowhere is this principle captured better than in Horning’s recent article, ‘Exerting Influence? Responsibility and the public role of archaeology in divided societies’ (Horning 2013), which explores the potential for archaeological authority to subvert a self-serving and politically polarised society.

Using the case study of Northern Irish archaeology and heritage, Horning describes how the post-1998 era has been dominated by a pluralist framework that reinforces differences between two dominant groups, Catholics and Protestants. Moving beyond this, Horning also notes how archaeology can be used to undermine commonly-held myths – such as that Scottish settlers came to a devastated land which they themselves developed, or that 17th century plantations ignored pre-existing Irish designs (Horning 2013, 24) – in a manner highly reminiscent of many Zionist narratives about Palestine before 20th century Jewish immigration (compare with Preece 2013). The reason to do so is quite clear; the vacuum left by professional ‘public intellectuals’ will always be occupied by less honest actors.

Subjects to objects

The final aspect of de Mola's article I would like to develop is his tantalisingly brief view on postmodern *relativism*, or the belief that personal bias is insurmountable. This popular view has, in turn, led to a discipline that is "intellectually confused" and in a "morally disordered state", which the author apparently regards as an unsatisfactory outcome.

It almost goes without saying that *dis-order* is a hallmark of the postmodern condition, and thus a goal for postmodernists; yet, if de Mola wanted to endorse a confident, authoritative, and indeed legible discipline, his methods are hardly best-suited to this task. He appears here to be out-flanking the postmodernists on their own terms, rather than suggesting credible ways to build archaeology and heritage around objectivity, authority and legibility. In this last section I wish to explore a new avenue of research that tackles the troubling subject-object split.

The issue of objectivity is central to the debate with postmodernists and post-processualists because the latter tend to believe that it does not exist; they argue that it is impossible for one to view the material world without personal prejudice. For example, Johnston (1998, 60) has argued that the notion of an external world is intrinsically linked to nationalist territorialism, and the postmodernist Zygmunt Bauman has claimed that objectivity – as a part of modernist scientism – was responsible for the Holocaust (Bauman 1989; Preece 2011, 15-16). This appalling claim that has been reiterated within archaeology explicitly by Thomas (2004, 49), and implicitly by Hodder (1998, 214): "After the horrors of the Great War, the Holocaust and Hiroshima, how can we put our faith in the mandate of Western reason?".

There is an obvious counter to this argument; the very fact that there are such things as vehicular traffic, property boundaries and language demonstrates that we all share the same world and therefore perceptive differences from person to person exist firmly within real-world constraints. From this starting point a serious argument can only ever concern to what extent we can claim to represent material culture accurately – whether this means in context sheets, site reports, or heritage treatments.

On this level I am prepared to concede some ground to post-processual thinkers. For example, Yarrow has written of how the process of archaeology simultaneously objectifies archaeologists, by forcing them to work in structures, and subjectifies material culture, by turning it into artefacts, recognisable features, etc., thereby incorporating both poles of objectivity and subjectivity (Yarrow 2003). Chadwick has even devised new sets of context sheets designed to capture the recorder's personal interpretation (Chadwick 2003, 108-9). Many post-processualists have also experimented with archaeological ethnography (for example, Moser *et al.* 2002; Yarrow 2006; Everill 2007) or the study of the social dynamics of excavation. While much of this work has ultimately been done in the interest of exploring subjective bias in archaeology, I am confident that it can be incorporated into the everyday structure of excavation – making it, for want of a more fitting term, *processual*.

It is the action of being 'objectified' that is significant to the argument against total subjectivity, because it illustrates our ability to be objective in our measuring of the real, external world. Archaeologists have long implemented several basic practices to ensure that they are not slaves to bias, such as working in teams so as to reach a shared opinion rather than a personal one and sharing their research in peer-reviewed journals.

All of these processes can be described succinctly as 'accuracy', which I believe is much more useful than 'objectivity' as a principle. Firstly, it neatly side-steps the subject-object split. Secondly, it captures the *scale* of objectivity much better than the term 'objectivity' itself does; objectivity and subjectivity are commonly held to be total, polarised opposites, whereas accuracy implies gradation. Thirdly, it works much better not as a principle to hold, but a principle to constantly aim for. This supports a framework for archaeology that challenges the nullifying relativism and tedious belief in total subjectivity that postmodern archaeology and heritage languishes in, and in that sense at least, I find them to be useful.

Conclusion – reclaiming narratives through principles

In this article I began by highlighting the significance of the postmodern socio-economic argument cited by de Mola, which I believe is crucial in underpinning all other narratives. An anti-postmodern response cannot afford to overlook this, and by merely exercising a certain amount of critical judgement we can justifiably present it as the product of assumptions and myths. It is not enough to merely suggest that postmodernist archaeology and heritage is benign; all myths and assumptions are damaging in some sense.

In this article I have chosen to illuminate the problems with eclecticism, pluralism and belief in total subjectivity, but there are indeed many more faults to pursue, including, though not limited to: the post-processualist conception of the archaeological record, phenomenology, democratisation of excavation, the emphasis on agency, and ecomuseum theory. Throughout I have tried to temper criticism with suggestions for improvement; it is easy to attack an argument, and much harder to offer anything in return. In this respect I have tended to build partially on the work of non-postmodernist post-processualists, and – regarding the concept of accuracy – have partially chosen to be speculative and abstract. These are options which anti-postmodernists may or may not explore, and at this stage require substantial development before they can operate as alternatives.

Finally, I wish to cross-examine a word that has appeared in the rest of this article frequently without being formally addressed – the notion of *principle*. I have intended to use this term fairly, with no implication that one side or another has a monopoly. Rather, I feel that principle has been neglected as a framing device by all theorists within archaeology, despite the fact that it is undoubtedly useful as a method of surveying the ultimate goals of postmodernists. In turn we must ask of ourselves what our own principles are, and what drives our separate or shared archaeologies. For good or ill, postmodernists have tended to selected eclecticism, pluralism and subjectivity. Whatever others may choose, I assert here a better trio: holism, authority and accuracy.

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The secret dig: First year prehistoric fieldschool at Star Carr

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This article will briefly summarise the research background of the famous Mesolithic site of Star Carr in the Vale of Pickering (North Yorkshire) and discuss the experiences of first year University of York undergraduate students, Sophie Austin (BA Archaeology) and Phoebe Haigh (BSc Archaeology), on their excavation fieldschool at the site.



Figure 1: 2013 Star Carr fieldschool students and staff (Reproduced with kind permission of the POSTGLACIAL Project)

First year undergraduates at the University of York's Department of Archaeology spend three weeks of their summer term on fieldschool. This year, the Department offered a historical and a prehistoric option for students to participate in. This year, prehistorians (Figure 1) were delighted to learn that they would be digging at Star Carr, though under strict instructions to keep the excavation a secret until after it had finished in order to respect the landowners' wishes as they did not want to attract publicity.

Excavated in the 1950s, Grahame Clark's finds at Star Carr (then known as Site 4) elevated an otherwise unremarkable field in the Vale of Pickering to archaeological fame. In this article, we will briefly summarise the history of excavations at the site of Star Carr and around Lake Flixton as well as discussing the highlights of the dig and the more general experience of fieldschool.

Star Carr: A brief history

Star Carr is an extraordinary Mesolithic occupation site in the Vale of Pickering on the edge of palaeo-Lake Flixton. Preservation in waterlogged peat has been excellent until recent drainage schemes and so organic remains, such as wood, bone and antler, that would not normally survive have been conserved. The finds provided such insight into the Mesolithic that it has since been scheduled as a site of national importance (Emerick 2011, 125).

Excavation, including environmental sampling by Godwin and Walker, has taken place around palaeo-Lake Flixton since 1948 when John Moore, a local resident, discovered a flint blade in a ditch cut at Site 1, the nearby Flixton Island in the middle of the palaeo-lake. John Moore carried out initial excavations of Flixton Island and, after discovering further worked flint in another ditch cut, Star Carr.

The pioneering Mesolithic Archaeologist from Cambridge University, Grahame Clark excavated Star Carr for three years between 1949 and 1951. His finds included the 21 renowned antler headdresses, 191 barbed points, shale beads, large flint concentrations and deposits of birch branches. Following a substantial break, the project resumed in the 1980s and the new Vale of Pickering Research Trust collected environmental samples and exposed a number of substantial timbers with evidence of human modifications (Milner *et al.* 2013, 56).

In 2004, Nicky Milner, Barry Taylor and Chantal Conneller continued the work of creating a more extensive picture of the whole area of palaeo- Lake Flixton (Milner *et al.* 2011, 5). Their finds included more worked timbers, deposits of animal bone, flint, antler, and, perhaps most excitingly, postholes suggesting a timber based structure; they also found a larger extent of human occupation than previously anticipated (Milner *et al.* 2013). The POSTGLACIAL Project is the recent culmination of attempts to understand the site more fully before changing conditions, a result of draining peat, oxygenation and increasing acidity, completely destroy the evidence of its occupation in the Mesolithic.

In the past few years in particular, methods such as thin section micromorphology, combined with microbotanical and geochemical analyses, have become increasingly recognised as providing an essential insight into several aspects of the archaeological record. An example of the resolution of this approach is the identification of individual layers of wall plasters at the site of Çatalhöyük in Turkey, revealing the seasonal redecorating habits of the Neolithic population (Matthews 2005).

The excavation and fieldschool experience

Both authors were excited about the prospect of excavation, especially at such an incredible site. Nevertheless, we were unsure of what to expect when we arrived at a road lay-by and set off on what felt like an intrepid walk towards the distant sight of three portable huts and a large mound of spoil. For those of us who had never excavated before, and even for those that had, being let loose on such an important Mesolithic site with a trowel seemed a bit overwhelming. Our supervisors made sure we felt comfortable though, and we soon got used to the strange experience of trekking out to the middle of a field every day to systematically reduce the build-up of sandy, silty re-deposited soil, through peat and clay and more peat and eventually right down to gravel.

As well as mastering (or perhaps merely grasping?) toweling, mattocking and shoveling (and of course the subtle art of shovel scraping) we practised section drawing and filling in context sheets. Initially, all of the groups had similar jobs, and the supervisors ensured that we all learnt the basics, but as the excavation developed, different areas of the trench produced varying artefacts or needed different levels of excavation so the five groups spread out in the trench by the middle of the field school, each conducting slightly different parts of the excavation (Figure 2)



Figure 2: *The unfolding excavation* (Reproduced with kind permission of the POSTGLACIAL Project)

Apart from archaeological skills, we found that we were learning more about the other students we were working with. It is amazing the obscure details about other people that you learn when spending nine hours together. We also learnt, by osmosis as well as directly, about the artefacts themselves. It was exciting to be finding some of the artefacts that would go towards new interpretations, or further contemplation of existing interpretations. Both authors felt that the fieldschool enabled them to learn a lot about the excavation process, an element which seems to many to be the defining character of the discipline of archaeology but which is difficult to appreciate without first-hand experience (Figure 3).



Figure 3: *Students learning from experience with group supervisors* (POSTGLACIAL Project)

Post-excavation and evaluation

Following the fieldschool, each group took part in four days of post-excavation which built on our understanding of the processes which enable the artefacts found on excavation to be used to create interpretations of the site. We processed soil samples which involved a fun morning of standing with hands and forearms elbow-deep in cold water and an afternoon of sieving the sample and sorting it to extract its different constituent materials.

Students also participated in photo archiving and flint washing as well as looking at the heritage side of the excavation; this was part of the task of creating group heritage boards to display at an end of term exhibition. Many of those who found that the field element of the excavation was not their calling enjoyed the lab-based work more and everyone began to see the excavation process as more than just a few weeks of digging.

After the required three weeks of fieldschool had been completed, there was an opportunity for students who were interested in gaining more experience, or who simply had a great time on site, to volunteer more of their time to the project. Many people chose to revisit the site during the following final few weeks of the excavation.

Overall, the University of York's fieldschool at Star Carr proved to be an amazing way of spending three (or more) weeks of the summer term. Even those who did not particularly enjoy the experience learnt from it and undoubtedly found it valuable. As for the authors of this article, we found that the experience firmly rooted our interest in the different branches of field archaeology. Hopefully everyone has blossomed from the experience and will continue to enjoy excavation.

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Seedy work! The what, why and how of archaeobotanical analysis

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This article is the first of two by the author relating to archaeobotanical assemblages. They aim to introduce the reader to the processes involved in archaeobotanical sampling, analysis and application of results. This first paper deals with the methods involved in sampling, retrieval and identification. The second paper will present case studies in which archaeobotanical analysis has been applied in order to inform upon any social, cultural and economic practices which may have left their trace in the environmental remains after the abandonment or destruction of the site.

The what

Archaeobotany is based on the identification, scientific analysis and interpretation of plant remains. These macrofossils are preserved by charring, waterlogging, mineralisation and desiccation. The latter tends not to apply to archaeobotanical assemblages in Ireland or the United Kingdom! In my experience, much of the material in this part of the world is charred – in particular that retrieved from prehistoric sites, although waterlogged material is also quite common. Charring is the result of the plant remains becoming carbonised under oxygen-poor conditions as a result of their interaction with fire; this leaves behind carbon skeletons of the seeds (Moffett 2009, 41).



Figure 1: *Charred wheat seeds* (Reproduced with kind permission of the Colonial Williamsburg Foundation)

Typically, because they are the result of people's interaction with cereal crops, chaff and weed seeds, these are the most common components of an archaeobotanical assemblage (Knörzer 1971; as cited in Fuller *et al.* in press). The most common 'modes of entry' (van der Veen 2007) of these remains into the archaeological record include food processing, preparation, consumption and storage as well as through fuels, animal dung, building materials and ritualistic practices (van der Veen 2007; Matthews 2009).

Primarily, seeds which have been charred are retrieved from drying-kilns, hearths, pits, ditches and floors. Kilns and hearths were often the location of primary activities concerned with cereal processing and it was here that grains, weeds and chaff were sorted, waste was discarded and the cleaned products dried for storage or further processing; such as grinding for flour or malting for ale production. Pits and ditches often indicate secondary deposition, as they tend to contain discarded waste from a kiln or hearth. These latter remains cannot be reliably used to indicate the environment within which they originated; rather they suggest the processes which resulted in their deposition.

The why

The identification of each charred fragment possible and the subsequent assessment of the origin of each context makes it easier to ask questions of the data. This enables any attempt to understand the socio-cultural and economic practices of the settlement or site (van der Veen 1992; van der Veen 2007).

In its infancy, archaeobotanical studies focused on landscape reconstruction through phytosociology, but acknowledged faults with this model are associated with taphonomy and changes in agricultural practices (Hillman 1991; Küster 1991). The impetus towards statistical analysis of taxa frequencies in the 1980s was based upon ethnobotanical studies of pre-industrial farming communities and it led to a deeper understanding of traditional agricultural societies and their methods of harvesting, crop-processing and storage (Hillman 1981; Jones 1987a; Jones 1987b).

These activities incorporated a number of steps and it was shown that each step could be tracked in the archaeological record by the relative frequency of grain, weeds and chaff in an assemblage. The steps include: (1) Threshing; (2) Raking; (3) Winnowing to remove light weed seeds and awns, which may be used as fodder later; (4) Coarse sieving to remove weed seeds, unbroken ears and straw fragments; the unbroken ears are re-threshed; (5) Fine sieving to remove small weed seeds and awns; (6) Pounding; (7) Winnowing to remove lemmas and paleas; (8) Coarse sieving to remove spikelet forks and unbroken spikelets, which are re-pounded; (9) Fine sieving to remove glumes bases, awns and small weed seeds; (10) Hand-sorting for removal of grain-sized weeds.

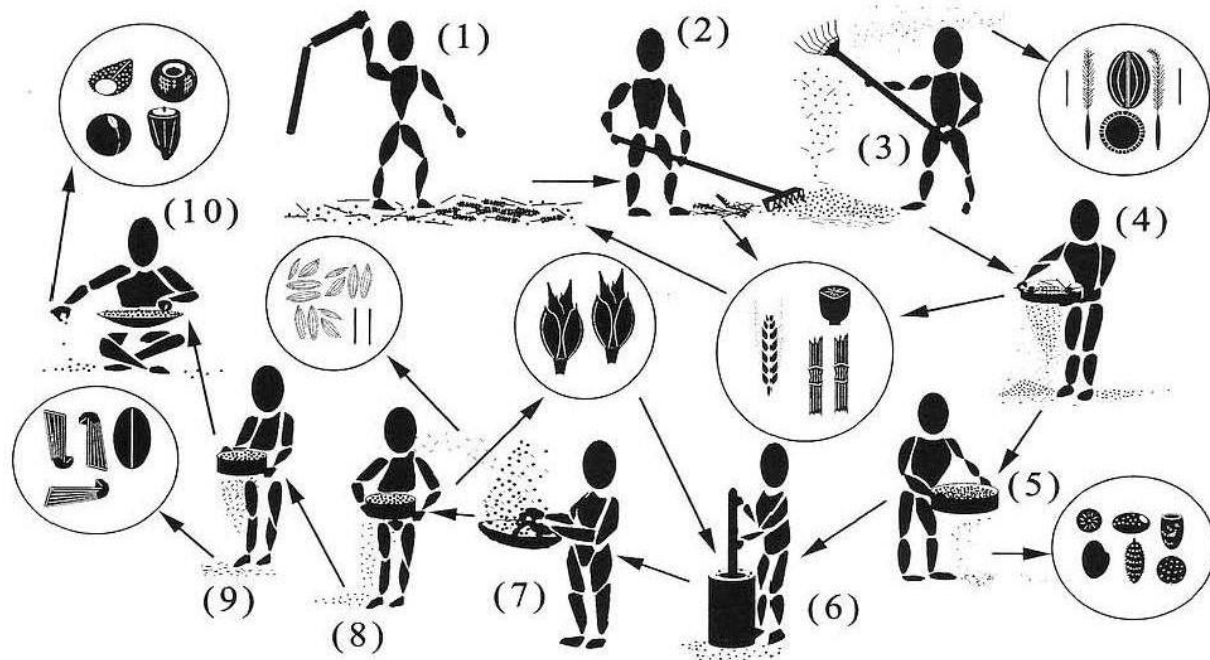


Figure 2: *Crop-processing steps and the by-products which form archaeobotanical assemblages* (after Stevens 2003)

By-products of the stages, as well as the resultant clean grain at the end of the process, are those plant parts which are likely to come into contact with fire through fuel stores, parching, routine processing and accidents (van der Veen 1992, 81). By understanding the stages and plotting the assemblage against each stage it should therefore be possible for archaeobotanists to infer how a society organised harvesting and how their crops were stored, as well as to suggest broader societal organisation, scheduling of labour and risk-management strategies. This theory was widely applied by all archaeobotanists in the 1980s and 1990s and has been further reworked by Reddy (1997), Stevens (2003), van der Veen and Jones (2006) and Fuller *et al.* (in press).

It is generally inferred that surplus clean grain is produced by complex and hierarchical societies for trade (Stevens 2003; Fuller *et al.* in press). Equally, those sites which show evidence for routine processing may be more domestic in nature. The debate is too detailed to outline here, but it must be remembered that differential preservation and cultural choice, as well as the context of the sample, influence the assemblage.

Other questions about agricultural practices can be asked of the plants within an assemblage. There may be evidence for harvesting methods (Wilkinson and Stevens 2008) when the relative frequencies of the contents have been analysed. Irrigation techniques identified through functional ecology (Bogaard *et al.* 1998; Charles *et al.* 2003) and evidence for the cultivation of cash-crops suggest intensification of production, which can be used as evidence for the emergence of hierarchical societies and trade networks (Miller Rosen 1997; Fuller and Stevens 2009).

Archaeobotany can tentatively be used to recreate the plant-based components of diets in the past. While many of the ingredients may not have come into contact with fire, small clues about prehistoric palates can be ascertained (Valamoti 2003). Alterations in preparation practices and place, as well as changes in crop choice, may be visible through very careful analysis of well-preserved assemblages (McCorrison 1995). Many prehistoric foods are silent, but may be suggested through careful analysis of the taxa.

Other themes which can be explored through archaeobotanical assemblages are climate change and land degradation, which are major topics in the Near Eastern Bronze Age (deMenocal 2001) and are thought to have been caused by an interplay of factors such as natural events (Weiss 2001) and expansion of agricultural lands, causing widespread clearance of forests and aridification. Further exploitation of the land, through irrigation and poor water-management may have contributed to the salinisation of the region. Carbon isotope studies of seeds, as well as germination requirements are utilised in studies such as these (Riehl *et al.* 2008).

The increasing use of animal dung in the Near East as fuel in the Middle Bronze Age as a result of woodland clearance can be detected by the increasing presence of steppe grasses, small legumes, barley and cereal chaff within an assemblage (Miller 1984). In this part of the world, animal management and foddering regimes can also be gauged through spatial analysis of threshing waste and small legumes, which are often fed to herds throughout the winter.

Thus, there are numerous topics which can be examined through archaeobotanical analysis. One crucial point is to understand that the charred remains have been preserved in the archaeological record only as a result of their contact with fire (Miller 1990, 75) and are therefore biased towards the preservation of plants that require fire for processing, preparation or are accidentally charred.

Inevitably, most assemblages have been built up during a series of activities and as such are secondary in nature (Schiffer 1976; Hubbard and Clapham 1992). It is important that 'modes of entry' (van der Veen 2007) are identified so that the potential of the data can be assessed (Hillman 1981; Jones 1987b; van der Veen 1992).

The how

Soil samples are collected from features on-site; the archaeologists involved in the sampling may have consulted an archaeobotanist or environmental archaeologist in order to devise a relevant sampling strategy. Campbell *et al.* (2011) have produced a very useful document on behalf of English Heritage outlining the methods for gathering and processing environmental samples, and the Institute of Archaeologists of Ireland (Monk *et al.* 2007) have also produced similar guidelines. Alternatively, the post-excavation work may reveal that particular features are important enough to be processed for archaeobotanical remains.

Typically, the samples are stored in plastic sample bags or plastic buckets; the latter are more durable, easier to store and reusable. The soil is then processed according to its preservation method; typically flotation is carried out for charred assemblages from dryland sites. This comprises the use of a flotation machine or a simple bucket method.

The principle of flotation is that the light environmental remains, such as charred seeds and charcoal, will float to the top of the soaked samples. The macrofossils are then poured off the top through geological sieves typically measuring 2mm, 1mm, 0.50mm and 0.25mm. The retent, which are the heavy particles that stay at the bottom of the soaked sample, is also poured through the sieves.

All fractions are left to dry and are scanned for environmental material under a microscope at a magnification between x7 and x40. The charred seeds are removed from the sample and are identified. Initial identifications can be made using a variety of literary and digital sources, including Stace (1997), Jacomet *et al.* (2006), Van Zeist and Bakker-Heeres (1985) and Cappers *et al.* (2006). Further in-depth identification is carried out by comparisons with physical reference collections.

The results of identification are presented in a table; with all plant parts listed in the table and noted with their English and Latin names. The table is generally organised in terms of nomenclature of species (examples in Stace 1997). An example of a table with few archaeobotanical fragments is visible below.

Context			[048]			Total
Period			1	Charred	Mineralized	
Volume sampled			3l			
Volume of flot			2ml			
Weight of flot			2.6g			
Botanical Name	Other	Plant part				
Poaceae						
<i>Avena sativa/Avena fatua</i> L.	Cultivated/Wild oat	caryopsis frags		1 5 [5]		
Identifiable Cereal grain		caryopsis			1	1
Identifiable Cereal chaff		Culm nodes culms				
Betulaceae						
<i>Corylus avellana</i> L.	Hazel-nut	frags			1	1
Brassicaceae/ Chenopodiaceae	Cabbage/ Goosefoot family					
<i>Brassica/ Chenopodiaceae</i> sp. L.		seed			13	13
Rosaceae						
<i>Prunus spinosa</i> L.	Blackthorn/sloe	seed frags			5 4	5 4
<i>Rubus fruticosus</i> L.	Blackberry	seed			2	2
Miscellaneous						
Miscellaneous Unidentifiable fragments				14		14
Total				14	26	40

Figure 3: A typical table of archaeobotanical finds (Image Copyright: Nikolah Gilligan)

The fragments are counted and listed in the table accordingly. Where possible, identifications are made to genus and species. However, where these identifications prove impossible, the remains are listed as '[Family] sp.'. In some cases, although much of the definitive identification criteria are missing, remains are recognisable to the analyst and are denoted by the letters 'cf'.

In order to assess the number of cereals present, either the embryos or the apices of fragmentary grains are counted where possible; it must be assessed which end is more suitable prior to counting in order to avoid double-counting of grains. Alternatively, an intact cereal caryopsis can be weighed and an estimate is then made of the number of whole grains which may originally have been present. These estimated figures are shown within square brackets in a table.

Tables also include information about the samples, including the phase they were associated with, the size of the sample and the flot, as well as species count. Basic statistical analyses are often also included, such as ubiquity values and the relative frequencies of taxa. The former is useful for quantifying the presence and absence of each taxon in the samples and takes into account differential preservation of plant parts (Hastorf 1999, 59). Relative frequency is a useful tool for analysing patterns and relationships in the data, though differential preservation may bias the results. By using both methods to complement each other, the limitations of either are lessened.

Additionally, the density per litre of each sample can be calculated by dividing the amount of specimens noted per sample by the volume of the sample. This can be useful in assessing whether the assemblage was formed by a gradual build-up, such as waste deposition, or was the result of a single episode, like an accidental conflagration.

Once identification and quantification has been completed by the archaeobotanist, the information is then collated into a suitable format to allow questions to be asked of the data. At this stage it is a good idea for the archaeobotanist to liaise with the archaeologist and other environmental specialists who may be involved in the post-excavation process. This will allow informed questions to be asked of the data and a multi-faceted report to be produced.

Conclusion

This article seeks to introduce the reader to the process of sampling environmental remains for the purpose of archaeobotanical identification and analysis; the aim of which is to extract any possible information about past activities on the site from any identifiable plant remains which may be present. The second article by this author will present case studies where the results of archaeobotanical analysis have been useful in building a better picture about activities on the site, including crop choice, processing and storage.

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