

Reference Collections Foundation for Future Archaeology

Edited by A.G. Lange

**Reference Collections
Foundation for Future Archaeology**

**Reference Collections
Foundation for Future Archaeology**

Proceedings of the international conference on
the European electronic Reference Collection
May12-13, 2004,
ROB, Amersfoort, The Netherlands

Edited by A.G. Lange

Colofon

Reference Collections
Foundation for Future Archaeology

Proceedings of the international conference on
the European electronic Reference Collection
May 12-13, 2004,
ROB, Amersfoort, The Netherlands

A.G. Lange (editor)
English corrections and technical editing
Drs. Kelly Fennema, Leiden
Cover design
Drs. Menne Kosian, ROB
Original design
Bert van As, ROB
Design, layout and prepress
Elvé Ex Press, Den Haag
Printing
Plantijn Casparie, Almere

Copyright on images rests with the individual authors,
unless otherwise stated.

© ROB, Amersfoort, 2004
ISBN 90-5799-059-8



Rijksdienst voor het Oudheidkundig Bodemonderzoek
State Service for Archaeological Heritage
PO Box 1600
3800 BP Amersfoort
The Netherlands

Contents

Preface	7
Opening address <i>René Jongerius</i>	11
Synopsis of conference discussions <i>Annet Nieuwhof</i>	15
1 Some thoughts on the history of reference collections in the UK <i>Clive Orton</i>	23
2 Classification and archaeological knowledge bases <i>Torsten Madsen</i>	35
3 Reference datasets for stone axes in the UK: some theory and practice <i>Mike Heyworth</i>	43
4 Quality through standards in UK and European archaeology <i>Kenneth Aitchison</i>	47
5 Building quality in working collections <i>Maureen Mellor</i>	53
6 Revealing collections: discovery, access and interoperability <i>Kate Fernie</i>	63
7 The London Archaeological Archive and Research Centre and the management and dissemination of archaeological data in London <i>Hedley Swain</i>	71
8 Archaeological archives – issues and solutions in the UK <i>Kathy Perrin</i>	77
9 Do reference collections have an electronic future? <i>Julian Richards</i>	85
10 The Portable Antiquities Scheme: recording the past <i>David Dawson and Michael Lewis</i>	93

11 Museum catalogues and a framework for publishing new reference collections <i>Øyvind Eide, Jon Holmen, and Christian-Emil Ore</i>	103
12 Visibility of knowledge: bringing archaeological references to the fore <i>Irina Oberländer-Târnoveanu</i>	111
13 Addressing the reference collections dilemma: the eRC (European Reference Collections) bid for European Commission funding under Culture 2000 <i>Jonathan Kenny</i>	121
14 Top down and bottom up – two perspectives on reference collections <i>Henrik Jarl Hansen</i>	129
15 ICT and the future of reference collections <i>Franco Niccolucci</i>	133
16 The European Reference Collection: founding the future <i>Guus Lange</i>	139
List of Contributors	147
List of Participants	149

Preface

On May 13 and 14, 2004 the conference 'Reference Collections: Foundation for Future Archaeology', was organized by the ROB¹ in Amersfoort, the Netherlands, as a sequel to a feasibility study that was completed the year before. This study made an assessment of the need for and feasibility of the establishment of a National Reference Collection (NRc) in the Netherlands. It was felt that the same problems that Dutch archaeology was facing in respect of the knowledge of material culture, might also be encountered elsewhere, and that international co-operation in solving these problems would be beneficial to archaeology on all levels. Archaeologists from Belgium, Denmark, Italy, Norway, Romania, and the United Kingdom participated in the conference, as well as Dutch archaeologists from various backgrounds, totalling about 80 participants.

The conference took place at a time when Internet technology is bringing about fundamental changes in the way we exchange information and knowledge. The new possibilities of accessing digitized information through the Internet have a fundamental impact on the practice of science in general and of archaeology in particular. Together with the changes induced by 'Malta', archaeology has reached a point where immediate action is required. On the one hand there is a fast growing demand for high-quality information and knowledge; on the other we see a fragmentation of the discipline. If we fail to adjust to the new circumstances, and do not incorporate state-of-the-art information and communication technology, eventually we will run the risk that knowledge accumulation will largely come to a standstill, or, perhaps even worse, that the knowledge base will be polluted by false information. This would seriously threaten the credibility of all our theories and decisions, and, in the end, the credibility of the discipline itself.

The contributions in this volume will show that many actions indeed have already been undertaken successfully. By discussing co-operation in the development of a (electronic) European Reference Collection (eRC), as a knowledge infrastructure to safeguard, enrich and disseminate knowledge of material culture, we hoped to find the right direction in which to push ahead.

Discussion

Participants in the conference have come from different backgrounds. Some are active in the area of archive management, and are not necessarily involved with reference collections per se; some work in universities and are, so to speak, producers of detailed reference collections, yet others represent members of excavation teams who tend to be more 'consumers' of reference collections. The focus in the discussions of each group was also expected to be slightly

¹ *Rijksdienst voor het Oudheidkundig Bodemonderzoek - National Service for Archaeological Heritage*

different. Therefore, the presentations of papers in parallel sessions allowed us to discuss the same issues from different angles. At the same time it created space for as many introductions to these discussions as possible within the limit of the two days available. The drawback of this approach with parallel sessions was that the participants could not attend every presentation. However, we regrouped frequently and took ample time to compare and discuss conclusions.

The parallel sessions were divided into four categories:

- 1 Basics (central theme: What are reference collections? How can we use them today?);
- 2 Development Knowledge Management (the value of the eRC seen from the viewpoint of scientific archaeology);
- 3 Use (the usability of the eRC seen from professional archaeology);
- 4 Storage and Management (eRC seen from the perspective of collection management and archaeological heritage management).

The central issue at this conference was to ascertain the value and the functions of reference collections and type series:

- Do reference collections and type series play a role outside their own immediate environment or are they of value only to a particular research, with its own research questions, in its own landscape and socio-economic/cultural setting?
- Can reference collections serve as standards in the form of dictionaries and encyclopedias of knowledge on archaeological materials and material culture?

Papers

On the first day, after the stimulating opening words by the director of the Royal Netherlands Academy of Arts and Sciences, René Jongerius, who sketched the wider scientific framework in which developments within archaeology take place, *Clive Orton* and *Torsten Madsen* were invited to deliver keynote lectures, addressing the above mentioned issues. For Orton the use of standard terminology is imperative, while Madsen holds that the use of standard terms may obscure the variability in the real data and warns against uncritical use of information labelled with standard terms. He pointed also to the danger of fossilisation of knowledge when using standards.

In the parallel sessions we paid attention to the same questions, but only after the introduction by papers from representatives of the three different viewpoints. The scientific researcher, *Mike Heyworth*, discussed the use and value of a typology of Bronze Age axes.

The user in the field was represented by *Kenneth Aitchison* who is a strong advocate of the use of standards in daily field practices, while *Maureen Mellor* presented the impressive work of the Medieval Pottery Research Group in realising a standard nomenclature.

The last group of speakers of the first day consisted of specialists on archiving: *Kate Fernie*, *Hedley Swain*, and *Kathy Perrin* all discussed various initiatives in Great Britain with the aim of safeguarding the archaeological archives which contain both material and documentation, and making these accessible to a wider public by reorganizing them physically and/or by digitizing.

In the second day's key notes, *Eelco Bruinsma* presented us, notwithstanding a computer crash the night before, with a vivid view on the vital function that

reference collections have in our daily thinking and especially in the realm of cultural heritage. *Julian Richards* gave us an overview of the results of successful projects like ARENA and gave us an insight into what soon will become state-of-the-art procedures in the management of knowledge.

David Dawson illustrated the highly successful Portable Antiquities Scheme that fundamentally changed the relationship between professionals and the public and for the better. *Øyvind Eide* showed how the database design of the Museum Project in Norway could be an example for the eRC development.

Irina Oberländer-Târnoveanu, who was already involved in the Bronze Age Monuments glossary mentioned earlier, illustrated progress made in Romania in the opening up of valuable archives, and *Jon Kenny* discussed the application for Culture2000 funding of a pilot eRC. *Henrik Jarl Hansen* introduces the combination of a top-down (central) and bottom-up (local) approach in Denmark to develop an up to date National Reference Collection of use to a wide (inter)national audience. *Franco Niccolucci* provides us with models to preserve in the classifications and the digital record the ‘fuzziness’ of archaeological data and our interpretations. Some backgrounds of the eRC-initiative and the lines of development are sketched in the last contribution by the present author.

In the concluding session of the conference we established priorities and composed the common agenda for further co-operative developments. *Annet Nieuwhof* wrote the extensive synopsis of the major discussions and proceedings of the conference.

Some other papers were presented which are not included in the present volume. This was either due to pressures of other work that prevented reworking the presentation into an article, or to the form of the presentation not lending itself for publication.

This volume will enable all participants to learn what was said in the sessions they could not attend and hopefully evokes for them the constructive atmosphere in Amersfoort. The non-participants I would like to recommend this publication as a rich reference collection of ideas and indications about the roles, tasks and possibilities that will play a role in promoting a healthy discipline of archaeology in the future. The diversity of the articles obviously reflects the various backgrounds of the participants, but one will notice the many corresponding points and principles that form the foundation for further development of the eRC.

Acknowledgements

To conclude I would like to express my gratitude to all speakers, who accepted with so much enthusiasm the invitation at such short notice, presented papers and reworked them into the inspiring articles you will find here. A special word of thanks goes to the director of the Archaeology Data Service, Dr Julian Richards, and his co-workers, William Killbride and Jon Kenny. They wholeheartedly welcomed the first presentation of the eRC at the EAA in Thessaloniki in 2002 and have been supportive ever since. Without their continued input of expertise, this conference simply would not have been possible. Jon Kenny, as before, has been ‘stand by’ and helped me out whenever he was asked. All participants I would like to thank for their valuable and good-humoured contribution to the discussions, which made the conference a truly inspiring event.



Good-humored participants...

I take the opportunity to thank the management and colleagues of the ROB, who, in good and in bad times, gave full support to the eRC initiative and made this conference possible. We owe much to the chairs of the different sessions that were held by ROB staff: Jos Bazelmans, Daan Hallewas, Henk Kars, Roel Lauwerier, Ronald Wiemer, Henk Stoepker, and former ROB-colleagues and NRc project members, Karen Waugh and Annet Nieuwhof. Before and during the conference they discussed the topics and decided on the direction of the discussions. This input was indispensable for a free, but at the same time, to the point and smooth flow of ideas. Esther Jansma, who unfortunately could not participate as much as she had hoped, deserves credit for convincing me to organize this conference in the first place. I am much indebted to Annet Nieuwhof, who, being involved in this project from the onset, took precious time off to attend and contribute the extensive synopsis of the conference. Substantial support, from the 'world outside', by SenterNovem², has provided a firm financial base for our national and European reference collection initiatives. For all its sustained support, which started with the Dutch feasibility study and ends with the funding of this publication, we are deeply indebted. At a very late date we found the division of the humanities of NWO³ willing to contribute financially to the conference and also taking a promising interest in the subject and its follow-up.

Guus Lange

² Formerly SENTER, an agency of the Dutch Ministry of Economics.

³ Netherlands Organisation for Scientific Research

Opening address

René Jongerius

Ladies and gentlemen,

I am pleased to have the opportunity at the opening of this conference to say a few words to underline the importance of the initiative you have taken.

My introduction to professional archaeology dates back about 25 years. As a University of Amsterdam research policy official, I was shown around a field investigation in Uitgeest being conducted by the Amsterdam Institute for Pre- and Protohistory. My memories of that occasion are confined mainly to rubber boots and mud, but also to astonishment at the fact that so much information could be collected from a 10 centimetre layer of compressed turf. I also remember that it was a relatively large-scale investigation for that period, which seemed unusual for an institute employing only about 15 staff.

Since then, the scale on which archaeology is practised in the Netherlands has changed beyond all recognition. At that time there were perhaps 70 professional archaeologists in the Netherlands, compared to over 1,000 at present. In those days archaeology was primarily a scientific discipline without a clearly useful purpose, with inquisitiveness being the guiding principle. These days archaeology is a branch of industry in which turnover has to be achieved. At one time archaeology seemed a scientific hobby for the true believers, nowadays it is a profession. This development came about as a result of the Malta Convention. This convention is intended to protect our archaeological heritage and obliges us to investigate the archaeological value of the soil prior to any infrastructural work. Although Dutch legislation still has to be adapted to the Malta Convention, its intentions are being observed with respect to large-scale infrastructural projects such as the Betuwelijn railway link and Vinex housing developments.

This expansion has had two effects. The excavation market has been privatized. In addition to university institutions there are about 80 companies, mainly small ones, involved in this sector. In line with this development, the archaeological profession has become institutionalized, and now includes:

- a professional association,
- a State Inspectorate for Archaeology, and
- a Council for Archaeological Quality.

In addition, a national research agenda (NOA) is currently being set up. And just remember that in the past, the annual Reuvensdagen archaeological conferences were all you needed to remain up to date. The setting up of a reference collection is an inevitable and logical part of this process. As a result of the expansion that has taken place, the transfer of knowledge requires more than an informal network; other means are necessary.

I can understand that you are concerned about the varying quality of the many excavation reports that have appeared as a consequence of the Malta Convention. I can also understand that you are worried about the continuity of knowledge exchange within your scientific field. Viewed in this light, the question is not *whether* a reference collection must be set up, but rather *how* and *when*. After all, what good is a Council for Archaeological Quality if there are no relevant standards to which the work being carried out in the privatized market can be compared?

In this context, the call for a reference collection seems to be prompted by concerns about the scientific standards of archaeology in a world in which the bulk of the archaeological work is executed outside the universities. I prefer to look at it another way: the reference collection will provide new opportunities and new possibilities for scientific research. As a result of the standardizing effect that ensues from the use of a reference collection, all those Malta Convention reports will be open to comparative investigation that goes far beyond the exploration of individual archaeological sites.

However, this requires more than just a reference collection. In the first place, those reports must be accessible, and more broadly and more extensively than is possible with the ARCHIS II now being used. An ARCHIS III will have to be set up that not only includes discovery sites and summary descriptions, but also more detailed information on the basis of the reference collection. Entering by hand will then no longer be feasible, and more attention will be required for matters such as automatic access, metadata, etc. In this area, too, initiatives will be needed from your field of speciality.

In this context, I would like to place the developments in archaeology in a wider perspective by making two points.

Data access is not confined to archaeology, it is also relevant to many other specialities. The Netherlands Organisation for Scientific Research and the Royal Netherlands Academy of Arts and Sciences have taken the initiative to set up a widely accessible national data archive, based on the English Arts and Humanities Data Service. Existing activities will be concentrated within this archive along new lines. A new umbrella structure will be created under which a speciality such as archaeology can shelter.

Data access is also a government priority. On 30 January 2004, at the suggestion of our Minister of Education, the OECD¹ agreed the 'Declaration on access to research data from public funding'. This declaration is based on the principle that data produced in the context of publicly funded research must – with a few ifs and buts – be freely available to other researchers. It is doubtful whether the Minister will be satisfied with this declaration alone, further initiatives may be expected, which in turn will provide opportunities for you.

We must consider all this within the wider perspective of e-science: the changes that occur in the practice of science as a result of developments in ICT and Internet. This not only involves better access to our own sources, it also includes sharing sources and linking them in an international context, structuring and ordering information using new techniques, virtual collaborative projects – in other words: achieving results using totally new methods.

Consequently, the reference collection is not only important as a professional yardstick for the Malta archaeologist, but perhaps even more as a means of offering archaeology prospects as a scientific discipline.

Maybe I have presented you with a hair-raising image of the future: the scientific archaeologist of the future, spending most of his time using ICT tools.

¹ Organisation for Economic Co-operation and Development

And why did you choose this profession? Because you pictured yourself in your muddy boots in Uitgeest – or elsewhere – hoping to make new discoveries in the field.

Nevertheless, I hope that I have provided you with some sort of framework for your deliberations. I wish you a fruitful and productive conference.

Synopsis of conference discussions

Annet Nieuwhof

1 Introduction

The aim of the two-day conference was to examine the theory of reference collections, to make an inventory of the problems which European archaeology is facing concerning the knowledge of artefacts, and to discuss the possible contribution a digital, international Reference Collection in some form could make to solving these problems. The Dutch feasibility study as well as the international conference was in particular intended to look into the possibilities of electronic access to knowledge of archaeological material groups. For this electronic 'reference collection' on the Internet, the name *eRC* was used, the *e* standing for electronic as well as European.

2 The Dutch feasibility study

As many of the topics of the conference already came up in the Dutch feasibility study, some of the conclusions of this study will be repeated here.

2.1 *Problems with access to and accumulation of knowledge*

The protection of and the research on the remains of early human activities can be described by the term Archaeological Heritage Management (AHM). For a well-functioning AHM, registration and exchange of data and knowledge is essential. Every archaeologist requires easy access to knowledge of archaeological remains: what has been found, how old is it and what are the geological and geographical contexts? The Dutch Sites and Monuments data are registered and accessible in the (not public) national archaeological database Archis2, maintained by the ROB. However, scientific knowledge of the artefacts and features themselves is not included in detail. All conclusions by archaeologists are based on the study of archaeological remains, on finds and features and their contexts. Knowledge of these remains is therefore of paramount importance to archaeological research and to the quality of AHM. However, this knowledge and the access to it are negatively affected by the drastic changes in modern, post-Malta archaeology, which caused a huge increase in scale, and mark the beginning of commercial archaeology. An inventory of the problems which Dutch archaeology is facing in this respect showed that access to knowledge of archaeological artefacts is hampered by many different factors, and that graduates generally have little knowledge of archaeological remains. The growth in and the loss of transparency of the archaeological field are major factors

contributing to this situation, together with a certain loss of status of research on artefacts.

The problems in the research on material culture and the access to the knowledge of it have serious consequences for archaeology as a science and for AHM. If the ways in which knowledge is accumulated and disseminated remain as they are now, the quality of archaeology will diminish in a growing and constantly changing archaeological world. The knowledge at the moment still accessible via specialists will disappear. The cost of archaeological research will rise as it will take longer to find the right information. Or: the quality of research will decrease as contract archaeology operates in a competitive field. Research will be limited to the registration of data. The support for archaeology within society will decline if archaeological research no longer produces a reasonable account of the past.

2.2 A National Reference Collection

A National Reference Collection in some form could be the answer to the problems mentioned earlier. It will have to ensure that information is assembled, stored, made available, exchanged and extended: a system for knowledge management. A good knowledge infrastructure is therefore required: a web of well-maintained lines and paths along which information can be reached and transported quickly. The Reference Collection should not be an object in itself, a 'stamp collection' in a new digital cloak. It will have to be a flexible system, open to new insights. The question 'What takes archaeology further?' must always be borne in mind. This also means that for each material type a different approach may have to be adopted. The NRc will thus offer a large number of sub-collections which may consist of:

- Digital references to information sources (literature, comparative material, specialists, relevant websites, and digital databases).
- Digital 'reference collections', by which is meant scientific information (identification characteristics, dating, synonyms, drawings, photographs, etc.) that is accessible on the Internet. Digital access to knowledge of find categories will require the use of a thesaurus to link databases and make them searchable.
- Physical reference collections. During the study it became clear that there was a great need for real, physical, reference collections for a number of find categories, especially (but not only) for ceramics.

To ensure the quality and usefulness of the NRc, a number of criteria were formulated with which the sub-collections of different material categories must comply:

- The collections must be suited to be used as comparative material in archaeological materials research.
- Use of the collection must place the studied artefacts in a wider scientific context.
- The collection must reflect the most recent scientific insights.
- The collection must give as complete a survey as possible of the particular material category of a certain period.
- The collections should represent as far as possible the communis opinio of Dutch archaeology. Where this cannot be achieved, more versions can be given alongside each other.

The National Reference Collection is aimed in particular at professional users: researchers, excavators, trainers and trainees. A digital Reference Collection may however also attract other users. Especially amateur archaeologists could benefit from it.

2.3 Organization of a National Reference Collection

Organizing a National Reference Collection will not be an easy task. In the feasibility study it was suggested that it might be wise to start with a relatively simple website with metadata (references to the sources of archaeological data). At a later stage, actual content may be added to the website, based on physical reference collections that can be used by visitors. In the end a national research centre of material culture may be envisaged, although this image conceived by many archaeologists may be no more than a *fata morgana*. At all stages the existence and maintenance of the National Reference Collection would have to be guaranteed. It should also be evident from the start that the NRc is meant for and made by the whole archaeological community. The availability of the NRc to all should be guaranteed as well.

2.4 European co-operation

It was clear from the start that European co-operation could make an important contribution to the study and knowledge of archaeological materials. During the feasibility study organizations in other European countries were visited with a dual purpose:

- Does archaeology in other European countries face the same problems as Dutch archaeology, and can the possible solutions of archaeology elsewhere inspire us?
- Is co-operation on a European level indeed possible and desirable?

During the feasibility study only a first start was made to answer these questions. It became clear that archaeologists in many European countries would welcome co-operation to facilitate the accessibility of data and knowledge. An international exchange of ideas and knowledge that would be facilitated by a digital system for knowledge management was also welcomed. The conference was a further step in getting to know each other better, and to bring within reach a long-term co-operation in the area of digital access to data and metadata on archaeological materials.

3 The conference

The leading thread running through almost all conference sessions and lectures was the language problem that, following the first keynote lecture by Clive Orton, can be designated the ‘Tower of Babel’ problem. It is not only an appropriate term for the confusion that the Euro-English, the *lingua franca* of the conference, sometimes raised. It is also a very apt description of the many definition problems that were encountered during almost every discussion, where many words, from ‘European’ to ‘reference collection’, appeared to be encumbered by many different apparent and hidden meanings. And, last but not least, the confusion in the terminology used by archaeologists to describe

their finds demands a more uniform approach in name-giving. This is in fact one of the main challenges the *eRC* will have to tackle. This not only is a prerequisite for a digital portal giving access to various websites and databases, but also has a more fundamental necessity. As scientists with different academic and national traditions, we should nevertheless try and learn to speak the same language, or at least learn to understand each others terminology. Only then will an exchange and comparison of data and scientific knowledge be possible.

3.1 *The necessity of a knowledge infrastructure*

One of the main topics of the discussions during the conference was, of course, the necessity of better access to knowledge of archaeological finds and features. It became clear that in many European countries archaeology is dealing with similar problems, despite national differences in schooling and knowledge exchange. Among the main difficulties were mentioned (in no specific order):

- the confusion emanating from the many different systems of terminology;
- the lack or poor quality of identification of recent finds;
- the insufficient knowledge in this area of young archaeologists;
- the modern requirement of efficiency, and pressure to produce site reports immediately following excavations which are a threat to the quality of research;
- the poor access to knowledge of material finds;
- the fragmentation of knowledge of material finds;
- archaeological archives (including reference collections) are under-used;
- so-called grey literature remains out of focus.

This list of difficulties on a European level is not unlike the Dutch inventory (Nieuwhof and Lange 2003: 90). The same problems appear to threaten the quality of archaeological research everywhere. To solve these problems archaeology needs an ‘open knowledge infrastructure for the study, management and public presentation of material culture and reference collections’ (citation from the lecture by Jon Kenny). Such a system would be highly beneficial to archaeological research. A selection of the advantages mentioned:

- it may be used by researchers, trainers and trainees on all levels as an easily accessible primary source of knowledge of archaeological objects;
- it will enable specialists to secure the knowledge in their heads by conveying it into an accessible, but still adjustable form;
- it will facilitate the exchange of knowledge between researchers;
- it will help commercial archaeology to maintain the quality of research and documentation;
- it will make knowledge gaps visible and stimulate research on material culture;
- digital access to scientific data and knowledge will facilitate comparative approaches in archaeology and open new possibilities for scientific research.

The Internet would provide the best infrastructure conceivable for such a management system. The Internet would make it possible to link individual, academic, regional and national databases and classification systems. It would provide access to virtual collections irrespective of identity, place and time, while there would be no limit to the volume of added information. And a virtual system could show collections of items not found together in reality. However,

some possible risks were also mentioned. A virtual or digital reference collection can never replace a real, physical reference collection. It should always be possible to really feel and touch the objects. Fear was expressed that an eRC might eventually replace the physical collections in archives. Also an eRC should not be an instrument for selection, used in 'cleaning up' depots and archives. Apart from these risks, some more fundamental issues emerged from the lectures and following discussion on the theory of reference collections.

3.2 Some theory about reference collections

What is actually meant by a reference collection? A reference collection in the first place is a classification system, which enables the archaeologist to recognize an object as being of a certain type, and coming from a certain period. Classification is no longer the goal of archaeological research as it was in the early days of the profession, although this may still seem so to non-archaeologists. As Torsten Madsen put it in his keynote lecture: 'classification is an operational tool in archaeology used to create meaningful structures from observations.' It helps archaeologists to ask and answer their own research questions. The traditional reference collection consists of typical examples of objects, or images of them, arranged in a certain way. A more recent and very successful type of classification system works with sorting keys. It does not classify the objects themselves, but their descriptive elements, in a logical and hierarchical way (Torsten Madsen). Both types of classificatory reference collections can be made accessible in a digital form. The keynote speakers on the theory of reference collections, Orton and Madsen, stressed the importance of wider access to classification systems as a means to get to know each others terminologies or even speak the same language, and make communication between archaeologists easier. There is however the danger of abuse of such a system. Not only would it be possible for inexperienced users to base false interpretations on the information provided by a digital reference collection, a problem that was already mentioned in the Dutch feasibility study, as well as in a British straw-poll by the Medieval Pottery Research Group (Maureen Mellor, this volume). False interpretations and conclusions are always a scientific problem, certainly when access to knowledge is poor (a striking example of differing interpretations by experienced researchers was given by Franco Niccolucci). Perhaps more dangerous would be such a knowledge management system, an eRC, also developing into an exclusive, fixed standard. Archaeology as a comparative science needs standardization in excavation techniques, in documentation and conservation. Standardization is however not desirable in interpretation. 'Clearly a knowledge base of classifications would be an advantage to research, but not if it is turned into an agent in current scholarly debate of the correct way to interpret our observations' (Madsen). An eRC will have to be a flexible and open knowledge system that can always be adjusted to new insights, and where different views and classification systems can be presented alongside each other. To quote Torsten Madsen once more: 'The purpose of standardisation is to keep things stable and controllable, which is a great thing in administration and industrial production, but not in humanistic research'. During the discussions it became clear that in situations where scientific interpretation and data input is carried out in a few, scholarly controlled, environments, such as museums and universities, standards are less desirable. When there are many more participants, it is vital to have standards in order to be able to reuse and enrich data and knowledge of others.

A reference collection in the strict sense, with images and/or sorting keys, can be broadened to a much wider knowledge management system, including all kinds of related information on finds and comparative material, their whereabouts, publications on find categories, relevant museum collections and other metadata. A still wider scope is offered when site reports are published in the system as well, and information on excavations and cultural heritage is linked to it. Although an eRC should primarily centre around knowledge of archaeological finds to help solve the problems mentioned above, a wider knowledge infrastructure would certainly be welcomed by many. It would be a reference collection in the widest sense: a system containing information one needs to refer to during research. This ‘information can be revised, reanalysed and compared in accordance with the progress of theory, excavation technique and new archaeological discoveries’ (from the lecture by Irina Oberländer-Târnoveanu).

3.3 Inspiring initiatives

During lectures and sessions, many of the participants of the conference showed and mentioned examples of internet access to archaeological or cultural historical knowledge which is already operational. Some of these were the initiative of individual researchers or research groups, others were operating on a national, or even international level. Detailed descriptions of many of these can be found in the following chapters presenting the full texts of the lectures. Some more general remarks will be made here.

It is the experience of many institutions (for example the Romanian website by CIMEC, the Royal Library of The Netherlands, the British Museums, Libraries and Archives Council (Kate Fernie, this volume)), that once specific and detailed information on a subject is available on the Internet, visitor numbers of these websites increase spectacularly. Information meant for professionals will attract a wider audience, no matter how it is presented. Another remarkable effect is the increased use of physical (reference) collections, once their existence and whereabouts are published on the Internet (the experience of, for example, the Naturalis museum in Leiden, The Netherlands). We can be confident that, although an eRC will be aimed especially at a professional audience, the information provided will also be found and used by the public. This is a side-effect of the eRC that may prove beneficial to archaeology and cultural heritage management on all levels. Support for these areas in society will rise when knowledge spreads outside the profession itself. An example of this effect is provided by the success of the British Portable Antiquities Scheme (David Dawson, this volume).

3.4 Organization

Organizing an RC on a European level is even more complicated than on a national level. There are already several portal websites giving access to archaeological research data that work on a national or even international level (British ADS, Romanian CIMEC, Danish National Cultural Heritage Agency, ARENA). They often are the result of co-operation between smaller institutes and organizations. An overwhelming majority of the participants of the conference saw this approach as the only possible way to organize a European eRC. On an international level co-operation is a prerequisite for development, a way of working that (since the lecture of Henrik Jarl Hansen) came to be called the

bottom-up approach during the conference. The opposite, a top-down approach of the *eRC* is conceivable, e.g. a European organization initiating archaeological finds research and digitizing its results. Although the top-down approach may well work on a national level, on an international level this approach was considered undesirable as it would imply enormous bureaucracy that would greatly hinder the flexibility of the *eRC*. It was considered best to start the *eRC* as a portal website linking reference collections initiated by individual scientists, research groups, organizations, national services and future national reference collections. This portal website would stimulate further research, as knowledge gaps would become apparent and data for new research would become easily accessible. It also would stimulate specialists in giving their knowledge a digital form if they would be provided with a suitable format. New research data could be digitized in the same format and become sub-collections of the *eRC*. However, all sub-collections would remain the responsibility of the researchers who can adjust and rearrange them when necessary. This will make it clear that the classification system as such is 'a mental construct, created at some point in time by specific persons' (Madsen). Also different views could be presented alongside each other, enabling researchers to make their own choices. Such a knowledge system would become a highly interesting, usable and flexible collection of classification systems and other reference data.

Apart from the lack of flexibility, a top-down approach for the content of the *eRC* would not be attainable from a financial and organizational point of view. Despite these major objections to a top-down approach, even an *eRC* in its 'simplest' form, a material finds centred portal, will require some form of organization to provide the system with portal services and the necessary thesauri. For the development of these tools and the foundation of an organizational structure that would safeguard the preservation of the *eRC* (a top-down approach for the structure of the *eRC*) European funding will be sought. The example of national and international portal websites (e.g. ARENA , see the contribution of Julian Richards) will be helpful in this respect.

4 Conclusion

To return to the Tower of Babel metaphor, we will probably never all speak the same (academic) language, use the same terminology and classification systems, nor do we need to. But for mutual understanding and the sake of future archaeology, we can and must publish dictionaries, so to speak.

The need for an *eRC* as a knowledge infrastructure was clear to all. 'The question is not whether a reference collection must be set up, but rather how and when' (René Jongerius in his opening lecture). Without it, there will still be archaeology in the future. It will however be affected by the difficulties in knowledge access and exchange. The Malta Convention, that was meant to improve the situation of archaeology in our part of the world, had some side-effects that archaeology will have to deal with. The increase in scale and its concomitant scarcity of time and professionals has actually created a threat to the quality of archaeology. However, these effects may as well be seen as an incentive for new approaches to research and knowledge exchange, especially on a European level. Initiatives in this field fit in with well the attention paid by European governments to data access. The Organisation for Economic Co-operation and Development agreed in January of this year on the 'Declaration on access to research data from public funding', based upon the principle that data produced in the

context of publicly funded research must be freely available to other researchers (Jongerius). It seems that the time is right for co-operation to achieve our goals. A partnership, in which organizations from 11 European countries participate in trying to raise funding (see the contribution of Jon Kenny), has already been established. A direct result of this conference is the intention to form a working group at the European Association of Archaeology, to further discuss the essentials of the eRC, and possibly to attract new participants. This was the practical translation of the 'Declaration of Amersfoort' that all participants finally agreed on: 'The discussion on the eRC is profitable and ongoing. We should transform it into a sustainable initiative. Therefore we agree that our objective must be to look for a more structural way of achieving our aims.'

References

- Nieuwhof, A. and A.G. Lange, 2003. Op weg naar een Nationale Referentiecollectie Archeologie. Eindrapport Haalbaarheidsonderzoek NRC. Amersfoort: ROB (with English summary and overview).

1 Some thoughts on the history of reference collections in the UK

Clive Orton

Abstract

This paper concentrates on the development of reference collections for pottery fabrics and forms in the UK since the 1970s, acknowledging that there are important reference collections for other classes of material, e.g. animal bones, seeds, about which the writer knows very little. However, in all cases the reasons for reference collections are the same, to ensure that valid comparisons of assemblages can be made, both within and between sites. A brief consideration of the theory of classification is needed, in order to provide a framework within which the issues can be discussed.

The rapid increase in the amounts of material being excavated from the 1970s onwards stimulated the need for a common 'language' for pottery fabrics and forms. A range of solutions were proposed: some computer-based, some paper-based and one using the material itself as a sort of physical memory. This last, the 'Polstore' system, will be described in some detail; other suggestions will be presented more briefly. At the time, computer-based approaches were generally not successful, partly because of their inability to capture some of the essential characteristics, particularly of fabrics. Many of the approaches simply presented a more-or-less structured collection of 'types', and left the users to search it as best they could, while what was really needed was a procedure to lead from the unknown in the hand to the known in the collection. Can modern computing technology achieve both of these aims, which have so far eluded us?

1 Introduction

This paper is divided into three sections:

- why have reference collections been created?
- how have they been created?
- what is the impact of IT on them?

It does not set out to be a comprehensive review, or a complete historical account, of the subject. Rather, it is a reflection on the theoretical and practical issues that have arisen during a career as both a creator and a user of reference collections.

2 Why have reference collections?

2.1 A case study

We start with a ‘quiz’ type question: what is the link between:

- the Tower of Babel,
- the newly-built Croydon Tramlink in south London, and
- the Museum of London’s Polstore system (Fig. 1).

The link is the need for everyone to speak the same language:

- At the Tower of Babel, languages were divided.
- The draft Roman pottery report on the Croydon Tramlink excavations was based on the Oxford Roman pottery terminology, not the one in use in London. It was therefore not directly comparable with reports relating to other sites in the region.
- The Polstores were intended to provide a common language for pottery fabric types (the Polstore system is explained in section 3.3 below).

2.2 Why do we need a common language?

Archaeology is a comparative discipline: archaeologists spend much of their time making comparisons between artefacts, between assemblages, between sites and even between regions. Such comparisons may be made in different ways for different purposes; for example, assemblages may be compared for chronological purposes (e.g. seriation), for spatial purposes (e.g. distributional studies), or for the study of function or status. None of these activities is possible unless comparable ‘objects’ (in the widest sense) are given the same names wherever they occur. If different terminologies are used in different places, then a means of translating between them must be made available. This can often result in all being reduced to a lowest common denominator (the coarsest level of classification) if comparisons at a higher level (e.g. of assemblages) are to be attempted.

A typically anarchic situation has arisen in the study of Roman pottery in Britain, where different organizations and individuals have developed their own terminologies, particularly of fabrics, in apparent ignorance of other systems. For example, Tyers (1996) lists twelve or more ‘aliases’ for common Roman wares, and four to six for less common ones.

2.3 The basic question

The basic question for the archaeologist, faced with an archaeological object, is ‘what shall I call it? What have other people called similar objects?’ I shall attempt to discuss this question in the context of ceramic fabrics and forms, which is where my experience lies. For some classes of object, the question would be ‘what is this object?’: for example, the species and element of a bone, or the species of a seed, can be seen as a fact to be ascertained, and reference collections can be created to aid that sort of identification. The form, and especially the fabric, of a ceramic vessel, is by contrast much more of an archaeologist’s construct. Even if we use ‘period’ terminology, such as *tyg*¹,



Fig. 1 A Polstore cabinet in use.

¹ a 17th-century word for a tall mug, often with lots of handles (two, sometimes up to six).

we are still imposing the names that we have chosen to give to the material. It is however no less important for us to give similar objects the same name.

2.4 Theory of classification

Classification, seen from a mathematical point of view, consists of two stages: (a) creating, and (b) dividing up ('partitioning'), what is called an 'object space'. An object space is a multidimensional space in which each dimension represents a measurable characteristic of the objects being considered, and in which each object is represented as a point in that space. The dimensions may well comprise different sorts of variables: ratio variables (e.g. length, weight), counts (e.g. number of handles), nominal variables (e.g. type of inclusion), and more complicated ones such as colour. Deciding which of the unbounded number of possible variables are relevant to a particular problem, is a difficult archaeological question that is not always given the detailed consideration that it deserves.

Some very general criteria for a 'good' classification can be suggested: it should be 'exhaustive' (every object should belong to a type), 'exclusive' (no object should belong to more than one type), and it should be 'natural' (the partitions imposed in the classification should respect any groupings of points in the object space).

There are two broad approaches to the question of dividing an object space into 'types'. They can be characterized as the implicit, in which 'typical' or 'core' examples of each type are described, and the explicit, which relies on defining the boundaries, or 'frontiers', between the various types.

One approach is not necessarily better than the other; it depends on the nature of the material and the purposes to which the classification will be put. Each approach has its strengths and its weaknesses.

2.4.1 The implicit approach

This is the approach adopted by many traditional type series. There may, for example, be a series of descriptions of pottery fabrics, often qualified by terms like 'usually', 'commonly', or 'most often', or a series of drawings of forms to illustrate the various types. Attention is thus focused on the 'core' or 'typical' examples, and the reader or user gains a strong impression of the central nature of each type.

The downside is the introduction of a new object to the space. Does it belong to one of the existing types (and if so, to which), or is it a new type in its own right? How can one tell? This raises the more abstract question of the differences between the types. Which variable(s) distinguish between two types, and why? What are the archaeological implications of such a distinction?

2.4.2 The explicit approach

This approach seeks to define types in terms of the differences between them. For example, plates, dishes and bowls may be defined in terms of the ratio of height to diameter. This makes it very easy to assign a new object to a type, and the information about the differences between the types can be useful diagnostically.

On the other hand, this approach may or may not create a 'natural' classifica-

tion (the simpler it is, the less likely it is to do so), as the frontiers between the types may divide natural groupings within the space. Further, it tends to focus attention on the peripheral, thus the least typical, members of a type. This may seem to make it a rather perverse approach.

2.5 *What happens in practice?*

The theoretical discussion given above makes classification appear to be an elegant, even a simple, exercise. But when one starts to try to put it into practice, the mathematical elegance and logical simplicity soon fade, in the face of questions like:

- which measurements (dimensions) to choose?
- should different dimensions carry different weights? If so, what?
- what do we do with new objects?

The most important question is: how can the knowledge embodied in a classification be actually used? To enable comparisons to be made (see 2.2), different workers, separated by space and/or time, must 'speak the same language'. This implies that not only must they use the same terms, but that those terms must convey the same meanings. This point about the transmission of information is especially relevant to ceramic studies in the UK today, when we are seeing a generational change, as the specialists who came in the boom of the 1970s approach retirement. It highlights the value of reference collections as a way of embodying and transmitting knowledge.

3 How have reference collections been created?

Before the 1970s, reference collections of pottery fabrics scarcely existed in the UK. There were of course published type-series, such as those for samian and amphorae, which worked well for highly standardized wares, but perhaps less successfully for the more locally-produced coarsewares (e.g. Gillam 1957).

A notable exception was the National Reference Collection of Medieval Pottery at the British Museum.

3.1 *Rescue archaeology boom of the 1970s*

The need for change became apparent in the 1970s, when the boom in rescue excavations led to a vast increase in the quantities of excavated materials, particularly pottery. The case for reference systems, whether formal reference collections or published type series, became rapidly stronger, in order to:

- Ensure consistency between different archaeological units, often working in close proximity to each other (Rhodes 1979: 97-8),
- Improve the efficiency of the recording and publishing of pottery, in the face of the increased volume of material (*ibid.*),
- Provide a training tool for the new and inexperienced workers who were drawn into the field.

This decade saw the creation of both the Medieval Pottery Research Group (MPRG) and the Study Group for Roman Pottery (SGRP), both of which instigated discussions about the establishment of fabric and form type series and/or collections. For various reasons, these were often slow in coming to

fruition; for example, the MPRG's Glossary of Forms, first mooted in 1975 (Moorhouse 1979), finally appeared as A Guide to the Classification of Medieval Ceramic Forms (MPRG 1998) and the National Roman Fabric Reference Collection, first discussed in 1972 (Detsicas 1973), finally appeared in 1996 (Tomber and Dore 1996). In the meantime, a good deal of terminological anarchy reigned (see 2.2).

The decade also saw a range of suggestions for classifying pottery fabrics and forms. Those for fabrics tended to start from Peacock's (1977) descriptive system, but developed in different directions, e.g.

- numerical taxonomy (based on Sokal and Sneath 1973)
 - the 'Polstore' approach (Rhodes 1977; Orton 1979a),
 - the National Roman Fabric Reference Collection (Tomber and Dore 1998).
- For forms, the classical type-series approach could still be followed (e.g. MPRG 1998), but attempts were made to develop methods to explore or partition the object-space:
- the 'tangent-profile' method of classifying forms, developed by Peter Main in the 1970s and 1980s (Main 1981; Leese and Main 1983), and extended by Gilboa et al. (forthcoming),
 - the 'envelope' approach to forms (Orton 1987).

Developments since the 1970s have been mainly in the direction of devolution, i.e. the setting up of regional type series of fabrics and/or forms, frequently crossing period boundaries.

3.2 Numerical taxonomy

The underlying idea, borrowed from the biological discipline of numerical taxonomy, was that all recorded variables should contribute in some way to the definition of a type. It was felt to be too subjective to select certain variables as 'key' ones in creating definitions. The idea could, in principle, be implemented by systematic recording of a standard and fairly exhaustive set of variables across the pottery being studied, and then using multivariate statistical tools (such as cluster analysis) to search for groupings within the resulting object-space.

This approach foundered on several rocks, both practical and theoretical, e.g.:

- The workload involved in such recording would be enormous and extremely repetitive. This would in turn lead to 'corner-cutting' and increased levels of error,
- The problem that not all variables are of equal value in distinguishing between fabric types is not addressed. Some variables can vary considerably within types (e.g. colour differences due to firing conditions),
- The combining of variables of different types (see 2.5) in a multivariate space is not an automatic procedure. For example, it is well known that the Gower coefficient, often used for this task, tends to give more weight to nominal than to ratio variables.

This approach did not, therefore, yield useful results (if any at all).

3.3 The Polstore approach

This is named after the Polstore industrial storage cabinets used to house the collection (Fig. 1). It was developed by Michael Rhodes at the Museum of London's Department of Urban Archaeology, assisted by me and Chris Green, between 1976 and 1979. A theoretical discussion is given in Rhodes (1979) and the practical workings are explained in Orton (1979b).

The starting points of this approach are:

- pottery fabric types consist of clouds, or swarms, of points in the object space, not of individual points,
- it is not possible to match a sherd in the hand to a written fabric description with any degree of certainty. A secure match can only be obtained by comparing sherd with sherd,
- the aim should be to enable workers to identify the sherd in their hand, as matching an existing fabric, or to decide that it belongs to a 'new' fabric (i.e. one not already in the collection).

Each of these points will be elaborated below.

Each fabric has a unique identifying number and a descriptive code, which is built up from elements recorded on the fabric description card (Fig. 2), which describe inclusions, forming, surface treatment, etc. It is possible to include variable characteristics even at this level of description by enclosing the variants in brackets. For example, fabric 70 described in Fig. 2 is black in colour, but may have light grey surfaces (this is probably based on the observation of light grey patches on basically black surfaces).

Several fabrics together comprise a fabric type, encompassing a wider range of possible variation recognized within the type. To avoid confusion between 'fabric' and 'fabric type', the latter level of classification is referred to as the Common Name (e.g. BB1).

Publication Ref.	Fabric Code	Sby 70	
E.R. No. of Type Sherd	Common Name	BB1	
COLOUR: black	ext. margin ✓ int. margin ✓	ext. surface / } (light grey) int. surface / }	
HARDNESS: hard		FRACTURE: hackly	
FEEL: rough			
INCLUSIONS	1 white & colourless quartz Frequency abundant Sorting ill-assorted extent Size < 1 mm Rounding angular/sub-rounded	2 clear quartz moderate ill-assorted < 1 mm angular	3 black iron ore sparse well-sorted ≤ 0.1 mm rounded
SURFACE TREATMENT(S):	ext. fingering (burnishing)	int. fingering, wiping (burnishing)	
MANUFACTURE:	hand-made		
SLIP:	extent none	colour(s)	
GLAZE:	ext. / extent int. ✓ extent	colour(s) finish	

Fig. 2 Example of a pottery fabric description card, used in conjunction with the Polstore system.

A physical example of each fabric was located in the Polstore under a code based on a subset of its description, which referred to inclusion, forming technique and glazing, but not, for example, to fabric colour. The codes were themselves ordered alphabetically throughout the cabinets. There would be, for example:

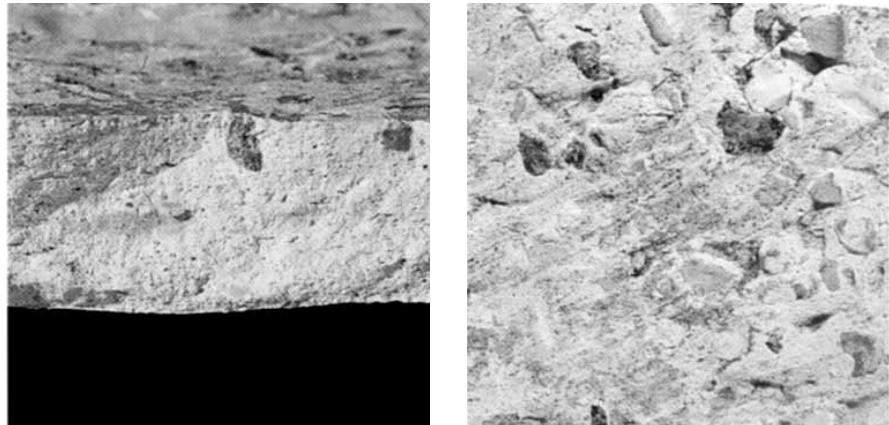
- whole cabinets of common codes (e.g. Sw),
- shelves of less common codes,
- parts of shelves for rare codes.

These examples became a sort of ‘physical memory’ of the characteristics of a fabric and its related Common Name.

Workers would code their sherds, then go to the appropriate cabinet/shelf for that description, and try to match by eye. They might not find a match at all, in which case they had a new fabric. This approach was expected to achieve a better match than matching to written or coded descriptions, as it allows the worker to look for ‘indescribable’ characteristics, e.g. texture.

The main problem was that we under-estimated the difficulty that people would have in making descriptive codings. Robinson’s survey for the MPRG (Robinson 1979) showed a surprising degree of variability in descriptions, even between acknowledged specialists. If the coding is wrong, then the worker is directed to the wrong part of the collection, and may thus never find a match that is actually present in the collection. This may be exacerbated because the first letter of the coding stands for the material of the inclusions (e.g. S = sand). Nearly 30 years later, the Polstores are still in use. Established workers tend to use them less and less as they gain experience, and memory is transferred from the collections to their own brains. The collection is currently little used by visitors, partly because of its location, being relatively inaccessible and badly lit. It needs to be actively promoted, as it is a valuable but under-used resource.

Fig. 3 Example of an image of a pottery fabric from the NRFRC Handbook.



Colchester White ware

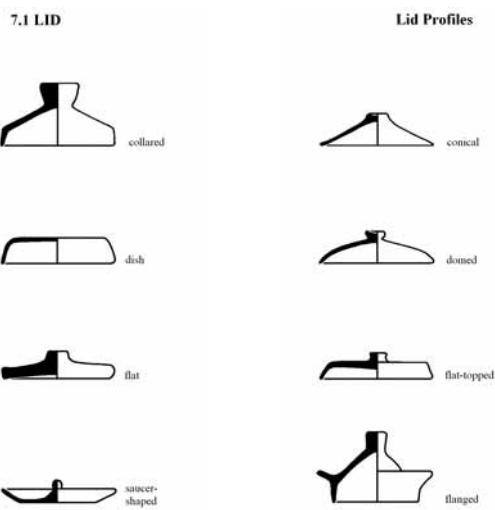


Fig. 4 Example of a form type from the MPRG Guide.

3.4 National Roman Fabric Reference Collection

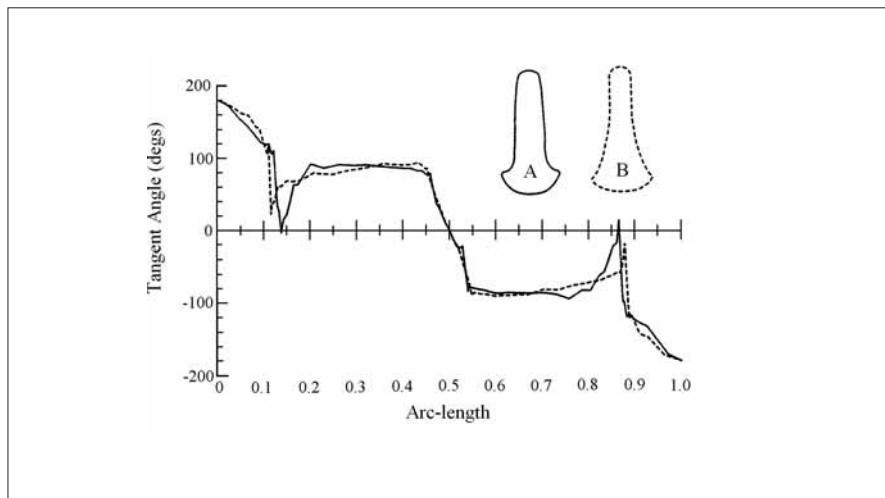
The NRFRC (Tomber and Dore 1998) is intended, like the Polstore system, to enable workers to identify pottery fabrics and to give them standard names and codes which will allow comparisons to be made both within and between sites. There are two important differences between the two approaches: The NRFRC in its published (handbook) form relies on high-quality black-and-white and colour photographs (see Fig. 3) as a way of recognizing and matching fabrics.

The NRFRC handbook is organized by geography and status - imported fine wares, coarse wares and amphorae, followed by Romano-British wares by county, ordered alphabetically. This form of organization makes searching more difficult, unless the worker has some idea of the type and is seeking confirmation rather than identification of an unknown. The authors explain that, although this approach is used for the handbook, 'the physical layout of the sherds is organised by ware and technological groupings (e.g. temper or surface treatment) regardless of source or industry, in order to facilitate the 'matching' of sherds.' (*ibid.*, 8).

3.5 Guides to forms

The MPRG recognized the need for a common terminology for medieval pottery forms. The resulting Guide was much delayed and was only published in 1998. It only covers broad 'high-level' terms, but has been designed to be extendible, as is shown by its loose-leaf format and the provision of a second (initially empty) binder when purchased (Fig. 4).

Fig. 5 Tangent-profile curves for two bronze axe outlines (from Leese and Main 1983).

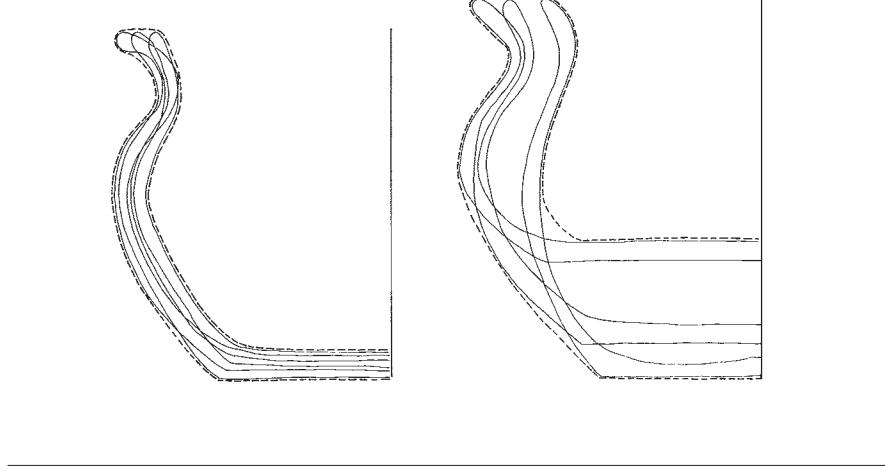


3.6 Shape statistics

A key aspect of the study of objects as points in a multi-dimensional space is to be able to define distances (or a metric) within that space, so that similar objects are ‘close’ to each other. It is actually possible to define an object-space entirely in terms of distances between pairs of objects; this approach has attractions when compared to measuring large numbers of dimensions, particularly if the process can be automated. Peter Main for his PhD in the 1970/80s found a simple way of describing and comparing shapes of artefacts. His ‘tangent-profile’ method was based on the idea of following the profile and noting the direction in which it was pointing. The relationship between distance along the profile and the direction of the tangent can be plotted, and differences between different shapes can be measured (Fig. 5).

A recent development uses the curvature function $\kappa(s)$, plotting it against the arc length (distance along the profile) s (Gilboa et al., forthcoming).

Fig. 6 Examples of envelopes for two delftware forms.



3.7 Envelopes

In geometry, an envelope is a curve which is touched, but not crossed, by all the curves of a particular family. For example, the envelope of all circles of a certain radius that pass through a fixed point is a circle of twice that radius, centred on that fixed point. It occurred to me, when sorting the pottery from the delftware kiln site of Mark Brown's Wharf, Southwark (Orton 1988), that an analogous idea could be applied to pottery forms. If all vessels of the same form were redrawn to a common size, and overlaid, it should be possible to draw an envelope around them in a way that generalizes their shapes (see Fig. 6). If the shapes that belong to the same form type were all very similar, their envelope would be 'tight' and would resemble the form closely, while if they were varied, it would be 'loose' and its relationship to individual shapes would be less obvious.

The perceived advantage, at least for the material from Mark Brown's Wharf, was that envelopes created from complete profiles could be used to test sherds of various sizes. A rim sherd, for example, might fit into the 'dish' envelope, but into neither the 'bowl' nor the 'plate' envelope. As the form type series current at the time defined such forms in terms of their diameter/height ratio (which does not exist for rim sherds), this was an obvious improvement, permitting a wider range of sherds to be classified. The technique served its purpose for Mark Brown's Wharf, but has never been developed into a practical tool.

4 Challenges for electronic approaches

In terms of speed and availability of access, electronic references collections seem to be the next step forward, for both fabrics and forms, though a physical version should be retained as the ultimate source of reference for pottery fabrics. The challenge is to devise systems that will enable the worker to match the sherd in their hand to a fabric and form as efficiently and as reliably as possible.

4.1 Some current electronic collections

An interesting contrast between the possibilities of paper and digital publication is provided by Potsherd: Atlas of Roman Pottery², a digitally-enhanced and updated version of Tyers (1996). The database of forms and images can be searched by ware, form or source. There is a concordance with the NRFRC, as well as links to bibliographies, other publications and websites, and even to sources of equipment.

An example of the current state of development is the Worcestershire On-line Fabric Type Series³. This is a reference collection of both fabrics and forms, of both Roman and medieval material, and incorporating bibliographic references and information on kiln sites. It uses text-based searching of Common Names for fabrics and of broad groupings for forms, cross-referenced to each other. There are high-quality images of both fabrics and forms, but they can only be accessed by their names.

Alternatively, some museums may wish to digitize their own collections, to make them accessible to as wide a public as possible. An example of this approach is provided by PotWeb⁴, the on-line catalogue of the ceramic collections of the

² www.potsherd.uklinux.net

³ www.worcestershireceramics.org

⁴ potweb.ashmol.ox.ac.uk

Ashmolean Museum, Oxford. Some of the museum's many collections are already included, and more will be added. Searching is mainly by period and broad source; there is also an interesting route via function and social meaning.

4.2 The future

For fabrics, a sort of 'electronic Polstore' may be the best way forward, if images of sufficient quality can be searched in acceptable timescales. An 'expert system' approach might help to narrow the range of images to be searched, provided that it can accommodate the sorts of mistakes that users are prone to make. For forms, there are competing approaches, including but not confined to those described above. Again, questions of efficiency and reliability are to the fore, but the ability to deal with fragmentary material (and perhaps produce 'fuzzy' outputs, giving ranges of possible forms) will also be very important.

5 Conclusions

The needs seem straightforward:

- speak the same 'language',
- be open-ended,
- allow workers to go from the unknown to the known,
- capture the 'indescribables'.

Can the technology deliver? How?

References

- Detsicas, A. (ed.), 1973. Current research in Romano-British coarse pottery. Council for British Archaeology Research Report 10.
- Gilboa, A., A. Karasik, I. Sharom, and U. Smilansky, forthcoming. Towards computerized typology and classification of ceramics. *Journal of Archaeological Science*.
- Gillam, J.P., 1957. Types of Roman coarse pottery vessels found in northern Britain. *Archaeologia Aeliana* (4th series) 35, 180-251.
- Leese, M.N. and P.L. Main, 1983. An approach to the assessment of artefact dimensions as descriptors of shape. In: J.G.B. Haigh (ed.), *Computer Applications and Quantitative Methods in Archaeology* 1983, 171-180. University of Bradford.
- Main, P.L., 1981. A method for the computer storage and comparison of outline shapes of archaeological artefacts. PhD thesis (Council for National Academic Awards).
- Moorhouse, S., 1979. Glossary of less common pottery forms. *Medieval Ceramics* 3, 112.

MPRG, 1998. A Guide to the Classification of Medieval Ceramic Forms. Medieval Pottery Research Group Occasional Paper No. 1.

Orton, C.R., 1979a. Dealing with the pottery from a 600-acre urban site. In: M. Millett (ed.), *Pottery and the Archaeologist*. Institute of Archaeology Occasional Publication 4, 61-72.

Orton, C.R. (ed.), 1979b. *Pottery Archive Users' Handbook*. Museum of London Department of Urban Archaeology Publications No. 1.

Orton, C.R., 1987. The 'envelope': un nouvel outil pour l'étude morphologique des céramiques. In: J. Chapelet, H. Galinié, and J. Pilet-Lemière (eds), *La Céramique (Ve-XIXe s) fabrication, commercialisation, utilisation*, 33-41. Caen.

Orton, C.R., 1988. Post-Roman pottery from Mark Brown's Wharf. In: P. Hinton (ed.), *Excavations in Southwark 1973-76 Lambeth 1973-79*, 307-347. London Middlesex Archaeological Society and Surrey Archaeological Society Joint Publication No. 3.

Peacock, D.P.S., 1977. Ceramics in Roman and Medieval Archaeology. In: D.P.S. Peacock (ed.), *Pottery and Early Commerce*, 21-33. London: Academic Press.

Rhodes, M., 1977. A pottery fabric type-series for London. *Museums Journal* 76 (4), 150-2.

Rhodes, M., 1979. Methods of cataloguing pottery in Inner London: an historical outline. *Medieval Ceramics* 3, 81-108.

Robinson, A.M., 1979. Three approaches to the problem of pottery fabric descriptions. *Medieval Ceramics* 3, 3-36.

Sokal, R. and P.H.A. Sneath, 1973. *Numerical Taxonomy*. London: W.H. Freeman.

Tomber, R. and J. Dore, 1996. A National Roman Fabric Collection. *Britannia* 27, 368-82.

Tomber, R. and J. Dore, 1998. The National Roman Fabric Reference Collection A Handbook. *Museum of London Archaeology Service Monograph 2*.

Tyers, P.A., 1996. *Roman Pottery in Britain*. London: B.T. Batsford Ltd.

2 Classification and archaeological knowledge bases

Torsten Madsen

Abstract

Reference collections are classifications in action and electronic versions imply the use of databases to store and organize the information. The way classifications are implemented in archaeological databases is far from unproblematic, however. This paper will initially summarize the role of classifications in archaeology, followed by an outline of the problems that may arise when using classifications in connection with databases. Finally it tries to clarify what this may mean to electronic reference collections.

1 Categories and classes

'Why do we have to learn all these types by heart?' students frequently ask me. 'We would rather learn more about the past!' For many years I did not give a consistent answer to that question. Rather when teaching typology and classification as a theoretical and methodological issue, I focused on the nature of types and classes. How are they structured, what is the proper way of creating them, are they artificial constructions on our part or do they reflect 'real' types, recognized in the past as well? All these are standard questions discussed intensively in the literature over the years.

Reading the book 'Archaeological typology and practical reality' by Adams & Adams (1991) changed my perspective somewhat. With one of the authors being a philosopher the book goes much deeper than ordinary texts on classification and typology in archaeology, and it shows systematically how classifications and typologies are closely related to basic human observation and categorization of the world around us. Only with typologies, which in their definition includes a demand for logically constructed, unambiguous sorting keys, do we have a categorization principle that separates itself from what ordinarily takes place in human society.

Categorization is our way to meaningfully structure the world we observe, and it forms the basis for efficient communication when we share the structure and its meaning with others in a group. Categorization is a basic means by which human beings create culture. In archaeology, when we insist that students learn classifications by heart, we are in fact integrating them into the archaeological subculture, setting them up with the means to communicate meaningfully with their peers, and at the same time we indoctrinate them with a meaningful structure, through which they can understand the past.

The degree of detail to which we take categorization depends on our needs. To me a camel is a camel, but Bedouins have around one hundred categories of camels. To me there is wet snow and dry snow, but to the Inuit there are some fifty categories of snow. In archaeology there is a great variation in the degree of detail as well, but here variation occurs between very small groups of people, even down to individuals. I recall a colleague at a local museum in Denmark who was setting up a recording system for the museum's excavations. He had some fifty categories for Iron Age pottery sherds but only one category for flint. My own recording system is not very different as I have only one category for Iron Age sherds and numerous categories for flint debris and artefacts.

The way changes in categorization of the world take place in society is complex and apparently unorganized. Obviously the forming and subsequent influence of subcultures plays a major role, but exactly how and why particular views become dominant is an interesting sociological problem. In archaeology, being a research discipline, we can expect changes in the way we categorize things to be clearer and not least more deliberate and controlled. Yet, within archaeology we can also find groups and alliances that use specific ways of categorizing their observations in a struggle for dominance and acceptance, but also of course to find ways of creating a better and more relevant understanding of the past. The nature of classes also varies from subject area to subject area, from country to country, and not least it has changed with time.

2 Traditional classification

From the outset archaeological classifications have been restricted to complete objects and not to parts of objects. It seems natural to think in complete objects even if details of the objects constitute the foundation of the classifications. Such is the preoccupation with complete objects that a type is formally 'defined' through a typical example to which you attach an often informal description based on details of the object. Since no formal definition of typehood exists, it is imperative that you have a typical object or a picture of it in front of you to learn what constitutes the type. This is the exact same way that children learn the categories of the world they have entered. You can point to a dog in the street and say 'dog', or you can point to a picture of a dog in a book and say 'dog'. Thus reference collections are a must when dealing with this type of classification. They can either be collections of real objects or collections of pictures of objects. When teaching students we use both, the same way as we were taught way back when.

It is important to note this kind of classification creates very fuzzy types. As a student I took part in a seminar organized by a teacher who was very interested in these problems. We took all the axes of the Single Grave culture in the museum and classified them according to the classification set up by P.V. Glob (1944). Most of these axes had been used as the basis for his study as well, and in the back of the book he had provided lists of inventory numbers sorted according to his classification. To our surprise and dismay, we found that agreement between his assignment of axes to classes and ours was often minimal.

3 Analytical classification

In the middle of the last century an interest arose in formal classification of descriptive elements. We normally refer to this as analytical classification following Rouse, who apparently was the first to apply it (Rouse 1939). In Europe in the 1960s, Jean Claude Gardin (1958, 1967) was a key figure together with Mats P. Malmer (1962, 1963), and the procedure has been given a central role in education in Denmark since the late 1960s.

The basic idea is to formally define descriptive elements of artefacts in such a way that the elements can be either measured, be present in some state, or be absent. Classification is then a question of setting up a logical sorting system for objects specifying, mostly in a hierarchical way, particular ranges of measurements and/or the presence of particular elements/element states for achieving typehood.

There is a significant difference here with the way classification had worked till then, which is that you do not need a reference collection in order to classify an object. It is simply a question of taking particular measurements and recording the presence and state of particular elements. All you need is the sorting key and then of course a clear understanding of how the elements are defined and measured, which in many cases means that you need a sort of reference collection for the analytical classification, but not necessarily one that shows particular objects.

Most major classification systems created since the beginning of the 1970s in Denmark use this approach to classification. They produce clearly defined monothetic type divisions, and although these are in fact 'artificial' classes, using them in further analyses has produced amazingly good results (see Ilkjær 1990 for an example on Iron Age spearheads).

Over the last 15 years a procedure has been developed, in which analyses are carried out directly on the analytical classifications. The idea for doing this dates back to the 1960s, but was not an attractive approach before personal computers became readily available. It is primarily Correspondence Analysis that is used, and mainly highly fragmented materials and richly decorated materials have attracted this approach. The results have been very, very good and the message is beginning to register: there is no reason for establishing detailed object classifications in the first place; it is sufficient and even better to work directly with detailed analytical classifications of descriptive elements (see Madsen 1988 for a series of examples instrumental in forming this approach).

It is still a question of classification though, and we still need some sort of reference collection for these classifications, but they are of a different kind. We are at a level of detail, where no studies will ever use the exact same set of classes, and the number of classes may be truly staggering. A colleague of mine working with animal style decorations on brooches from Early Medieval time operates with a total of close to two thousand classes and modification occurs all the time (Karen Høilund Nielsen, personal communication). So a 'reference collection' here is more of a documentation of classes used in a particular study.

4 Dynamics in research

I am certain that in the future we will see many more studies based exclusively on analytical classifications. As a result we will also find that object classifications will play a diminishing role. In principle it makes no difference to the research process, however. Classification, whether of objects or elements, is not an end in itself, even if it is a way to structure and communicate our observations. The meaningfulness of our classes will have to be tested against the contextual information that is also part of our world of observation.

The bottom line is that classification is an operational tool in archaeology used to create meaningful structures from observations. These are then used in analysis, and as a basis of internal scholarly communication. Our successes as researchers depend to a great deal on our ability to interact with our classifications and to dynamically change these to create new meaning that better explains our observations in terms of past culture. Any classification considered to be the ultimate solution in a humanities discipline is a testimony to fossilization of research. The purpose of standardization is to keep things unchangeable and controllable, which is a great thing in administration and industrial production, but not in research into human culture, where the aim is to continuously construct meaning and insight into our life as human beings.

5 Fossilized knowledge

This leads to the problem of classifications in large, permanent archaeological knowledge bases. Classifications and typologies published in print are historic statements that may immediately be negotiated and modified by others in new publications thus creating a dynamic development. Databases in the form of huge knowledge bases designed to last for decades at least and meant to be loaded cooperatively with information over time poses a real problem here, because it is not obvious how the classifications and typologies embedded in them can be negotiated and modified, and indeed if technically possible by whom they should be negotiated and modified. All experiences so far show that the classificatory base of such databases fossilizes from the very beginning, and thus becomes counterproductive to research.

Fossilization in a knowledge base primarily takes place because the classification system used is not up to date, it is not reflecting current usage and current trends in research. As the classification system is considered authoritative and an absolute key for searching the knowledge base it cannot be changed, however, without a complete reclassification of the content of the knowledge base. Neolithic causewayed enclosures were unknown in Denmark when the classification scheme for the Danish SMR was created. Today we know of at least 50 of these monuments, but in the SMR they are simply recorded as settlements, and there is no way to separate them through a search.

With fossilization comes corruption of the meaning of the classification system, because even if the classes of the knowledge base do not change, our understanding and interpretation of them do, and at the same time new categories turn up that somehow will have to be squeezed into the existing system, thus changing the de facto meaning of the existing classes. Again, when the Danish SMR was set up, no categories were created that could represent the findings of two or three pieces of flint debris found in a field during survey, because

the whole classification system was contemplated in cultural terms. This kind of ‘background noise’ is today more often than not classified as ‘settlement’ in the absence of a more suitable category, and it thus completely corrupts the meaning of settlement in the knowledge base.

6 Object oriented design

We certainly need large databases to store the vast quantities of information we produce, to secure this information, and not least to disseminate it through networks. We should be very careful however when deciding what to store, and how to store it. It is important that we make a distinction between what can be considered historical data and what is current ad hoc interpretative information. Historical data should be stored exactly as created. By historical data I mean for instance to the results of an excavation (the excavation report), recording of a site at a given point in time, an illustration of an object together with its administrative identification, or a classification presented by a particular person at a specific occasion. The interpretative information, which certainly includes the way we currently tend to classify the historical data, should be negotiable at all times.

We can store all the historical data as simple documents (an excavation report as printed, for instance), but that is certainly not a satisfactory solution, especially not as some of the newer information stems from well-structured databases. On the other hand, we cannot allow the storing in a common database format of excerpts or interpreted versions, as this would breach the integrity of the historical information. The solution is to use object oriented designs combined with metadata descriptions. It is thus fully possible to store very different database structures with different content definitions in the same physical structure without loss of information.

The problem with this approach, however, is that it becomes very difficult to retrieve information from the knowledge base across elements in the database that differs in logical structure and content definition. We lack the overall authoritative classification of the content, but to include that is, in my opinion, out of the question. We are therefore left with only two possibilities, both of which should be used. One is the use of search engines of the type known from the Internet, with all the weaknesses they have. The other is an interface to the knowledge base that allows researchers individually or in groups, publicly or privately to set up and maintain formal classifications to the content of the knowledge base. In this way multi-vocality in interpreting the content of the database can be established. Technically all of this could be set up today, but apart from a few notable uses of object oriented design, archaeology is a far, far way from achieving this kind of solution (for instance ArchaeoInfo and Intrasis¹).

7 Reference collections

We can distinguish two types of traditional reference collections. One consists of proper physical collections, the other of printed type inventories as part of ordinary scientific publications or as regular guidebooks on particular categories of material.

¹ www.archaeoinfo.dk / www.raa.se/uv/intrasis

In order to be of practical use, the physical collection will have to be ordered according to one particular classification system, in the same way as books in a library are placed on shelves according to some classificatory principle. The classification scheme is thus an integrated part of the traditional reference collection by means of the physical organisation of the collection. To have one physical collection representing more than one classification scheme would be very unpractical. Physical reference collections will also have to exist undivided at one location, as they will be of little use otherwise.

Building a reference collection at a specific location, say a museum, may be difficult because not all objects covering all the types of a specific classification may be found at that museum. For instance it has not been possible to establish a complete reference collection of Neolithic flint axes for teaching purposes at my own institution, even though we are associated with the second largest museum in Denmark. Physical reference collections thus tend to be restricted to more or less technical aspects on a common level of occurrence, and they seem to be relatively rare. In Denmark they only exist for teaching purposes in connection with the universities.

The printed type inventories in practice share one of the limitations of the physical collections. Due to the ordered, sequential presentation they are bound to present one particular classification system, and although it would be possible to present alternative classifications with cross references to the illustrations, this is very seldom done, partly because it is not the intention of the publications to do so, and partly because, as with the physical collections, it would be impractical to deal with. The great strength of the published type inventories is of course that they, in contrast with the physical collections, are not limited by the location of the objects, both in terms of what can be brought together in an inventory, and of the location of use. For this reason they are much more practical to work with than the physical collections, and in Denmark for instance they form the backbone of all referencing of objects in excavation reports and publications.

An electronic reference collection may be viewed as a knowledge base containing two sets of quite different information. One is information about concrete objects including ideally various illustrations of the objects, description of the find circumstances associated with them and administrative information on their life story, including their whereabouts, their physical condition/treatment, and references to where they have been published and discussed in the literature. This is all proper descriptive information of a historical nature.

The other is a documentation of the description and classification system to be applied to objects. This is in fact also information of a historical nature, as all description and classification systems in principle are mental constructs created at some point in time by specific persons. However, they are on a totally different level than the objects as they can exist, in principle at least, without the objects.

The combination of these two sets of information in reality constitutes the electronic reference collection. Electronic reference collections thus simply consist of a formal linkage between two sets of information in a knowledge base: historical information on objects and historical information on our mental constructs of description and classification.

8 Benefits of electronic reference collections

As with the printed type inventories, the electronic reference collection lacks the possibility of physical contact with the objects, but shares all the benefits of the former and has a few potentials of its own. Most importantly the objects of the collection consist of virtual representations and are thus not limited to a particular physical order. The order of objects is determined by the way they are linked to a classification system, and as any object may be linked to an unlimited number of classification systems, they may be part of many different orderings at the same time. It also allows for comparisons and cross-referencing of different classification systems applied to the same material.

An electronic reference collection of this kind would be extremely useful to research. The simultaneous application of different classifications to the same material in a regular knowledge base makes it possible to compare which description and classification systems have been applied to which objects, by whom and when. Very often you will have to dig deep in order to understand the implications of a particular classification in the literature, and in most classification studies you will find an in-depth analysis of previous work in that particular field of study.

An electronic reference collection could also (and easily) be given the same structure as a printed one, but that would lead directly to fossilization as with all other knowledge bases that embed the interpretative statements with the basic information. There is one fundamental difference between electronic reference collections and printed type inventories, and that is that the latter has a publishing date, which is taken into consideration when you evaluate and use its content. The electronic reference collection will always appear as current regardless of whether its content is old and outdated or not.

9 Conclusion

Classification is an active research tool through which we create structure and assign meaning to our observations. Classifications are entirely our constructs, and the meaning of classes is our meaning, irrespective of whether comparable categories existed in the past or not. By creating new classifications and restructuring old ones we create new meaning and new knowledge, and the constructions we create become important elements in the scholarly debate. Electronic reference collections can become a very valuable element in this process, but a large database, as it will be, tends to fossilize, its content can easily be controlled by a few and there is a danger that it becomes authoritative in its own right, no matter what it contains. If this happens, the reference collection could become a hindrance rather than a help to the research process. Therefore we must be very careful when we set out to design an electronic reference collection.

References

- Adams, William Y. and Ernest W. Adams, 1991. Archaeological typology and practical reality. A dialectical approach to artefact classification and sorting. Cambridge: Cambridge University Press.

Gardin, Jean-Claude, 1958. Four codes for the Description of Artifacts: An essay in Archaeological Technique and Theory. *American Anthropologist* 50, 335-57.

Gardin, Jean-Claude, 1967. Methods for the descriptive analysis of Archaeological Material. *American Antiquity* 32(1), 13-30.

Glob, P.V., 1944. Studier over den jysk Enkeltgravskultur. *Aarbøger for Nordisk Oldkyndighed og Historie*.

Ilkjær, Jørgen, 1990. Illerup Ådal 1. Die Lanzen und Speere. *Jutland Archaeological Society Publications XXV*, 1.

Madsen, Torsten (ed.), 1988. Multivariate Archaeology. Numerical Approaches in Scandinavian Archaeology. *Jutland Archaeological Society Publications XXI*.

Malmer, Mats P., 1962. Jungneolithische Studien. *Acta Archaeologica Lundensia*, Series in 80, No. 2.

Malmer, Mats P., 1963. Metodproblem inom järnålderens konsthistoria. *Acta Archaeologica Lundensia*, Series in 80, No. 3.

Rouse, Irwing, 1939. Prehistory in Haiti, a Study in Method. *Yale University Publications in Anthropology* 21.

3 Reference datasets for stone axes in the UK: some theory and practice

Mike Heyworth

Abstract

This paper briefly describes work undertaken by researchers over 60 years relating to the study of prehistoric stone axes in the United Kingdom. It has led to the development of a substantial body of information which is now available to other researchers in a variety of forms. Some of the issues relating to the use of this 'reference dataset' are then discussed.

This work has been nurtured through the work of the Council for British Archaeology, an independent, educational charity and non-governmental organisation, which was founded in 1944¹.

1 Early work

The Implement Petrology Committee (IPC) of the Council for British Archaeology was formed in 1952, building on work of earlier groups and in particular the Sub-Committee of the South-Western Group of Museums and Art Galleries on the Petrological Identification of Stone Axes Committee (Grimes, 1979). Over some forty years the group of individual researchers who came together under the banner of the IPC undertook an extensive research programme leading to the creation of over 7,500 thin sections relating to stone axes. They used the petrological information derived from the slides to define a number of petrological groups which have featured in a series of CBA publications (e.g. Stone Axe Studies I and Stone Axe Studies II). Given that the IPC is a voluntary group it is a remarkable achievement that it has operated one of the longest running systematic petrological and archaeological identification programmes on stone implements.

In recent years, work has been underway using new techniques, particularly geochemical analysis, to re-assess the petrological groups defined in Stone Age Studies II, and an electronic Petrological Atlas is now in preparation which will allow images of the thin sections to be published, together with the archaeological, petrological, and geochemical data, and made available for other scholars to re-use.

2 Accessing the early work

However, modern technology has allowed the current re-assessment work to be partly overtaken by events. The Council for British Archaeology has a well-established principle of making all of its previous publications freely available

¹ <http://www.britarch.ac.uk>

online once they go out of print. Consequently, over the last two years, both research volumes relating to the study of stone axes have been made available through the web catalogue of the Archaeology Data Service². The extensive petrological database printed in Stone Age Studies II has also been made available as a downloadable database file from the ADS.

This database contains the results of examining more than 7,500 stone implements from the British Isles. These artefacts range in date from the earliest Neolithic to the Bronze Age; in type from polished battle axes to net sinkers; in quality from the finest jadeite axe to the crudest roughout; and in composition from mudstone to porcellanite. Many come from known rock sources and places of manufacture, as far apart as Land's End in England, the Northern Isles in Scotland, Ireland and the Channel Islands. Together these implements comprise an extraordinarily extensive and varied cross-section of the stone tools and weapons made and used in Britain over a period of at least 3,000 years. A majority of implements have been allocated to one of thirty-four different petrographic groups, each of which has been defined in the literature. The information normally provided for each implement includes basic factual information, e.g. the IPC catalogue number, locality and National Grid Reference of findspot, museum accession number (where known and appropriate), but also includes interpreted information, such as the type of implement and the petrological group to which it was assigned.

We know from the web server statistics available from the ADS that this database has been downloaded several hundred times since it was made available online, yet we have little idea of how the information has been used. Do its users understand or care about the known 'issues' with the database and the allocation of the individual items within it to the particular petrological groups? The database is a mixture of basic factual information and interpretive information, yet these different data forms are not in any way differentiated for the user.

Inevitably this can create problems for unwary users and raises issues about making reference data available for study by others. Another issue of potential concern is the relatively crude early use of a computer database, which requires a definitive assessment of the petrological group to which each implement is assigned. There is no room for 'fuzzy logic' or any expression of uncertainty, no sense of core and periphery in the definition of each group. So can this reference dataset still be used with any validity by others?

3 More recent approaches

In recent years the IPC has become an independent study group, the Implement Petrology Group (IPG). Building on the work of researchers from the Irish Stone Axe Project³ an 'Implement Petrology Axe Record' form has been defined and circulated, encouraging a more standard approach to data collection.

A more standardized approach is essential for cross-comparison of results, particularly from a dispersed group of researchers. The form includes a variety of information on the description of the individual axe, its findspot, its size, etc. However, even within a more standardized approach there is considerable room for variation and inbuilt uncertainty. For example, the record form has 21 different options for defining the cross-section of the implement. Several are very similar on initial visual inspection (e.g. full oval, full oval with flattened

2 <http://ads.ahds.ac.uk>

3 http://www.ucd.ie/archdata/external/research/stone_axe_project

sides, full oval with flat sides, full oval with faceted sides) and you have to wonder whether different researchers will use these definitions consistently. If they do not then the value of the information for comparison within any reference dataset will be diminished. Can reference datasets of this kind really be put together by a widespread group of researchers?

4 Access to information

With the advent of the Internet and networked access to information from across the world this has led to increasing potential use of reference datasets made available in this format. To facilitate access to these key resources a number of 'gateways' have been set up which bring together index information (or metadata) about such collections. One such gateway, which now incorporates information about the implement petrology dataset, has been created in the UK by the Historic Environment Information Resources Network (HEIRNET), an informal group of UK bodies with an interest in information relating to the historic environment⁴. HEIRNET is facilitated by the Council for British Archaeology, and its Register of reference datasets is made available through the catalogue of the Archaeology Data Service⁵.

To date the Register has collected together information on a wide range of information resources, not all of which are held in electronic format, or are available online. The Register is an eclectic mix of resources, provided by a wide variety of research groups and individuals. There is no attempt to 'validate' the resources that are listed, other than ensuring that they relate to the area covered by the Register (the historic environment of the UK). So how do users judge the quality of the information contained within the reference datasets made available through such gateways, or found through standard web searches?

5 The need for health warnings

Inevitably the researchers now working on the re-interpretation of the information contained within the earlier database of implement petrology, as published in Stone Axe Studies II and made available online, are concerned how others are using this information. They know that much of the interpretive information has been re-assessed and the petrological groups are in need of considerable revision (Davis 1985). In some cases different researchers have different views on the definitions of the petrological groups. Potentially, equally valid interpretations can exist, based on the same core reference data. This needs to be reflected in the 'metadata' that accompanies each reference dataset. Users need to know how, when and by whom the reference dataset was created in order to apply their own critical faculties to their own use of the dataset. They need to know about key decisions taken in the publication of the reference dataset which may affect their re-use, for example the fact that the number of petrological groups published in Stone Axe Studies II were collapsed simply to cut down the length of the published lists (Davis 1985)!

4 <http://www.britarch.ac.uk/HEIRNET>

5 <http://ads.ahds.ac.uk/heirnet/index.cfm>

6 Are reference datasets valid?

We all recognize that archaeological interpretations change over time. That is the nature of research. Answering one question usually opens up further questions, or causes us to go back and re-evaluate our position on earlier questions. This does not invalidate the earlier work, but it is important that researchers understand and appreciate the context of earlier research. We do not undertake ‘archaeology by numbers’, but need to make a critical appraisal of earlier research.

The opportunities of access to information which now exist certainly exacerbate the dangers of an uncritical use of earlier work. This does not mean that reference datasets are suddenly invalid, but we should be aware of the opportunities of the new technology to build in contextual information, to incorporate ‘fuzziness’, to allow multiple views or interpretations. Gateways to reference collections held online should make clear when they were created and who was responsible for their creation. Ideally links should be provided to subsequent work which covers the same area, and may well include revisions or alternative interpretations of the data.

Ultimately, it is the responsibility of individual researchers, aided through standard peer review processes, to ensure that new research is built on solid foundations and not a house of (reference) cards. In doing so they can often be aided by appropriately defined and described reference datasets.

References

Clough, T.H. McK and W.A. Cummins (eds), 1979. Stone Axe Studies I, CBA Research Report No. 23.

Clough, T.H. McK and W.A. Cummins (eds), 1988. Stone Axe Studies II, CBA Research Report No. 67.

Davis, R.V., 1985. Implement petrology: the state of the art – some problems and possibilities. In: P. Phillips (ed.), *The Archaeologist and the Laboratory*, 33-35. CBA Research Report No. 58.

Grimes, W. F., 1979. The history of implement petrology in Britain. In: T.H. McK Clough and W.A. Cummins (eds), Stone Axe Studies I, 1-4. CBA Research Report No. 23.

4 Quality through standards in UK and European archaeology

Kenneth Aitchison

Abstract

The value of all archaeological work depends upon the quality of the products it creates. To create high-quality products rests upon both the primary data-collection, whether this is through excavation or other techniques, and access to comparable pre-existing information which can set the findings of the work in context. The application of Standards, as benchmarks of performance, can maintain and improve quality. This paper reviews the use of Standards in the United Kingdom for quality assurance, explores their wider application across Europe and discusses how the eRC can contribute to this.

1 Introduction

In the United Kingdom, the number of people working professionally as archaeologists – over 5,700 in 2003 (Aitchison and Edwards 2003) – is growing as the amount of work undertaken increases year-upon-year. In the 1990s, there were 28,000 separate archaeological investigations in England, with over three times as many taking place in 1999 as did in 1990 (Darvill and Russell 2002: 52).

This is not happening solely in the UK; across Europe, employment in professional archaeology has grown rapidly as frameworks have been established to allow for the consideration and recording of archaeological remains before land is developed (Evans and Williams 2001). In Ireland in 2002, a total of 650 professional archaeologists were employed in all sectors (CHL 2002), with numbers increasing with the establishment of major infrastructural projects. In terms of numbers of workers, Irish archaeology, like that in the UK, is dominated by the private sector. 2,100 archaeologists were working in France in 2001 (Rubio and Bernard 2001); following a political crisis brought on through the establishment of a new legal system for funding investigations, French archaeology has returned to full and expanding employment.

The value of this work depends upon the quality of the products it creates. The challenge to create high-quality products depends upon both primary data-collection, whether this is through excavation or other techniques, and access to comparable pre-existing information to set the findings of the work in context.

2 The process of commercial archaeology in the UK

It is necessary to examine the process through which archaeological work is undertaken in order to establish at what stages products are produced and so how the application of standards can ensure quality. Set out here (in an abbreviated and necessarily simplified form) is the outline of the process through which work is undertaken in the United Kingdom by archaeological contractors for commercial clients. This process is mediated through the spatial planning system, with local government having responsibility for planning policies and decisions.

The initial stage in this process is when a developer makes an application to local government for permission to change the use of a parcel of land, such as for the construction of housing. This application is then assessed by the local government archaeologist to establish if the proposed development might have an impact upon known or suspected archaeological remains. If so, the local government archaeologist will issue a brief, setting out the requirements for any archaeological investigation that must be satisfactorily undertaken before permission for the development to proceed can be granted. This brief may be influenced by issues that have been identified in regional research agendas. The developer will then engage the services of a commercial archaeological contractor to work to the brief. The commercial archaeologist will prepare a project design, setting out how they intend to carry out the work. This project design is then reviewed and approved by the local government archaeologist. Only at this stage can the archaeological investigation – such as an intrusive evaluation, excavation or non-intrusive survey and recording – be undertaken by the commercial archaeologist. This work may be monitored as it happens by the local government archaeologist.

Following the completion of the work, the commercial archaeologist generates the first product of the project – the report. Following approval of the report by the local government archaeologist, there will be no archaeological obstacles to permission being granted to the developer to undertake the land-change development that they planned.

The second product of the process is the archive. This is prepared by the commercial archaeologist, and will contain both an ordered record of the work undertaken and any information generated or recovered plus any artefactual material recovered from the fieldwork. The archive will then be deposited in a designated depository, often the local museum.

The process can end at this point, but there is also potential for further publication to form another product of the project. This publication could be through a variety of media and formats; again, the work involved in the creation of this product will be carried out by the commercial archaeologist.

3 Reports

The first product of the investigation, the report, is submitted first by the commercial archaeologist to the developer as their client who has funded this research investigation. The brief will specify as well that the report also has to be delivered to a historic environment record (formerly known as sites and monuments records), a central place where all records of archaeological sites, monuments and historic buildings is maintained. These historic environment

records are normally maintained by local government, but this is not a universal system – there are also national records, such as the National Monument Record of Scotland, where all such investigation reports must be primarily submitted (and only secondarily to local records).

There is potential for such reports to remain ‘grey literature’; while they are a record and interpretation of the work that has been undertaken, they may remain underused within the historic environment record, and not directly contribute to future research.

Two significant projects are aiming to make better use of the accumulated information held in grey literature. The Archaeology Data Service’s OASIS project has created a portal through which grey literature reports are made available online.¹ Secondly, Richard Bradley of the University of Reading is leading a research project which is trawling historic environment records to synthesize information with the intention of rewriting British prehistory. This ambitious project starts from the standpoints that general understandings of prehistory have been largely established and unchallenged since the mid-20th century, but that these understandings were generated from relatively little fieldwork, especially when compared with that undertaken since 1990.

4 Archives

Regarding the second of the products, the archive, a series of points can be made. Archives must be ordered and accessible records. A project can produce up to three different forms of archive: paper, material and electronic. The paper archive will incorporate all of the notes and records made during the process of investigation, and should normally include a copy of the report. The material archive will include all artefactual material recovered. The electronic archive may in part or fully replicate the paper archive, but if the project has generated complex datasets, these may be most effectively stored and accessed electronically.

The brief will specify where the archive is to be deposited; this is commonly (but not universally) the local museum, often maintained by local government within the same area as that covered by the local government archaeologist discussed above. However, this is not always the case; the designated depository can be a local record office, or a regional or even national repository.

The deposition of the archive can be further confused if different depositaries are designated for different components of the archive – the paper archive might be required to be deposited with the local record office, while the material archive might have to be deposited with a separate museum.

5 Publication

The final, optional product is further publication of the project’s results. Conventionally, this might be through full academic publication as a journal article or monograph. Given the vast quantity of work being undertaken and the relative expense of such a production route, this is relatively uncommon, effectively being reserved for projects that have produced exceptional results. The British and Irish Archaeological Bibliography is an annual publication which effectively provides a metadata structure for all such paper-published sources.

¹ <http://ads.ahds.ac.uk/newsletter/issue13/oasis.html>

Summary reports are much more frequently produced, in local, regional or national reviews. On the local level, this is typified by publications such as Archaeology in South Yorkshire, a selective review of recent work in an area of the north of England, published bi-annually. However, in Scotland, it is a requirement of all developer-funded work that an abstract is submitted to the Council for Scottish Archaeology who produce the annual Discovery and Excavation in Scotland, a truly comprehensive review of archaeological work in that country. Period-based reviews are also produced, such as Vernacular Architecture, which collates accounts of work on medieval and post-medieval standing buildings.

Alternative forms of publication, including popular books and the use of other media, are also occasionally used; these tend to supplement the formal, academic publication of a particular site or project.

6 Reference collections

It is at the stage of the preparation of the report, the key product, that reference collections may be utilized. In the UK, reference collections do exist, but their coverage of material culture is not universal, neither in terms of coverage nor consistency.

For different periods and categories of material culture, some national reference collections do exist, but locally organized collections are more common. In addition to the artefactual collections, there are also (non-archaeological) ecofact collections such as that of botanical seeds held by the Royal Botanic Gardens in Kew or the many collections held by the Natural History Museum.

Often the deciding factor in whether a reference collection is consulted will be set in the brief issued by the local government archaeologist near the start of the process. If the brief stipulates that a collection must be consulted, then it will be; if there is no such stipulation, it may not be and so the opportunity to make comparisons with the previous work that has gone into the construction of the reference collection will be lost.

A number of online reference collections have now been established, such as the Worcestershire On-Line Fabric Type Series, held online at <http://www.worcestershireceramics.org>. The existence of such collections makes cross-referencing much easier, as the time requirement of a physical consultation is bypassed, and so opportunities are opened up to enhance the quality of the work that is being produced.

7 IFA standards and guidance

In the United Kingdom, the quality of the products is ensured through the use of Standards. The code of conduct of the Institute of Field Archaeologists is a shared set of ethical principles reflecting archaeologists' duties to the historic environment, the public and fellow professionals. The standards and guidance advise archaeologists on how our work can comply with these principles, whilst fostering a profession that is diverse, flexible and progressive. The key section is the Standard, which is only a few lines long. For example:

An archaeological excavation will examine and record the archaeological resource within a specified area using appropriate methods and practices. These will satisfy the stated aims of the project, and will comply with the *Code of*

conduct, Code of approved practice for the regulation of contractual arrangements in archaeology and other relevant by-laws of the IFA. Excavation will result in one or more published accounts and an ordered, accessible archive (IFA 1999). The standard deliberately lacks detail. It is impossible to predict every circumstance – but it is reasonable to set procedures by which measurable outcomes or products can be attained. The standard states that an excavation will produce a publication and an archive that meets the requirements of the project. ('Quality' means 'fit for purpose' – it does what it is supposed to do.) If the excavation doesn't result in a report the standard has not been met. It is a 'sub-standard' excavation. Similarly, if the excavation doesn't answer the questions it was supposed to, it has not met the standard – the phrase 'as far as is reasonably possible' allows for any good reason the excavation might – as many do – fail to do so. It is very difficult to define 'reasonably possible': such decisions rely on shared professional judgment and values. The rest of the document provides guidance on what the profession considers best practice.

To date, IFA Standards and guidance have been produced for the following categories of work: archaeological desk-based assessment; archaeological field evaluation; archaeological excavation; archaeological watching briefs; archaeological building investigation and recording; collection, documentation, conservation and research of archaeological materials. A Standard and guidance for the conservation and management of the historic environment will be produced by 2005.

8 European standards

A proposed Europe-wide standard for excavation is being developed by the European Association of Archaeologists' Committee on Professional Associations in Archaeology. This will be based upon internationally portable principles contained within the equivalent IFA standard, incorporating separate appendices for each country / region to identify relevant legal and procedural frameworks.

The application of such a standard will allow an ensured high level of quality work across the continent.

The EAA is not able to insist upon members using such a standard; while membership of the Association requires commitment to the EAA Code of Practice (EAA 1997) and members should follow the Principles of Conduct for Archaeologists Involved in Contract Archaeological Work (EAA 1999), there is no disciplinary procedure to deal with transgressions of the Code of Practice.

The objective of the proposed Standard will be the establishment of a common set of parameters for practice that the EAA can recommend the use of by archaeologists in all European states.

9 Conclusions

The implementation of standards is and will be the defining tool for ensuring and improving the quality of archaeological work. This has been successfully achieved in the United Kingdom, and the work by the European Association of Archaeologists will be a major step forward in the development of a shared understanding of how to undertake quality archaeological work.

Standards cannot operate in a vacuum; they must be supported by relevant information, and critical to this is access to that relevant information which

has been previously generated. This information may exist in report, archive or reference collection form, and being able to locate and consult this information is crucial to the establishment of standards, the maintenance of quality in archaeological work and even the future directions of the discipline.

The eRC can be central to this process. If the eRC is to be a portal, a commonly available route to shared information sources, then it will become the first and best access point to the information needed to support those standards, and so to contribute to quality work in European archaeology.

References

Aitchison, K. and R. Edwards, 2003. Archaeology Labour Market Intelligence: Profiling the Profession 2002-03. CHNTO.

CHL Consulting Co. Ltd., 2002. Profile of the Archaeological Profession and Education Resources in Ireland. Heritage Council and The Institute of Archaeologists of Ireland.

Darvill, T. and B. Russell, 2002. Archaeology After PPG16: archaeological investigations in England 1990-1999. Bournemouth University School of Conservation Sciences Research Report 10.

EAA (European Association of Archaeologists), 1997. The EAA Code of Practice.

EAA, 1999. The EAA Principles of Conduct for archaeologists involved in contract archaeological work.

Evans, K. and J. Williams, 2001. Archaeological Evaluation Strategies in Belgium (Flanders and Wallonia), England, France and the Netherlands. Kent County Council on behalf of Planarch.

IFA (Institute of Field Archaeologists). 1999. Standard and Guidance for Archaeological Excavation. IFA.

Rubio, E. and S. Bernard, 2001. Cartographie du Paysage Scientifique en Archéologie Métropolitaine. Ministère de la culture et de la communication, sous direction de l'archéologie.

5 Building quality in working collections

Maureen Mellor

Abstract

The Medieval Pottery Research Group has promoted a number of new resources in the past decade, and a new initiative linked to Europe-wide integration is underway. These initiatives will do much to aid the concept of a European Reference Collection and ensure that the capture of quality data has highest priority. This paper will present the results of a straw-poll of three national collections and some twenty-five local or regional collections covering the British Isles¹. Curators were asked about the place in national hierarchy, the number of consultations, funding for updates and any plans for web access. Was it feasible to create a National Reference Collection for all material culture, and could this be extended to continental Europe? Benefits and pitfalls were considered. But first a few words about pottery, the Medieval Pottery Research Group and new resources which may benefit online reference collections.

1 Post Roman pottery

Pottery is a commodity, it was distributed to all sectors of the population, in both town and country (Mellor 2004 (forthcoming)). It had an active social role in almost every stage of European development. In the medieval world the relations between the elite and peasantry varied regionally and through time (Hodges 1995: 105), the importance of regional studies was first recognised in the British Isles in the 1950s (Jope 1952, 1963).

Professor Richard Hodges, writing in 1995, suggested that part of the future for regional studies lay in European-wide integration facilitated by international agencies (Hodges 1995: 106).

2 The Medieval Pottery Research Group

The Group first came into existence in 1975, as a vehicle for the regular exchange of views². The first meeting, The Analysis and Publication of Pottery, was discussed by delegates from museums, universities, the then Department of the Environment, London, the Office Works now English Heritage. People came from Belgium, France, the Netherlands, Ireland and Scotland, and many of the leading units in the United Kingdom (McCarthy 1977: 1). This broad mix of membership from many countries is still evident today (seven European countries are represented along with members from Japan and United States of America). Research interests often overlap. By the 1980s contemporary

1 <http://www.medievalpottery.org.uk/refcoll.htm>

2 <http://www.medievalpottery.org.uk>

craftsmen had joined the Group. In 1992 the Group became a charitable trust (Blackmore and Redknap 1992: 1).

In recent years, as Historical Archaeology has become a serious player in the United States of America, the Group's interest have extended to include more sixteenth, seventeenth and eighteenth century ceramics.

From the beginning the Group recognized that the basis of all science is a clear definition of the material under study, so the developing typologies of wares, visual identification (Fig. 1) of fabric backed up by thin-section analysis and occasionally chemical analysis, still form the core of current ceramic studies (Mellor 2004, forthcoming).

Their aim in the mid 1970s was to determine whether it was possible to standardize such descriptions and improve on terminology, building on previous work (Robinson 1979; see Orton this volume).

A network of Regional Groups gradually evolved across England. One region, the northwest of England devised a fabric reference collection for the whole region, to ensure consistency in analysis and to aid comparison with other sites (straw-poll 2004 pers. comm. Julie Edwards). Within the other regions, ceramic type series for form and fabric were developed at centres for County Historic Environment Records, by Independent Archaeological Contractors, local Authority Field Units – some City based, others serving a regional community – Museums and Individual specialists, all with different agendas.

3 The changing global climate

1990 heralded a changing economic climate in England that had rapid and severe repercussions on archaeological fieldwork, post-excavation analysis and research (Blackmore and Redknap 1990: 1). The loss of considerable expertise of specialists made a real impact on the profession that has yet to be replaced. However, the 'Medieval Europe' conference in 1992 held in York, in the north of England, demonstrated the growing interest in post-Roman archaeology of the wider European community. As did the annual MPRG conference held at the University of Southampton in 1993 that embraced 23 speakers from 11 different countries (Blackmore and Redknap 1993: 1). In 1995 the Group held its three day conference in Cologne, where we were confronted with tonnes of ceramic from production centres, that awaited analysis and publication (Barclay and Hughes 1995: 1). 'Medieval Europe's second conference was held in Bruges in 1997 which took a more holistic view of medieval and later archaeology and 'encouraged networking and an exchange of views' (Verhaeghe 1998 -1999: 162).

MPRG clearly had a role to play in promoting professionalism in ceramic research and a national survey of medieval pottery studies, funded by English Heritage, set out to collect data from the Regional Groups across England. Scotland and Wales were outside this remit (Mellor 1994).



Fig. 1 Cataloguing ceramics.
Ceramics are one of the primary sources for the archaeologist.
(Copyright PotWeb, University of Oxford, Ashmolean Museum, 2001)

The survey resulted in a series of recommendations, those at national level have now been implemented, but regional recommendations still await action. Of particular interest to the workshop of the European Reference Collection are:

- 1 A Guide to the Classification of Medieval Ceramic Forms (MPRG 1998, Section1). This Guide aims:
 - to present an extensive range of ceramic forms,
 - to provide a recommended name for each form,
 - to provide a foundation onto which regional and local variations can be added,
 - to give a list of alternative names previously used,
 - to provide a terminology for vessel parts, decoration and manufacture.
- 2 Minimum Standards for the Processing, Recording, Analysis and Publication on Post-Roman Ceramics (MPRG 2001: 2). This document aims:
 - to provide a tool for planning and curatorial archaeologists, and others involved in the monitoring process, to assist in the monitoring of archaeological fieldwork, analysis and publication,
 - to act as a guide for the profession, and, by the application of agreed minimum procedural standards, to encourage good practice in ceramic research,
 - to help museum curators in the management of ceramic archives,
 - to establish minimum standards as a guide to students and new entrants into the profession.

3 The digitization of the National Bibliography now on the web.

The year 1984 saw the publication of the annual bibliography for the first time; the information was collected by a network of volunteers for each county with some volunteers working at national level and this valuable resource continued until very recently (2003). The national bibliography holds over twelve thousand records from Britain, Ireland and offshore islands in the database. Now that the national bibliography is online³, moves are afoot to add the annual bibliography to the online resource annually, rather than publish in hardcopy in the journal of the Group, Medieval Ceramics.

These three resources as set out above, along with the essential reading of *Pottery in archaeology – a manual aimed at a wide audience* (Orton et al. 1993) – and a handbook of resources, *Scientific Analysis of Archaeological Ceramics* (Barclay 2001), have been invaluable in the cataloguing of the post-Roman vessels curated by the Ashmolean Museum, Oxford.

The project, code named PotWeb: Ceramics online⁴, has a database with over 8,500 vessels or sherd families (Orton et al. 1993: 172, 180) which is linked to a fabric reference collection of some 150 fabric types. This reference collection is available for consultation by scholars, students and the interested public (Haslam et al. 2001: 101).

The emphasis of this project, within a University Museum, was on high-quality data to be used to provide research data, which can be developed, for other audiences at a later date. Capturing quality data is labour intensive, but if a product is good it will be used all the time (Fig 2).

³ <http://ntserver002.liv.ac.uk/mprg>

⁴ www.PotWeb.org or potweb.ashmol.ox.ac.uk

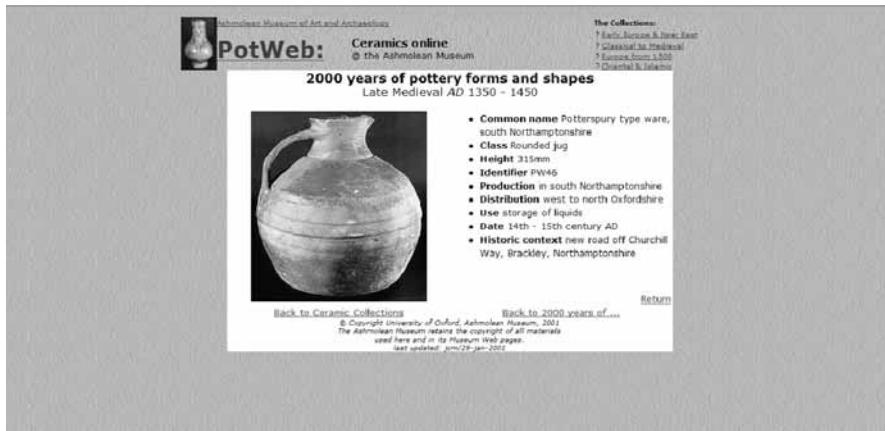


Fig. 2 PotWeb catalogue sheet, capturing quality data is labour intensive.

Some museums have created tremendous teaching collections, but universities and museums still need to be encouraged to work together more closely (Strawpoll 2004, Bristol City Museum).

TileWeb, a joint project between Worcester City Museums and Art Gallery and the Ashmolean Museum, Oxford has developed a search engine to enable browsers to locate some 3,000 tile designs on medieval paving tiles from 34 counties, within the United Kingdom. It also searches by parish, town, specific provenance and by iconographical groups⁵.

4 Medieval pottery production in England: a new gazetteer.

Currently a new resource for archaeology is being tested and refined across England. The national database of medieval pottery production in England: a new gazetteer has attracted interest from Welsh and Scottish colleagues as well as from the Continent (Marter and Gerrard 2004: 15, 16)⁶.

This resource records archaeological investigations, kilns, waster dumps, pottery fabrics, forms (standardized using the Classification of Medieval Pottery Forms, see above), and links to the national digital thin-section database.

In February 2003, the Medieval Pottery Research Group was approached by a Hungarian archaeologist suggesting the idea of a European project on production centres. This was followed up at a round-table discussion in the autumn of 2003 at the European Archaeologists Association in St Peterburg, the project was endorsed by the conference⁷. The MPRG undertook to promote this project through its quarterly newsletters and a group emailing keeps the Working Group informed. The Working Group will meet again at the 10th annual conference to be held in Lyons, (September 2004) when we hope to find partners to put together a bid for Culture 2000.

Since its inception in July 2001, the All Party Parliamentary Archaeology Group (APPAG) has been seeking support from Members of Parliament and Peers with a view to giving archaeology a voice in the House of Commons and the House of Lords. The initial aim of APPAG was the compilation of a report on the state of archaeology in Britain at the start of the 21st century⁸.

5 <http://tileweb.ashmolean.museum>

6 <http://www.kingalfred.ac.uk/mppc>

7 <http://www.e-a-a.org>

8 <http://www.sal.org.uk/appag>

The Medieval Pottery Research Group's submission focused on three points:

- The need for increased resources for synthesis.
- The need for increased support for archive and reference collections.

Access to well-maintained archives and reference collections is an important part of the research infrastructure. It is threatened by lack of resources and inadequate curation, including the appropriate training of curatorial staff. Spins-offs include a common terminology which is all the more pressing as we begin to put material on the World Wide Web. Sometimes the problem is that the issue of international use was not thought about, for instance Border Wares from the counties of the Surrey/Hampshire border might well be interpreted as coming from the Scottish/English border or even further afield (Pearce 1992).

- Increase in teaching of ceramics in universities

A survey carried out on behalf of the Medieval Pottery Research Group in 1992 found that there were only two PhDs in progress and only one course teaching medieval pottery at university level. If students do not come in contact with ceramics in their early years at university, there will be little chance of any growing interest which might develop into PhDs and research will be paralysed (pers. comm. Alexandra Gutteriez).

There are similar issues in the world of bones (pers.comm. Professor Tom Beaumont James).

5 Ceramic reference collections in the UK

In order to make the best use of technology, it is important that concepts and strategies are discussed among likely users. To this end a survey of six questions was devised and discussed with or emailed to some fifty curators of local or regional ceramic reference collections⁹. The three national reference collections held in Edinburgh, Scotland, and Cardiff, Wales, and two in England, one for the post-Roman period at the British Museum, London and the other for the post-medieval period in Stoke-on-Trent, Staffordshire, were also approached. The survey was carried out over a three-day period and a 50% response was achieved. A further five positive responses were received beyond this date. A summary of the results are set out below:

Question: How would you describe your place in national hierarchy?

The place of national reference collections is clear and they serve national, and international communities; only four reference collections are tied to cities serving local communities and these tend to be cities with a long tradition of archaeology, for example, Winchester, in the south central region of England. Counties/regions serve a wider community, some are independent trusts, others are contracting units, two are centres for the Historic Environment Resources. Independent specialists, working for a number of different clients, hold a great deal of knowledge.

Question: How many external consultations per year?

Many of the reference collections are used actively internally, but have recorded few external visitors in the past year. This can, in part, be accounted for by the

⁹ <http://www.medievalpottery.org.uk/refcoll>

tight economic climate, with no budget for travel or to take a day away, to visit a relevant reference collection.

National museums attract student and specialist groups, from time to time. While local and regional reference collections are used by contracting units. There is a charge in some cities to use the reference collection, for example, at Chester, in northwest England.

Question: Any plans for web access?

National Museums in England, Wales and Scotland are digitizing some of their collections, but there are no immediate plans for digitizing reference collections as such. At local level there are no plans as yet. At regional level, one Museum in the East Midlands has a long term plan (Scunthorpe Museum, Lincolnshire), while in the West Midlands two Centres for the Historic Environment Records are actively pursuing online strategies (Worcestershire and Herefordshire).

Question: What funding is available for updates?

The updating of National Reference Collections is costed into the budget, but a European initiative would require new funds. For example, such a project, within a National Museum, might need to employ one person for three - five years to co-ordinate and supervise museum assistants/volunteers.

At local level, reference collections, most of which were started in the 1960s/1970s, would need updating, cross-referencing, where necessary and new funding. At regional level in four counties there is a public service requirement that contractors must use the local or county ceramic reference collection and some of these reference collections cover prehistory, roman and post-roman ceramics, for example, in Bedfordshire in the south east Midlands. The remaining collections are updated on an ad hoc basis, if at all.

Question: Whose reference collections/type series are they anyway?

Ownership is often tricky and the survey highlighted that it was not always clear where ownership lay. Local city reference collections are tied closely to their local museums, but the ownership of Regional Reference Collections is more varied, some are owned by local authority field units and the Centres for the Historic Environment Records are a new player. Independents still see Museums as a natural repository for reference collections, because museums are used to handling objects. It is not certain how local and regional Museums collectively perceive this role.

Question: Is it feasible to provide online national reference collections for all archaeological finds?

Here the 'Yes' votes just gain ascendancy; the 'Nos' included contracting units, museums and independents. The negative respondents noted the dangers of duplicating work. For some there was a preference to invest at regional level rather than at national level; that ceramics are too local - but non ceramics online

may be useful. The difficulties of travel to a national collection were cited and dangers in making instant identification, not supported by any accompanying understanding or knowledge were of particular concern. Many respondents mentioned that there is no substitute for handling sherds.

Question: What minimum standards, what quality control need to be in place?

The need for sustainability was perceived as critical – who edits the webpages? Who sustains the resource?

Each country needs a structure with shared standards and shared systems, properly funded and controlled. With a Web enabled database, type series at county/regional level. The Worcestershire online resource - Pottery in Perspective¹⁰ linked to national level, which in turn is linked to a European index in a specific place with quality search engine, may serve as an example.

A taxonomic key was proposed – so if an iron object requires identification, a simple procedure needs to be followed to enable the correct chronological period to be identified; this would ensure, at least, that the relevant specialist be approached.

It was suggested that peer review (two persons) should agree on classification before the information was uploaded online, with a focus on high quality data. In ceramic studies, fabric, form, decoration, provenance, source and appropriate documentation with drawings, digital images (broken edges, aerial view, thin sections) would be the first step.

Question: Would an online European resource for all archaeological finds be useful? Any pitfalls?

Table 1 Results of the straw-poll survey.

Respondents	Yes	No	Uncertain / cautious
Curators of local reference collections	5		
Curators of regional reference collections	9	2	1
Independent researchers			8

Comment:

- Not necessarily beneficial to contract units;
- Goods for forms but not fabrics;
- Good for metal detected finds (Portable Antiquities Scheme);
- Risk of misidentification through lack of specialist knowledge.

10 <http://www.worcestershireceramics.org>



Fig. 3 Assemblage from Bull Hall, Southampton: Continental imports (left) alongside local wares. Late 13th century.
(Copyright Southampton City Museums, Southampton City Council)

The European online provision gained greater support than the national resource, particularly with museums that need to mount exhibitions, are keen to stimulate work, draw in new researchers and have education at their core. Contracting units do not necessarily feel an online European resource would be beneficial, unless they are working in ports (Table 1).

Respondents felt very positive towards a ceramic form series, but not for local/regional fabrics types. Some imports, such as Saintonge from southwest France or the Rhenish stonewares from northern Germany, do need clarification at national and international level. The online resource supported by the Portable Antiquities Scheme¹¹ has proved useful for metal detected finds in some areas.

There remains the risk at national and international level of misidentification through lack of specialist knowledge.

The basic tool of interpretation in archaeological research is the comparison of assemblages (Orton 2001), it is the structure of archaeological assemblages which provide the key to differentiation (Fig. 3), so we also need to consider some more archaeological parameters, beyond characterization of the individual artefact. How will this new online resource aid comparison? Date range, the size of the assemblage, the stratification of the assemblage and the nature of the assemblage: monastic/domestic etc. must all be considered.

11 www.finds.org.uk

6 Conclusions 'in an ideal world'

The way forward is to build quality into working collections – quality data is essential.

Each country needs a clear structure; at local/regional/county level reference collections would link to a national collection, thence to a European cyber-index, hosted at a centre of excellence.

The European index would be continually updated, as a guide to collections, searchable by culture, by artefact-type and by chronology. The index would link back to museum collections and archaeological reference collections.

At regional/county level there would be three identical type series:

- one to be passed to the national reference collection
- one to be curated by its originator
- one for short-term loan (to archaeological contractors, independents as needed).

The Worcestershire model¹², county-based Historic Environment Records might become a model for this - the definition of ware-types, common names, bibliographic references would be at this level.

But the general consensus is go for it – It is better to light a candle than to curse the darkness (Confucius).

7 Acknowledgements

I am indebted to the curators of the ceramic reference collections for their input into the straw-poll survey and their readiness to discuss freely the future of such collections.

References

- Barclay, K., 2001. Scientific Analysis of Archaeological Ceramics. Oxbow Books.
- Barclay, K. and M. Hughes, 1995. Editorial, Medieval Ceramics 19.
- Blackmore, L. and M. Redknap, 1990. Editorial, Medieval Ceramics 14.
- Blackmore, L. and M. Redknap, 1992. Editorial. Medieval Ceramics 16.
- Blackmore, L. and M. Redknap, 1993. Editorial, Medieval Ceramics 17.
- Haslam, J., M. Mellor, and J. Moffett, 2001. PotWeb:museum documentation - a world vision. Medieval Ceramics 25, 99 - 107.
- Hodges, R., 1995. Review article: Valediction or Vision? In: M. Mellor (ed.), Medieval Ceramic Studies in England. A review for English Heritage, 103-107.
- Jope, E.M., 1952. Regional Character in West Country Medieval Pottery, Transactions Bristol and Gloucestershire Archaeological Society 71, 88-97.

¹² www.worcestershireceramics.org

Jope, E.M., 1963. The Regional Cultures of Medieval Britain. In: I.L. Foster and L. Alcock (eds), *Culture and Environment: Essays in Honour of Sir Cyril Fox*, 327-350.

Marter, P. and C.M. Gerrard, 2004. Medieval pottery production in England: a new gazetteer. *The Archaeologist* 51, Winter issue, 16-17.

McCarthy, M.R., 1977. Introduction, in *Medieval Ceramics* 1, 3-4.

Mellor, M., 1994. Medieval Ceramic Studies in England. A review for English Heritage.

Mellor, M., 2004 (forthcoming). Making and Using Pottery. In: C. Dyer and K. Giles (eds), *Town and Country 1100 - 1500, Medieval Archaeology Monograph*.

MPRG, 1998. A Guide to the Classification of Medieval Ceramic Forms. Medieval Pottery Research Group Occasional Paper No. 1.
online: <http://ntserver002.liv.ac.uk/mprg>

Orton, C.R., P. Tyers, and A. Vince, 1993. *Pottery in archaeology*. Cambridge University Press.

Orton, C.R., 2001. Discussion Paper. MPRG newsletter no. 39, April issue.

Orton, C., this volume. Some thoughts on the history of Reference Collections in the UK.

Pearce, J., 1992. *Border Wares: Post-Medieval Pottery in London, 1500 - 1700*, vol 1. HMSO, London.

Robinson, A., 1979. Three Approaches to the Problems of Pottery Fabric Descriptions, *Medieval Ceramics* 3, 3-35; see Orton this volume.

Slowikowski, A., B. Nenk, and J. Pearce, 2001. Minimum Standards for the Processing, Recording, Analysis and Publication of Post-Roman Ceramics. Medieval Pottery Research Group Occasional Paper No. 2.

Verhaeghe, F., 1998 -1999. *Medieval Ceramics*, 22-23.

6 Revealing collections: discovery, access and interoperability

Kate Fernie

1 Background

The Museums, Libraries and Archives Council (MLA) is a strategic agency funded by the UK Government's Department for Culture, Media and Sport. Its objective is to provide strategic leadership, advocacy and advice to enable museums, archives and libraries to touch people's lives and inspire their imagination, learning and creativity.

The MLA undertakes a wide range of tasks, but those of specific relevance to European Reference Collections include benchmarking of standards in the UK's museums, libraries and archives, technical advice and guidance, developing the Cornucopia database (of which more later) and managing the Portable Antiquities Scheme.

2 Collections

An aspect of the MLA's work involves undertaking surveys of the collections that are held in England's museums, libraries and archives – whether in national collections, local institutions, universities or in independent organisations (Bott 2003; MLA 2004; Re:source 2000). It goes without saying that the breadth, depth and quality of the collections is amazing, and that they include both individual star items and comprehensive research collections. More relevant to this paper is what this research is revealing about access to collections and the emerging strategies for promoting their use.

A common finding of the research has been to underline the value that people place on museums, libraries and archives and their collections coupled with the need to find ways of increasing their use. 'Their collections and spaces must be opened up for all to use in a creative way for learning, inspiration and enjoyment' (Re:source 2000).

It would be easy to cite examples of inspirational exhibitions currently in museums across Europe. But the problem that faces museums (also archives and libraries) is informing potential visitors about what is going on and where. The problem that faces users, particularly specialist researchers and students, is finding out which collections are available and where they are held. Without this most basic of information, undertaking a programme of research can involve a lifetime journey visiting collections to check out their catalogues.

3 Supporting discovery

In recognition of this problem a number of initiatives have emerged in the UK to support the discovery of collections. This work has, directly or indirectly, been influenced by the Research Libraries Support Programme (RSLP) which funded a large number of digitization projects in the UK higher education institutions.

The RSLP developed a schema for describing collections in a consistent way that would support resource discovery via the Internet (Powell et al. 2000).

The schema was a development of existing schemas for resource discovery and archive description including Dublin Core metadata, ISAD[G] (the General International Standard Archival Description) and EAD (Encoded Archival Description). The schema is relatively simple, providing a consistent core of useful information covering concepts such as: title, description, author, date, physical location, deposit conditions, access arrangements.

Although it was originally developed for use only by digitization projects funded by the RSLP, the RSLP schema has had impact across the cultural heritage sector in the UK and internationally (for example, Foulonneau 2003). In recent years several initiatives have emerged that are resulting in the development of collection description services that are of potential interest to archaeological researchers.

4 Cornucopia

Cornucopia is a searchable database of museum collections in the UK. It is developed and managed by the MLA and was established in response to the UK Government's Treasures in Trust report which called for a way to be found of recognizing the richness and diversity of museum collections (Turner 2004). The database was initially piloted in 1998 using information from 62 museums in England holding designated collections. Following evaluation the structure of the database was developed to reflect a report from UKOLN (Powell 1999) and went on to be used to capture information about museum collections across the UK. The Cornucopia database currently holds detailed information about almost 6000 collections held in nearly 2000 cultural institutions nationwide.

The MLA's long-term plan for Cornucopia focuses on its ability to act as a comprehensive information resource on UK collections (Turner 2004). There are plans to develop the content of the database with detailed information from museums and from other cultural domains (libraries and archives) across the UK. A third version of the database has been developed to support interoperability with other collection description services by adopting the RSLP schema. Online forms are also being created to ensure that the content of the database will be easily updateable in future. The new database and web interface have been launched in July 2004 (fig. 1).

Cornucopia has been developed as a resource discovery service for museum collections and is evolving into a cross-domain service for museums, libraries and archives. It is inter-operable with domain specific collection services (see below), that is to say the use of a common collection description schema will enable information to be harvested for Cornucopia via the OAI communications protocol. The provision of a SOAP (Simple Object Access Protocol) based web service for the latest version of Cornucopia will enable searches to be integrated seamlessly into resource discovery services developed by others.

Fig. 1 Cornucopia
<http://www.cornucopia.org.uk>



5 Access to Archives – A2A

The A2A (Access to Archives) database provides an example of a collection description service for the archives domain (fig. 2). It allows users to search online to find information about archives held in local record offices and libraries, universities, museums and national and specialist institutions across England. A2A is part of the growing archives network in the UK, which includes the Archives Network Wales, the Scottish Archives Network, the Archives Hub (for UK higher education and colleges) and others. The aim of these projects is to provide access to archive catalogues that are often not available on the

Fig. 2 A2A
<http://www.a2a.org.uk>



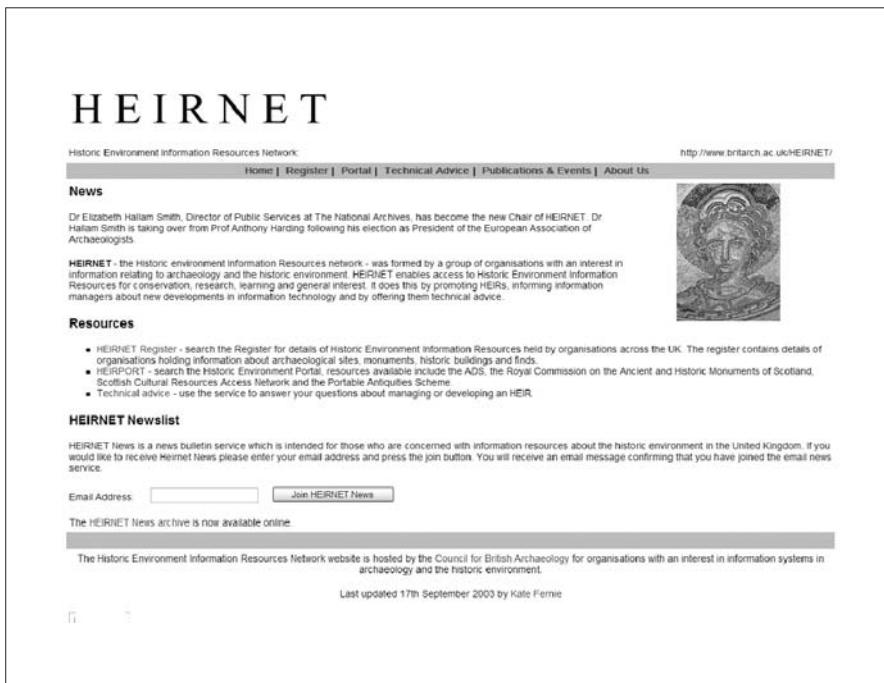
The screenshot shows the homepage of the HEIRNET website. At the top, it says "HEIRNET" in large letters. Below that is a navigation bar with links: Home, Register, Portal, Technical Advice, Publications & Events, and About Us. The main content area has a heading "News" with a sub-section about Dr Elizabeth Hallam Smith becoming the new Chair. It also includes a "Resources" section with links to the Register, PORTAL, and Technical advice. There's a "HEIRNET Newslist" section with a form to enter an email address. A small image of a classical head is on the right. At the bottom, there's a footer with copyright information and a last update date of 17th September 2003 by Kate Fernie.

Figure 3: HEIRNET
<http://ads.ahds.ac.uk/heirnet/>

Internet – typically such catalogues have previously only been available in paper form or on a local offline database.

Currently the A2A database allows users to search detailed information about the collections of around 340 archive repositories in England. A2A is an invaluable resource, but it is worth noting that the MLA estimates that there are 2150 archives in the UK as a whole. The UK's archives are visited by over 1.5 million people each year. Millions more people are known to be accessing archives virtually each year, for example the National Archives website¹ handled 85 million information requests in the year from 2002 – 2003. Interest in archives in the UK has never been greater.

6 Historic environment

The Historic Environment Information Resources Network (HEIRNET) came into being to support interest in information about the archaeological monuments, historic buildings and other structures that survive in our landscape (fig. 3). In the UK, many people and organizations are involved in recording aspects of the historic environment in databases and in other information systems for conservation management, research and to public information services.

Information resources include monument inventories, excavation archives and the associated finds, reference collections, specialist bibliographies and other important research resources (Fernie 2004). Some of these are available online, but many are available only in the form of offline databases or as paper-based card indices. Typically these resources are held by many different organizations across the UK, in local and national government, by museums and archives, local societies, public libraries and others.

1 <http://www.nationalarchives.gov.uk/>

Figure 4: EnrichUK
<http://www.enrichuk.net>



The dispersed nature of the information resource makes it very difficult for both conservation managers and researchers to do their work. Recognizing this difficulty, HEIRNET set out to create a register of available collections (Baker et al. 2000). This register is being developed to provide a searchable online index to collections. The HEIRNET register provides a collection level description providing a general overview of an information resource, its subject coverage, geographic area and the formats of the material held. Perhaps the most important information of all, are the details of how and when to contact the person or organization which holds the collection and, where available, a direct link to the resource online.

HEIRNET's aim in developing its register is to help researchers to find resources (Fernie 2003). The register offers a simple and easy to use mechanism for searching and browsing through the available collections to find out what material is available for a research topic.

7 Access and users

The three services that have been described are examples of a number of UK initiatives which are useful to researchers. These services make it much easier to find out which cultural institutions hold collections that are relevant to a research project and in some cases provide direct links to catalogues and databases online. They are ideal for expert researchers but the information that they access is unmediated and can be difficult for students and members of the public to use. The EnrichUK gateway provides an example of a service that is intended to support life-long learning and use by a non-specialist audience (fig. 4). Instead of providing an index to descriptions of collections or collections catalogues, EnrichUK provides an index to 150 websites that were created as a result of the NOF digitize programme (NOF 2003). The NOF digitize programme was a Euro 80m content creation programme that resulted in the digitization of a number of important collections. The focus of this programme was life-long learning not research, and the resources that were created all mediate the collections for non-specialist users.

8 Teaching and learning

Mediation of collections is important in the context of the recognized need to support artefact teaching for archaeology students (LTSN 2002). Collection description services like Cornucopia and the HEIRNET register make it easier for students and researchers to find reference collections of archaeological artefacts. But learning how to use them requires mediation.

The PATOIS project provides an example of the online learning environments that are being developed to support archaeology teaching. With funding from the JISC, the Archaeology Data Service with a consortium of UK higher education institutions set out, through PATOIS to tell students about the information tools that are emerging in archaeology, and which are changing scholarship. PATOIS presents students with a set of Internet-based tutorials that lead them through different datasets and show how they may be deployed in research (Kilbride et al. 2002; Fernie et al. 2003). Four tutorials were developed in the PATOIS project; of particular interest in the context of the proposed development of a European Reference Collection is the tutorial based on the excavations of the burial crypt at Christchurch, Spitalfields in London. These excavations were of international importance in terms of the contribution that they made to advancing the forensic analysis of human remains. The PATOIS tutorial is designed as an inter-disciplinary resource, setting out to introduce students to specialist techniques used in other disciplines and the potential for cross-disciplinary research. The tutorial includes an introduction to the techniques used by forensic archaeologists in determining the age and sex of human remains in the light of the Spitalfields excavations (Fernie 2001).

The four PATOIS tutorials have all been implemented in real teaching scenarios in universities, further education colleges and continuing education departments in the UK. It is too early to come to firm conclusions about the long-term impact of PATOIS in facilitating change in training young archaeologists (Kilbride et al. 2002). Nevertheless, the take-up of these tutorials underlines the potential of e-Learning for academics looking to develop research skills among their students. The Spitalfields tutorial demonstrates the potential for supporting artefact teaching as well as enabling students to use new research tools such as collection description services.

9 Bringing it all together

This paper has looked at a number of initiatives that have emerged in the UK in recent years to improve access to the collections held by museums, libraries and archives. Collection description services such as Cornucopia and the A2A database are developing into invaluable services for researchers. But both these services have developed within specific domains. Researchers often need to search across domain boundaries to search for collections wherever they are held.

If research is to be transformed, then collection description services must be inter-operable to enable the development of subject specialists or cross-domain resource discovery tools such as the HEIRNET register or, in future, the pan-European service being developed through the MICHAEL project (MICHAEL, 2004). The adoption of common standards for collection level description (such as the RSLP schema), following good practices should enable information collected by different initiatives to be shared. In this way an index to European

Reference Collections held by museums, libraries and archives might be created.

10 Some conclusions

Research by the MLA and others has underlined that there is a growing demand for access to the collections that are held by museums, libraries and archives. It is often difficult for people to identify collections and to find out where they are held. Resource discovery tools such as collection description services are needed to improve access to collections for researchers and for others. Such tools facilitate the process of research and of promoting the use of collections whether online or offline.

Both EnrichUK and the PATOIS project demonstrate the potential of electronic resources in supporting teaching and learning. PATOIS is of particular interest in the context of the proposed development of a European Reference Collection as it demonstrates the potential of e-Learning resources in supporting the teaching of research skills to young archaeologists. PATOIS sets out to complement in-person, hands-on teaching with online materials and illustrates the potential of electronic resources in supporting artefact teaching.

There is great potential to create new online research resources for European archaeologists. But to make this happen, first we must agree to adopt common standards to make sure that we can share access to knowledge about the collections held in our museums, libraries and archives.

References

- Baker, D., G. Chitty, J. Richards, and D. Robinson, 2000. Mapping information resources: a report for HEIRNET. Council for British Archaeology. online: <http://www.britarch.ac.uk/heirnet/rep1.html>
- Bott, V., 2003. Access to Archaeological Archives: a study for Resource and the Archaeological Archives Forum. online: <http://www.mla.gov.uk/documents/id838rep.pdf>
- Fernie, K., 2001. Christ Church, Spitalfields: an inter-disciplinary resource for learning and research. PATOIS module 4. online: <http://ads.ahds.ac.uk/project/patois/module4/index.html>
- Fernie, K., 2003. Getting it together on-line: HEIRNET and Internet-based resource discovery tools for the Historic Environment. Internet Archaeology issue 13 February 2003. online: http://intarch.ac.uk/journal/issue13/fernie_index.html
- Fernie, K.M., 2004. Revealing Collections: Discovery, Access and Interoperability. In: Magistrat der Stadt Wien – Referat Kulturelles Erbe – Stadtarchäologie Wien, ‘Enter the Past. The e-way into the four dimensions of cultural heritage: CAA 2003, Proceedings of the 31st conference, Vienna, Austria, April 2004’, BAR International Series 1227, 356-358

Fernie, K.M., W.G. Kilbride, and P. McKinney, 2003. PATOIS: Accessing archaeological archives for teaching and learning on-line. In: Martin Doerr and Apostolos Sarris (eds), *The Digital Heritage of Archaeology. Computer Applications and Quantitative Methods in Archaeology 2002*. Proceedings of the 30th conference in Heraklion, Crete, 405-410.

Foulonneau, M., 2003. Specifications for Inventories of Digitised Content: NRG Parma, November 2003, MINERVA project report. online: <http://www.minervaeurope.org/intranet/documents/specinv0311.pdf>

Kilbride, W.G., K.M. Fernie, P. McKinney, and J.D. Richards, 2002. Contexts of Learning: The PATOIS project and Internet-based teaching and learning in Higher Education, *Internet Archaeology 12*. online: http://intarch.ac.uk/journal/issue12/patois_index.html

LTSN, 2002. Teaching Archaeological Materials: A summary of the Teaching Archaeology Forum on held at the University of Leicester, on Wednesday, 24th April 2002.
<http://hca.ltsn.ac.uk/resources/reviews/TAF/TAF-Materials.php>

MICHAEL, 2004. Multilingual Inventory of Cultural Heritage in Europe. project website: <http://www.michael-culture.org/index.html>

MLA, 2004. Listening to the Past, Speaking to our Future: report of the Archives Task force. online:
<http://www.mla.gov.uk/action/archives/00archives.asp>

NOF, 2003. EnrichUK website. online: <http://www.enrichuk.net/>

Powell, A., 1999. Collection Level Description - a review of existing practice, an eLib supporting study. UKOLN, August 1999m. online: <http://www.ukoln.ac.uk/metadata/cld/study/>

Powell, A., M. Heaney, and L. Dempsey, 2000. RSLP Collection Description. D-Lib Magazine 6 No. 9. online: <http://mirrored.ukoln.ac.uk/lis-journals/dlib/dlib/september00/powell.html>

Re:source, 2000. Renaissance in the Regions: a new vision for England's Museums. online: <http://www.mla.gov.uk/documents/rennais.pdf>

Turner, C., 2004. Cornucopia: An open collection description service. Ariadne issue 40, July 2004.

7 The London Archaeological Archive and Research Centre and the management and dissemination of archaeological data in London

Hedley Swain

1 Introduction

The Museum of London has created a single centre for the storage and curation of archaeological archives from the capital. By doing this it has also set out to stimulate and encourage research into this material as well as maximizing its value for the public in general. The London Archaeological Archive and Research Centre, or LAARC, has been acclaimed as a major success, however it is recognized that much still needs to be done to make its undoubted research potential fully accessible, and to make it fully sustainable for the future.

Archaeological archives (the term normally used in Britain for the collective records and finds and associated reports and data from an excavation) should represent a prime research and heritage asset; and yet for many years they have been under-resourced and under-used. British museums have struggled to find the resources to properly store archives, never mind maximize their research and educational value. This situation has been made worse by the organization of archaeology in Britain where the practitioners are now primarily peripatetic commercial organizations quite separate from the museums that are expected to curate archives (see for example Merriman and Swain 1999).

In London in the past thirty years this situation had become acute. The unprecedented level of excavation in the historic urban core has resulted in the largest body of archaeological records and finds of its kind. This is an immense research resource making London one of the best-understood historical cities in Europe (Museum of London Archaeology Service 2000). However it has brought with it huge logistical problems for the Museum of London which takes and cares for the archives from excavations.

2 The LAARC

Since its foundation in 1976 The Museum of London has acted as the traditional home for archaeology in the capital (Sheppard 1991, Ross and Swain 2002). Its field units, in their different incarnations, have carried out the vast majority of excavations in Greater London. The Museum's main galleries tell London's story from prehistory to the 20th century and draw heavily on archaeology, as have some of its recent temporary exhibitions. Behind the scenes the Museum also cares for the archives from excavations in Greater London. It has long been realized that this material offers both great challenges in terms of its sheer quantity and an incredible untapped resource for research. In the creation of the London Archaeological Archive and Research Centre (LAARC) the Museum has tried to meet these challenges.

The LAARC was opened in February 2002, it is housed in the Museum's Mortimer Wheeler House resource centre, about 2 miles from the main Museum building and its galleries. LAARC shares the building with the offices of the Museum's archaeology service and much of the Museum's social and working history collections. A grant from the Heritage Lottery Fund and funding from central government, the Getty Grant Program and many other organizations, archaeological societies, and individuals have funded its creation. Two new large storage areas have been created as well as a visitor centre and two study rooms. State-of-the-art roller storage has been installed and a computerised index and access system (the latter available over the web) have been developed. The LAARC project, which included not only building and equipping the new spaces but also designing the computer systems and undertaking a minimum standards programme on the archive, cost about £2.5 million. Costs for the 6-person team who manage the LAARC is found from the Museum's recurrent costs.

The London archive is by far the largest in Britain. It currently includes about 150,000 individual boxes of finds stored on 10,000 m of shelving, and includes finds and records from about 5,200 individual excavations from throughout Greater London. And of course this figure is growing every year. Therefore about 20 years expansion space has been built into the plans. This will be achieved partly through current spare space but also by the rationalization of existing material.

The Museum has prepared rigorous standards for the preparation of new archives resulting from excavations and expects the archives from all excavations in Greater London to be deposited in the LAARC. It has taken a while for the 20 or so archaeological contractors that regularly operate in London to become accustomed to this new disciplined approach, but the will does seem to be there and material is now being deposited at an increased rate.

Meanwhile we have also turned our attention to that material already in our care. This has been generated over about 100 years by many different archaeologists working for many different organizations. Material is not compatible and often not easily accessible. A huge effort is being made to bring all this material up to an acceptable level of care and accessibility, not only for its long-term well-being but to encourage research.

Research has been spearheaded by the publication of a London archaeological research framework (McAdam et al. 2002) and a series of partnerships with London's archaeologists and universities. The international research potential of material held at LAARC is also being recognized. The Museum already has formal partnerships in place with La Trobe University Melbourne Australia to study 18th and 19th century assemblages and with Penn University USA studying DNA from some of the skeletons held in the archive.

Another key part of the London archaeological community are its local societies and again the Museum is working with these groups to encourage research and use of the LAARC. Several societies were actively involved in the planning of the LAARC and indeed have donated funds for its creation. It is hoped that society projects either researching London's past or helping with collections management in the LAARC will allow local society members to feel actively involved in London's archaeology – something that has been very difficult in the last 10 years as more and more archaeology has been funded commercially by developers. Another initiative is for the LAARC to host a Central London Young Archaeologists Club for children and teenagers.

The LAARC is not an alternative to the Museum's galleries and it is fully appreciated that archives may not be the best way of introducing the general

public to archaeology. There are public weekend events at the LAARC but its main value is as a foundation for other activities. The London Bodies exhibition would have been impossible without the Museum's archive of human remains; other such projects will follow. The sorting and rationalization of material in the archive has also made possible the Museum's *Roman Boxes for Schools* scheme whereby unstratified material has been turned into teaching collections (Hall and Swain 2000). Such material was also used in The Dig a re-created excavation using real artefacts which was the Museum's summer family event in 2001 (Martin 2002).

The philosophy behind the LAARC is simple but does call on the archaeological community to re-focus its priorities. For thirty years we have become expert at excavating and recording archaeological material in the face of threats from development. But we have been very poor at using the results of excavation to further public knowledge and appreciation of the past. An incredible unrealized resource has slowly accumulated. By its proper curation we are now ready to put it to a whole variety of uses, led by research. It is hoped that LAARC will develop as a strong foundation for archaeological activity in London and a model for similar endeavour elsewhere.

It is not enough simply to keep archives because they are a record of excavations. They must be put to use. Archives must be properly curated. If they are properly curated they can be used for research and as a foundation for other archaeological endeavour: display, education, management. It is only worth curating them if they are used in these ways.

3 The wider challenge

The challenges posed by the curation of archaeological archives are not restricted to London. A number of reports and surveys have highlighted the plight of archaeological archives throughout Britain (Swain 1998). Archaeological digging units have been slow to transfer archives to museums, and museums in their turn have struggled to find the space and resources to care for them to acceptable standards. There has also been a poor record of dialogue between museums and archaeologists, and the archaeological infrastructure in general in England has not supported the creation and use of archives.

The apparent success of the LAARC hides underlying contradictions in British archaeology that undermine much of the philosophical basis for archaeology. As archaeologists we have long learnt that excavation is destruction and therefore it is imperative that we properly preserve and 'archive' our records and finds and publish the results. Developing from the idea of archiving is the concept that the 'archive' should be a valuable research tool both allowing archaeologists to 'test' the conclusions made – in the same way as a scientific experiment is only valid if it can be repeated, but also allowing new research by comparing the results from more than one dig or studying a different aspect of the archive.

Reality has shown that professional archaeologists, and the archaeological community in general, have been reluctant to archive material and reluctant to use archives as a valid research resource. Obviously, by so doing undermining the original premise for preservation in the first place. We therefore tend to fall back on the argument that material must be preserved 'because it is part of our heritage and is unique'. This will not do. It is not justifiable to spend large amounts of money and resources preserving something just because it was dug up and is old. It must have a demonstrable value to society now.

In Britain much progress has been made in the last 5 years to recognize the poor state in which archives are being curated and the threats so posed to them. However, we still have some way to go as a profession to decide whether this material is of real value; and to demonstrate this by not only caring for archives properly but by using them, thus demonstrating the need for the care. Hopefully the LAARC can play an important part in this task by demonstrating how archives can be used once they are valued.

4 Managing and disseminating data

The London archaeological holdings represent a vast research resource. Not just for understanding London, but because of London's size and historical international role, for British, European and indeed world archaeology.

A central tenet of the LAARC has therefore been to make its holdings as accessible as possible, both physically and intellectually. Literal physical access has been achieved, although it is recognized that many who would want to use the data in LAARC are unable to visit London. This has obviously turned us towards the use of digital data and the internet.

The huge number and complexity of the archaeological records held make intellectual access more difficult. Standardized methods of recording and recognizing types of data are therefore essential. Here we face a massive challenge.

Much of the material already held in the LAARC is recorded to variable standards using many different methodologies.

LAARC as it stands at present is close to a regional version of the proposed Dutch National Reference collection on the basis of the pottery reference collections for forms and fabrics and the published catalogues, by the fact that it holds the vast majority of physical archaeological material records and objects from London; and in that the Museum of London has historically undertaken the vast majority of archaeology in London and has developed the vast majority of the systems for recording and listing archaeological remains. As such by default most archaeologists working in London use MoL recording systems and reference collections and prepare archives for deposition in LAARC to laid down MoL guidance. But still only a relatively small percentage of the data held in the LAARC is easily accessible.

However, LAARC has not set out to take on a regulatory role – and only has a locus of responsibility to do this through the deposition of archives. Its main *raison d'être* is to act as an archive and as a research centre. Although both of these requirements do call on standardization and the need for reference collections.

Archaeology as it operates in England at present has not got the regulatory, or statutory power to insist on practitioners using set standards or systems; although it is moving in this direction. The archaeological community tends to aspire to best practice in the use of regional systems and reference collections but funding does not always allow this to happen. A current initiative in London that might see the archaeologists responsible for managing and monitoring archaeological fieldwork through the planning system moving to and becoming part of the LAARC, would change this situation for the better. But at present this is no more than a suggestion.

References

- Hall, J. and H. Swain, 2000. Roman Boxes for London's Schools: an outreach service by the Museum of London. In: P.M. McManus (ed.), *Archaeological Displays and the Public*. London: Archetype Publications Ltd.
- Martin, D., 2002. Great excavations, *Museum Practice* 19, Volume 7 No.1, 21-23.
- McAdam, E., T. Nixon, H. Swain, and R. Tomber (eds), 2002. *A Research Framework For London Archaeology 2002*. Museum of London.
- Merriman, N. and H. Swain, 1999. Archaeological Archives: Serving the Public Interest?, *European Journal of Archaeology*, Vol. 2 No. 2, 249-267.
- Museum of London Archaeology Service, 2000. *The Archaeology of Greater London*. London: MoLAS.
- Ross, C. and H. Swain, 2001. *Museum of London: 25 Years*. London: Museum of London.
- Sheppard, F., 1991. *The Treasury of London's Past*. London: HMSO.
- Swain, H., 1998. *A Survey of Archaeological Archives in England*. London: Museums and Galleries Commission.

8 Archaeological archives – issues and solutions in the UK

Kathy Perrin

1 Introduction

Archaeologists acknowledge the importance of recording and archiving the results of their work to the highest standards. However sometimes it can be a struggle to find the resources to properly care for archaeological finds and records and perhaps more importantly to provide good access to this material and use it for meaningful research.

The advent of the digital age has resulted in many institutions finding new and innovative ways of getting the results of archaeology out to the world. The eRC project is a fine example of such an initiative. Others range from individual specialist group websites to the much wider vision of a project like AREA, whose aim is to create new possibilities for the promotion and preservation of archives of European archaeology. Along with this development are other exciting changes in the way that the physical remains of archaeology are being made far more accessible to both existing and new audiences, such as the London based archaeological resource centre, the LAARC. This new development aims to collect and care for, provide access to and encourage research into, the finds and records of archaeological work in London. Also, within England, information about archaeology is about to become an integral part of information about the whole heritage environment through the development of heritage environment records.

The difficulty is that such forward thinking initiatives can be hampered by a lack of basic infrastructure which supports access to the finds and information. In the UK the Archaeological Archives Forum, a consortium of all the major archaeological bodies in the UK, are working hard to build this infrastructure, thus ensuring that archaeological finds and records are properly cared for, documented and made fully accessible. It is important to note that in the UK we have recognised that success will only be achieved if all sectors involved in the archaeological process work together.

The Archaeological Archives Forum are working on three major challenges: issues regarding the deposition of archives in a suitable repository, the means of providing full and interactive access to archives and ensuring that documentation and finding aids properly facilitate the researcher.

2 Historical background

I would like to present a brief history of the situation which brought the Forum into being and to describe the reasons behind and some of the major elements of our work.

England's problems have developed over time as archaeological work left the province of the small independent researcher or university department and became an industry in its own right. A quick foray through the history tells us that on the whole, archaeological work had been carried out on a small scale up until the 1970s and it tended to lie in the province of universities or independent researchers. In the 1970s burgeoning town development, including the creation of a number of new towns, combined with the advent of the concept of rescue archaeology to create a huge increase in excavations. Archaeological units were formed in most areas and large post-excavation backlogs built up as digging tended to continue all year round.

This situation was exacerbated in the 1980s when a government scheme to put unemployed people to work brought large numbers of mostly inexperienced extra staff into archaeological units with a concurrent increase in output but often at the expense of quality and post-excavation programmes.

In the 1990s a change in government policy saw the concept of the polluter pays applied to building development and for the first time archaeological units had to compete for work which was now funded by private companies. Small rapid evaluations and an explosion in grey literature combined with a paring of costs and even more pressure to reduce archiving procedures.

How has all this affected the archives? On a simplistic level it can be explained as follows.

In the 70s and 80s most archaeologists did not have much time to consider the archives they were creating – attention was focused on excavation, recording and publication. Such huge amounts of activity meant that large archive holdings were building up in unit stores and offices.

In the 90s commercial practice meant that increased pressure of work due to contractual deadlines left the backlogs to be done only as and when, and the archives from later commercial development work often fell foul of adequate monitoring by overworked county archaeologists.

As a result large quantities of archives, often inadequately prepared and stored, were looking for homes in museums equally ill prepared to receive them for reasons detailed later.

Archaeologists in England have been aware of these issues for some years. A study carried out in 1998 on behalf of English Heritage (EH) and the Museums and Galleries Commission (MGC) by Hedley Swain, 1998 concluded that a number of initiatives were needed, including:

- National coverage in museum collecting areas
- A review of the EH storage grant scheme
- Guidance on selection and disposal
- A study of the physical condition of major archives held by contractors and the cost and feasibility of their transfer to museums
- A review of the nature and sustainability of digital data.

EH proposed to take these recommendations forward in partnership with other bodies, especially the MGC.

However in the following period rapid changes overtook EH and MGC and it took a further 3 years before any real action could be initiated. EH carried out a rapid scoping survey during 2001 and published 'Archaeological Archives: Documentation, Access and Deposition. A Way Forward' in 2002.

A plan of action was recommended which aimed to tackle the most pressing of the current challenges in the field of archaeological archives, but the report

argued that success would only be achieved if all sectors involved in the archaeological process were to work together. As a result in March 2002 the Archaeological Archives Forum was formed and six months later it became a nationally representative body.

3 Current situation

Three major challenges were identified: deposition, access and documentation.

What are the problems?

- Documentation. In other words the information provided with an archive to allow others to use it easily. This can be something as simple as clear labelling on boxes and paperwork, to the metadata we provide with digital files. It is important that the preparation of a clear and usable archive must begin before the first spade hits the ground and is not just a process which is tacked on at the end of the project.
- Access. How easy it is to find and use the resource in archives? The audiences who are able to reach it, such as schoolchildren, academics, or the general public. We often do not think of the archive as a resource to be utilized in the same way as the publication, in fact the same amount of care and attention should be expended on the archive in order that it is well used and accessible.
- Deposition. Problems relating to deposition were identified as centring on the scale of the physical archive generated by fieldwork projects, including its use, storage, access, discard and curation. An increasing number of museums have difficulty in housing new and especially large archaeological collections and some stores are full or close to capacity.

What we discovered is that there is a broad consensus on what we must do to make things better.

4 Major concerns

The term archiving is used quite freely to describe the process of depositing in a public repository the product of archaeological research. In fact it is a poor term for a practice which can vary as wildly as just throwing everything in a box and giving it to the museum, to those who take immense care that everything is ordered, indexed, conserved and packaged appropriately.

The following can be identified as major concerns:

- Selection processes.

There is a widespread reluctance to assess critically what should be kept and what can be discarded. The common approach is to collect all and keep all on the basis that future generations will be better able to understand it. Past history argues against this theory – current trends demonstrate that archives are seldom revisited and hard-pressed local authorities pick up on this information when taking cost cutting decisions. We must become more proactive in taking decisions about retention and we should justify this decision-making process against sound research criteria. The danger is that if

archaeologists do not bite this bullet then decisions will be made for us on the unacceptable basis of cost. This is not a fantasy scenario, bulging stores and massive quantities of bulk archives with no identifiable repository are all too common in England.

- Temporary storage.

Storage of sensitive archive material can become a problem in the temporary stores available to most archaeological practices. This includes documentary archives, as for example, photographic images require good storage conditions or they can fade, develop mould or foxing. Currently we do not have recognized standards for these stores and yet archives can remain there for many years. Some of them are truly awful, it is not unknown to have archives stored in hot damp boiler rooms, wet cellars and even broken-down chicken sheds with brambles growing through the roof.

- Legal issues.

In England we have difficult legal issues to address. Landowners have legal title to archaeological finds uncovered on their land and they must relinquish title to these finds if they are to be deposited in a public museum. However many archaeologists find it difficult to obtain the landowner's permission to deposit the finds, especially as the landowner then has to pay the museum in order to give away finds he actually owns and yet has already paid to have them uncovered in the first place. There are also thorny copyright issues to contend with in the case of the documentary archives.

- Access.

We need to make the archives more accessible and capable of re-use. This is a complicated issue, beginning with simple problems such as providing a knowledgeable curator to document archives clearly in order that future researchers can find answers easily, to even more complex issues such as making good use of the internet in order to reach new audiences. The eRC project demonstrates clearly the benefit of opening doors to the wealth of information currently held within archives in a multitude of storerooms

5 Where do archives go?

Traditional storage arrangements in England mean archaeological archives are deposited in a local museum. However this seemingly straightforward solution poses a number of problems such as

- Museums can often be inner city old establishments with limited storage space. These traditional museums are designed to house displayable objects, on the whole not boxes and boxes of bulk material such as animal bone and bits of broken pottery. Most museums in England have difficulty housing archaeological archives and an increasing number are turning them away.
- Museums are now increasingly stretched for resources and many have lost the staff with archaeological expertise to utilize the archives. This in turn means that only limited re-use of the archive is possible in most cases.
- In England the material and documentary archive is traditionally deposited together, a situation which does not happen with other collections. Documentary archives are normally the province of the local record office which has specialist staff skilled in documentary archive conservation. This puts an extra burden on museum staff and resources.

- There is a move away from traditional paper and photographic records towards ‘born digital’ records and digital records require active specialist curation not usually found in museums. Therefore if an archaeological practice deposits a digital archive in a museum, what this can actually mean is that a disc will be put on a shelf to gather dust. Often the museum may have no means of providing access to the data present on the disc.
However we are now moving towards a situation where specialist repositories will curate and provide access to digital records. The Archaeology Data Service is one such example in the UK and the National Archives are beginning a project which hopes to provide regional solutions. However this is early days for a situation which needs urgent solutions and not just solely for archaeological data.
- In England there are little consistent charging, collecting or accession standards in place for museums, a fact which causes real problems for many archaeological practices who have to produce archives to many differing standards.
- There are now large gaps in collecting areas willing to take archaeological archives.

6 How do we change things for the better?

Get people working together

It is important to ensure that all the differing groups working within the field of archaeology are on board with the solutions proposed. There have been lots of attempts to tackle some of these issues, but too often they have not succeeded because they have been done in isolation. For example standards produced by the museum community alone may not be taken up by the archaeologists because they think they do not apply to them.

In this new initiative, English Heritage have brought together representatives from across the Heritage sector, including our national colleagues in Scotland, Ireland and Wales, in order to deal with issues collectively. We have done this by creating a new Archaeological Archives Forum. Working like this together means

- More weight attached to initiatives
- More resources available
- More experience better results
- Taken more seriously by government

These are some of the issues we are currently tackling

Selection policies

We plan to put a national framework in place within which regional, local and site or project specific policies can be developed. It is important that the issue of what is retrieved in the field and later selected for retention is justified against sound policies at each stage of the process. Work on this project began last summer and we should have a draft framework for the Forum to review at its next meeting.

This issue has been evaded for too long leading to an almost critical overload of material which, because it cannot be weighed against sound selection criteria, is also vulnerable to disposal by hard-pressed local authorities.

Disaster management planning

Most archaeological organisations operate within a health and safety code of practice which means that the risk to staff is minimized as much as possible. However most do not apply the same principles to the business side of their work, and as a result the irreplaceable information on which their livelihood depends is put at risk from both natural events such as fire or flood and man-made events such as robbery or terrorist activity. We have just completed guidance on disaster management planning for archaeological archives.

Legal issues

We hope to work on policy guidance which will assist archaeologists in dealing with the complicated mazes thrown up by the current copyright and intellectual ownership laws which affect the way we can deal with archaeological finds and records, and also by the laws affecting ownership and transfer of title for the finds.

Standards for post-excavation archiving processes

We need commonly held transparent standards for the whole discipline, from the person writing the archaeological brief to the curator accepting the archive at the end of the process. Each must know and understand what others are doing, and why and when they fit into the picture.

Work on mapping existing standards is complete and work on drafting an overall common standards document will begin this summer. This will be badged with the Forum logo in order for it to be accepted on a multi-discipline basis.

Deposition standards

We need consistent standards for depositing archaeological archives across the whole country. We have completed work on reviewing current museum and record office standards for accession, charging policies and collecting areas and policies. We will be using these reports to lever support at a national level for consistent standards across the board.

Standards for temporary storage of archaeological archives

It is vital that sensitive archaeological material and records are not allowed to degrade due to inadequate storage facilities at any time. Museums are well regulated, but this is not the case for storage facilities in most archaeological practices. A recent survey demonstrated that nearly all units had dedicated stores for finds but that almost none operated any form of environmental

controls. In the case of documentary storage, the majority of units maintained these in standard offices, with all the inherent problems of fluctuating heat, light and humidity. Standards for the temporary care of archaeological archives will be included within the standards document previously mentioned.

Training

It is vital that the young archaeologists begin their career with an appreciation of the importance of the archive resource and how it is best created and maintained. We are working to ensure that current training programmes include archive processes for the wider profession.

Influencing government

A most important aim! This is a time of policy change in English politics and the heritage environment is high on the agenda. Currently we are working to influence things in two ways:

- 1 We wish to ensure that new legislation includes recognition of duty of care to the archives of archaeological investigation. The Forum have already provided input into new forthcoming government legislation and one of our members sits on the All Party Parliamentary Archaeology (APPAG) group.
- 2 We are also assisting in the production of standards for new Heritage Environment Record Centres which will evolve out of the current system of sites and monument records. It is hoped that these will become information portals for the whole of the historic environment.

Long-term aim – Regional Resource Centres

It is clear to the majority of those involved in archaeology in England that we need a better answer to the storage and access issue. The most popular solution is to build a network of large archaeological resource centres which could maintain a dual function, one of storage and the other of access and research. There are a number of such initiatives beginning to spring up across England, but most have only reached the planning stage. We are hoping to facilitate these exciting developments by holding a one day conference on archaeological resource centres in October.

One such centre has already been built in London by the Museum of London, The London Archaeological Archive Resource Centre (The LAARC) and is operating successfully.

7 Why is this the future?

As can be seen from the illustrated examples there is plenty of good storage and room for researchers. However centres such as these also mean plenty of access to curatorial support and advice, archaeological expertise to hand, good access to conservation support and massive opportunities for training research, teaching, and outreach including presence on the internet.

We plan to build on the LAARC model to assist other regions to develop their own such centres. In the meantime the current initiatives are putting the building blocks in place for these centres to operate smoothly.

9 Do reference collections have an electronic future?

Julian Richards

Abstract

This paper examines current trends in the digital environment in which we operate. Many of these are external to our discipline and outside our control, but provide both potential and challenge for any future reference collection project. It looks at some examples of on-line reference collections and considers how the concept and delivery of a reference collection may change as electronic dissemination becomes standard. The experience of the Culture 2000 ARENA project demonstrates that future reference collections must (i) be distributed, (ii) be shared, (iii) be electronic, (iv) serve multiple audiences, and (v) reflect different local traditions. However, it also shows there are considerable challenges in meeting these objectives, of which technology is probably the least problematic. More important are differences in language, including technical vocabulary, questions of preservation and access, issue of re-purposing and, as always, politics and funding.

1 Introduction

To a large extent the title of this paper is a rhetorical question, as it is a reasonable assumption that European reference collections of the future will inevitably be digitally based. This does not mean, however, that electronic access to scanned images will replace physical collections. Whilst sufficient for the majority of queries, electronic access cannot function as a complete replacement for the physical examination, by sight and touch, of type specimens. Nonetheless in this paper I will look at the implications of the growth of electronic (henceforth e-reference) reference collections, and examine what form they may take. In order to do this first I shall try to characterize the digital environment in which we operate. Secondly I will consider some emerging examples of e-reference collections. Thirdly I shall examine the requirements for future e-reference collections, and finally I will outline some of the challenges.

2 The digital environment

The digital environment is all-encompassing and provides opportunities and constraints that go beyond our own narrow disciplinary boundaries.

- There is increased usage of digital resources for teaching, learning and research, across all user communities and across all boundaries. The Internet has rapidly become the primary source of information for most school and university students, as well as for a large proportion of the general public. Home Internet access is reaching levels of over 50% of the population in most European countries, but also provides instantaneous international access. The high levels of access to rather scholarly web resources contrasts with the very low levels of usage reported for traditional archives (Merriman and Swain 1999). Web access statistics, crude as they are, demonstrate that these users are not drawn exclusively from an elite scholarly community. The Archaeology Data Service web site, for example, receives only about 25% of its 'hits' from higher and further education '.ac.uk' domains.
- Within an increasingly complex and fragmented web environment, collaboration will emerge as a strategic way forward. By definition, the Internet is about distributed links. Within the UK, an umbrella body called the Common Information Environment (CIE) represents a consortium of information providers who have agreed to work together to provide shared access to information (Miller 2004). Within the historic environment sector, HEIRNET¹ (Fernie this volume), represents the CIE in microcosm, and includes governmental and quasi-governmental groups, higher education, and private sector representatives.
- There will also be increasing cross-fertilization of methods and techniques across disciplines. Archaeologists can no longer afford to shelter behind discipline-specific battlements. Funding will depend upon working with others and there will be positive advantages to be gained from collaboration. Current developments in e-Science, such as grid computing, have much to offer a subject, such as archaeology, which is at the boundary between arts and sciences.
- Lastly, the cross-disciplinary nature of digital resources will be recognized and better exploited. Once exposed to search engines, web resources gain immediate open access and new markets are opened up. Resources which may have been regarded as being of relatively narrow interest might gain new audiences. Reference collections of stone tools may be relevant to geologists and earth scientists, for instance.

In addition to these general factors there are also specific developments with Information and Communication Technologies (ICT) which will have an impact on the future shape of reference collections:

- First, we will see the increased use of ICT for new forms of scholarly communication. ICT does not just allow us to do what we have always done more quickly or efficiently; it also has the potential to change the nature of what we do. In archaeology, for example, the traditional distinction between publication and archive can be broken down, to the extent that it becomes

¹ <http://www.britarch.ac.uk/heirnet>

meaningless. A future user should be able to navigate seamlessly from a high level statement based upon the interpretation of a finds assemblage to a sherd-by-sherd description of that assemblage, for example.

- There will also be seamless integration of digital resources with access to the tools to process and analyse them. In reference collection terms a tailored on-line interface might allow a user to undertake a database query to select pottery types meeting certain criteria, to total the numbers of such types from specific features, and might also provide a 'light-box' application to allow the user to store and compare images of the fabric thin-sections.
- In addition, ICT will be used to develop individual and community information spaces for the exchange of knowledge and information. The Portable Antiquities Scheme web site (Dawson this volume) provides a good example of how an artefact collecting community can be mobilized to contribute information to a shared public resource. It is clear that, linked to e-reference collections, such sites could develop into valuable tools for the identification of finds, harnessing specialist expertise in intelligent knowledge-based information systems. It is likely that any distinction between public and professional resources would be hard to maintain. Indeed, the creation of such sites contributes to the breaking down of traditional barriers.
- Finally, it is likely that we will see the continued development of portal services, providing integrated search interfaces to distributed content. In technological terms these sites will utilize OAI-PMH and Z39.50 protocols, will be based on XML mappings to common standards, and may use RSS feeds to syndicate information to numerous outlets. The technologies are not important. The key issue is that there will be multiple *shop windows* and that e-reference collections will be required to appear many times, whilst being hosted and maintained in a single location.

3 Emerging examples of e-reference collections

A growing number of physical reference collections are being prepared for online access. I shall highlight three that are known to me because they are hosted by the Archaeology Data Service. Individually very different, together they provide examples of many of the features which will characterize e-reference collections of the future:

1 Roman pottery database²

Although extensible to other sites this reference collection began as the type series for the pottery recovered during the excavations of a single Roman fort at Hayton, East Yorkshire. The database was funded by English Heritage. The user is enabled to search the database by form or fabric, resulting in descriptions of specific form or fabric types, with type drawings or thin sections. Of particular interest is the fact that users can then select a specific fabric or form to obtain a listing of all examples from Hayton, with context details. In this instance, therefore, the reference collection becomes a means to interrogate the raw pottery data. It is accepted that the reference collection is simply a higher level

² Soon accessible at
<http://ads.ahds.ac.uk/catalogue/specColl/..>

classification or interpretation of the pottery assemblage (Madsen this volume), but since the user also is also provided with access to the raw data it would be possible for them to contemplate alternative groupings.

2 South Yorkshire / North Derbyshire medieval ceramics reference collection³

This second example is also a period-based collection, but one which covers a whole region within the north of England. The reference collection was developed as a personal resource by Chris Cumberpatch, the main medieval pottery specialist for the region, but digitisation was funded by English Heritage with the aim of providing wide and permanent access to this specialist knowledge. Users can search by fabric type, or where they know it, by the ware name. The database includes over 3000 thin sections as well as full bibliographic entries (Fig. 1).

Fig. 1 South Yorkshire / North Derbyshire medieval ceramics reference collection.

3. University of Southampton Stone in Archaeology database⁴

The last example is a national resource which provides a complete online register of all known archaeological occurrences of every stone type in the British Isles, with descriptions, thin sections, source information and full bibliographic entries (Fig. 2). The project was directed by Professor David Peacock at the University of Southampton and funded for three years by the Arts and Humanities Research Board. The database is hosted by the ADS. It can be searched by stone name, stone type, geological time period, or physical characteristics of the stone. This is an example of an inter-disciplinary resource which is of interest to geologists as well as archaeologists.

3 <http://ads.ahds.ac.uk/catalogue/specColl/ceramics eh 2003/index.cfm>

4 Soon accessible at [http://ads.ahds.ac.uk/catalogue/specColl/..](http://ads.ahds.ac.uk/catalogue/specColl/)

Fig. 2 University of Southampton Stone in Archaeology database.

Stone in Archaeology Database

[Logout](#) [Options](#)

[About The Project](#)

[Stone Search](#)

[Quarry Search](#)

[Usage Search](#)

[Reference Search](#)

[Data Maintenance](#)

[Standard Data](#)

[System Admin](#)

Swaledale Fossil Stone

[Back](#) [Main Details](#) [Samples & Images](#) [Quarries](#) [Usage](#) [References](#) [Print](#)

Sample Details and Images

Sample: 24

Local Name: Swaledale Fossil Stone

Quarry Name: Barton Quarry, Darlington

Location: Southampton Lithics collection, North Yorkshire Box 3, Tray 34.

Comments: None Recorded

Physical Characteristics:

		Fresh	Dressed/Tooled	Polished
Primary Colour	Grey	Grey	Grey	Grey
Secondary Colour	None	None	None	None
Primary Munsell Code	10YR 7/1	10YR 7/1	10YR 7/1	10YR 7/1
Secondary Munsell Code				
Surface Appearance	Crystalline	Crystalline	Bioclastic	
Hardness	Very Hard	Very Hard	Very Hard	Very Hard
Feel	Rough	Smooth	Very Smooth	Very Smooth
Grain Sorting	Poorly sorted	Poorly sorted	Poorly sorted	Poorly sorted
Grain Size	Coarse	Coarse	Coarse	Coarse

Macroscopic Images:

Fresh Surface. Large scale image Polished Surface. Close up of surface detail.

Fresh Surface. Close up of surface detail. Dressed/Tooled Surface. Close up of surface detail.

Polished Surface. Close up of surface detail.

Click on an image to view a larger version with a scale.

Photomicrographs:

Plane Polarized Light Crossed polars

Click on an image to view a larger version with a scale.

From these three examples it is clear that online reference collections will continue to develop according to user needs and individual initiative. They may arise at local, regional, national, and presumably even international level. Their focus may be upon an artefact type or a material, or any combination of periods. In some cases their users may even cross disciplinary boundaries. It would be naïve and unrealistic to try to impose a single organizational framework on such resources and so any project must proceed at least in part in a bottom-up fashion. It must seek to harness the strengths of existing resources and use them as building blocks towards a European e-Reference Collection. The potential of e-reference collections is clear. Type series can be linked to primary data sets. Text descriptions can be supported by unlimited colour photographs, and maybe even three-dimensional virtual reality, or map-based display of distributions. Simultaneous worldwide access can be provided to a wider public as well as the traditional specialist audience. Such access will open

up new possibilities for comparative analysis across data sets, and across national boundaries.

Nonetheless in order to realize this potential we must address several challenges. If we accept that we must inevitably proceed from the bottom up using existing building blocks, then how can we ensure that the building blocks will fit together? How will we be able to effectively cross-search multiple local and regional reference collections to find what we are interested in? And finally, if the future of reference collections is largely to be electronic, how will we safeguard our investment in this fragile digital data to ensure its survival into perpetuity?

4 Requirements for e-reference collections

The discussion so far allows us to specify certain requirements for the design of e-reference collections at European level.

- Firstly, they must be *distributed*. It is entirely unrealistic to imagine that we can develop a single resource managed in one place, as the responsibility of a single organization. Such a scenario is probably impossible at national level, let alone in a European context. Reference collections are best managed at local level by those people who are expert in the material
- Secondly, access to such resources should be *shared*. The data is not the private property of local or national groups. Although they will be managed at local level a shared technical infrastructure will facilitate access. A common portal would provide a single point of entry and shop window and could also facilitate a shared set of access tools, such as 'light-boxes' etc.
- Thirdly, such collections should have an *electronic* front-end organized at European level, supported by physical collections curated at local, regional or national level, according to circumstances. Wherever possible, local collections should be digitized to enhance access.
- Fourthly, e-reference collections must serve *multiple audiences*. By exposing resources on the Internet they will inevitably acquire users for whom they may not have been originally intended. If possible the needs of public and professional users should be designed for at the outset. The Portable Antiquities Scheme shows how community web spaces can be created which will aid the identification and reporting of finds.
- Lastly, it is necessary that any European level e-reference collection structure must accommodate *local traditions*. Within Europe there are many different archaeological traditions and a 'one-size fits all' approach will not work. On the other hand, our research agenda transcend national boundaries. These are generally political constructs of the modern era and have no relevance when studying prehistoric or even medieval trade and exchange.

The ARENA project (Fig. 3) provides an example of *distributed, shared, electronic* access to heritage information which reflects *local traditions*. Although it is an experimental portal for sites and monuments type information it provides an example of the type of system that would meet the requirements for European access to e-reference collections. What, when, where type queries entered at the portal are simultaneously checked against six distributed databases, in Denmark, Iceland, Norway, Romania, Poland and the United Kingdom. Hit lists of index records are returned from each server, and the user is able to follow hypertext links to drill down into more detailed resources managed

Fig. 3 The Arena portal to distributed archives in Europe.
<http://ads.ahds.ac.uk/arena>

locally on different systems in different data structures in different languages. Although the ARENA portal is still experimental it provides a vision for shared European access to heritage data. Further portal development work by the ADS on behalf of the CIE has demonstrated how the same cross-search architecture can be tailored to provide different views for different user activities, such as tourism, education, or research (Miller 2004).

5 Challenges and conclusions

In conclusion, the development of a common European e-Reference Collection must proceed partly from the bottom up, building upon existing resources held nationally, but partly from the top-down, developing a common European infrastructure for shared access. There must be agreement on common standards for sharing information and the use of controlled vocabularies. For an integrated resource to succeed a number of challenges must be met. The first of these is linguistic. To achieve full interoperability it will be necessary to be able to translate between multiple European languages and to develop multi-lingual thesauri. The second challenge is to ensure that e-reference collections are developed in a way that is suitable for long-term digital preservation (Richards 2002). Thirdly, the work involved in re-purposing reference collections for multiple audiences is not trivial. Reference collections have generally been developed by specialists for specialists and may require layers of supporting

information to render them comprehensible to general users. Funding is nowadays available for the digitization of specialist databases for public benefit, but that benefit must be demonstrable. In the case of e-reference collections benefit will stem from enabling the individual to take an artefact recovered from their garden and compare it against an online reference collection to establish what it is, but part of the public benefit will stem from allowing professionals to tell better stories for the public, based upon hundreds of such artefacts.

Acknowledgements

I am grateful to Guus Lange and his colleagues for the invitation to present a paper at the eRC meeting, and to all the participants for the stimulating debates which have informed this written version of my contribution, although its inadequacies remain my own full responsibility.

References

- Dawson, D. and M. Lewis, this volume. The Portable Antiquities Scheme: recording the past.
- Fernie, K., this volume. Revealing collections: discovery, access and interoperability.
- Madsen, T., this volume. Classification and archaeological knowledge bases.
- Merriman, N. and H. Swain, 1999. Archaeological archives: serving the public interest?, European Journal of Archaeology 2, 249-67.
- Miller, P., 2004. Towards the Digital Aquifer: introducing the Common Information Environment, Ariadne 39, <http://www.ariadne.ac.uk/issue39/miller/>
- Richards, J.D., 2002. Digital preservation and access, European Journal of Archaeology 5, 343-66.

10 The Portable Antiquities Scheme: recording the past

David Dawson and Michael Lewis

Abstract

The Portable Antiquities Scheme is a voluntary scheme to record archaeological objects found by the public. Every year many thousands of archaeological objects are discovered, most of these by metal-detector users, but also by people whilst out walking, gardening or going about their daily work. These objects offer an important and irreplaceable source for understanding our past. The Portable Antiquities Scheme offers the only proactive mechanism for systematically recording such finds for public benefit and is the largest community archaeological project the UK has ever seen. This paper outlines the origins of the Scheme and its success to date.

1 Treasure law

The Portable Antiquities Scheme has its origins in the reform of the ‘common law’ of Treasure Trove; this dates back to the thirteenth century and was part of the hereditary revenue of the Crown. In England, Wales and Northern Ireland, Treasure Trove was defined as gold and silver objects, which had been deliberately hidden with the intention of recovery and where its original owner/s or heirs are unknown. Under arrangements established in 1886 finders of Treasure who acted properly and lawfully by reporting their finds and handing over anything they had found to their local Coroner received a reward (based on the market value of the find) if any items were retained by a museum. Otherwise the finds were disclaimed and returned to the finder. Treasure Trove was not designed as an antiquities law and hence significant and important archaeological finds were sometimes outside its scope. Perhaps the most famous example is the Sutton Hoo Treasure (discovered in 1939), which was returned on the basis that it was deliberately hidden without the intention of recovery.

Thankfully in this case the finder/landowner (Mrs Pretty) donated the find to the British Museum where it remains on display. The Government became aware that there were anomalies with the existing system and set about introducing new legislation. This came in the form of the Treasure Act 1996, which became law on 24 September 1997.¹ The main aim of the Act was to tightly define Treasure and improve reporting and administrative procedures. Under the new Act finders had a legal obligation to report potential Treasure finds to the Coroner of the district where the objects were found within 14 days of discovery (or upon realizing the objects might constitute Treasure). This includes: all objects (other than coins) which are at least 300 years old, with



Fig. 1 Some of the Sutton Hoo Treasure

¹ For further information about the Treasure Act 1996 and the Treasure Act Code of Practice see http://www.finds.org.uk/background/treasure_summary.asp.

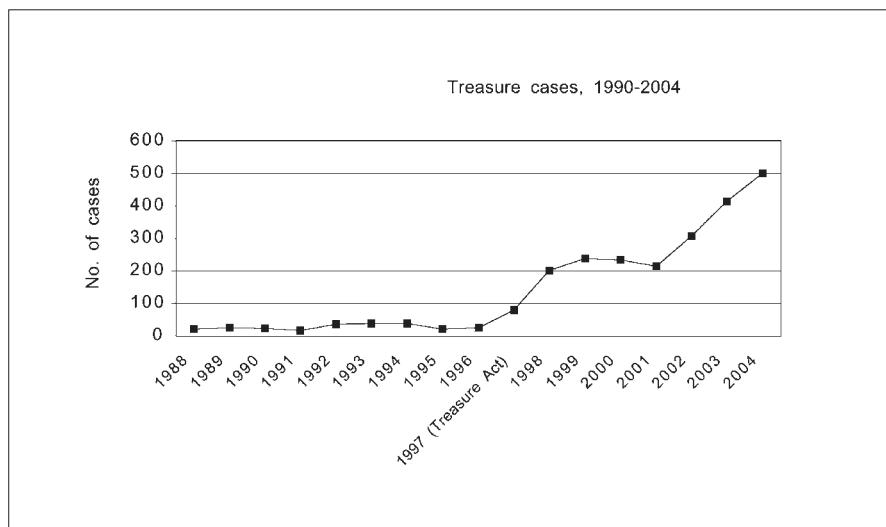


Figure 2. Treasure cases reported between 1988 and 2003

at least 10 per cent of gold or silver; all coins from the same find (two or more, provided they are at least 300 years old and are at least 10 per cent gold or silver (in the case of base-metal coins there must be 10 or more found in the same place); and all objects (no matter what they are made of) found in association with Treasure. From 1 January 2003 the Act was extended to include all prehistoric base-metal objects found in the same place. Where objects are acquired by a museum, the reward is set at the full market value determined by an independent panel known as the Treasure Valuation Committee. The reward is (normally) equally divided between the finder/s and landowner/s. Once the valuation is agreed the museum acquiring the object has four months to raise the necessary funds.

Since the Act became law there has been a great increase in finds reported. In the first full year (1998) of the Act 200 cases of Treasure were reported; this compares with an average of about 25 cases under the old law. In recent times the number of cases reported continues to increase. In 2003 there were 428 cases, and in 2004 the number is expected to be 500 or more! This increase in finds reported is explained by the clearer definition of Treasure and improved reporting arrangements and administrative procedures for dealing with Treasure. However, fundamental to the increase in the reporting of potential Treasure finds has been the establishment of the Portable Antiquities Scheme and its network of 36 Finds Liaison Officers who work with finders and encourage the reporting of archaeological finds. Research shows that the presence of a Finds Liaison Officer encourages the reporting of Treasure finds by a factor of between two and five (DCMS 2003).

2 The Portable Antiquities Scheme

In England and Wales it is legal to recover archaeological objects or metal-detect providing you have permission of the landowner and avoid scheduled ancient monuments (currently 31,400 sites). Finders of archaeological objects are only legally obliged to report finds of potential Treasure, which represents only a tiny fraction (less than one per cent) of the number of objects actually discovered. In 1995 a study of 'metal-detecting and archaeology in England' estimated that about 30,000 people actively metal-detect, finding as many as 400,000 objects each year (Dobinson and Denison 1995). This number is probably an over-estimate. Recent research shows that the number of metal-detectorists active in England and Wales is more likely to be between 7,000 and 10,000 – but still a substantial number! (MLA forthcoming).

Before the advent of the Portable Antiquities Scheme only a small proportion of 'non-Treasure' finds were recorded by museums or archaeologists, representing a loss in potential information about the historic environment. The Government recognized this and provided funding to establish six pilot schemes (in Kent, Norfolk, North Lincolnshire, the North West, the West Midlands and Yorkshire) in the autumn of 1997. The main focus of these posts was to record archaeological objects, rather than attempt to acquire them for museums. The initial pilot schemes were a great success and in the first year of the Scheme 13,500 objects were recorded by its Finds Liaison Officers (DCMS 1999). Subsequently the Heritage Lottery Fund funded a second tranche of pilot schemes in the spring of 1999 (in Dorset and Somerset, Hampshire, Northamptonshire, Suffolk and Wales). The Scheme now covered about half of England and all of Wales, and in the year 1999-2000 the Scheme was able to report that a further 31,783 had been recorded (DCMS 2001). In 2002 the Scheme made a successful Heritage Lottery Fund bid to extend the Scheme to the whole of England and Wales, employing 36 Finds Liaison Officers and a Central Unit of ten others, including specialist Finds Advisers and an Education Officer. This represents a £3 million project with funding until 1 April 2006.

The Portable Antiquities Scheme is managed by a consortium of national bodies led by MLA and includes the British Museum, English Heritage, the National Museums & Galleries of Wales and the Royal Commission on the Ancient and Historical Monuments of Wales, together with the Association of Local Government Archaeological Officers, the Council for British Archaeology, the National Council for Metal Detecting, the Society of Museum Archaeologists and the Department for Culture, Media and Sport.

The aims of the Portable Antiquities Scheme are:

- To advance knowledge of the history and archaeology of England and Wales by systematically recording archaeological objects found by the public.
- To raise awareness among the public of the educational value of archaeological finds in their context and facilitate research in them.
- To increase opportunities for active public involvement in archaeology and strengthen links between metal-detector users and archaeologists.
- To encourage all those who find archaeological objects to make them available for recording and to promote best practice by finders.
- To define the nature and scope of a scheme for recording portable antiquities in the longer term, to access the likely costs and to identify resources to enable it to be put into practice.

2.1 Finds Recording

In the period 1 April 2003 until 31 March 2004 the Scheme's 36 Finds Liaison Officers have recorded 47,099 objects, of which more than 64 per cent have been found by metal-detector users.² In the past metal-detector users have been criticized for causing damage to archaeological sites, however over 91 per cent of the finds recorded have been recovered from cultivated land, where they are susceptible to plough damage and artificial and natural corrosion processes. These finds are at risk. If finds are removed from disturbed layers and made available for recording then the finder is not only helping to preserve objects that would otherwise be lost or damaged, but this information also provides archaeologists with information about underlying archaeology which might be subject to agricultural damage. The discovery of the Early Bronze Age gold cup found at Ringlemere in Kent is a prime example. The object itself was already damaged by the plough and would have surely suffered further under the plough had it not been recovered. Further, excavation of the site revealed a barrow complex not previously known to archaeologists. Sites discovered in 2003/4 include a significant Iron Age site in East Leicestershire, a Roman cremation burial from Kent and an Anglo-Saxon cemetery on the Isle of Wight.

Obtaining good findspot precision is an important objective of the Finds Liaison Officers. Traditionally finders have been poor in providing information about where objects have been found. However, the Finds Liaison Officers have met increased success in explaining to finders the importance of knowing where objects were found. In the first year of the Scheme (1997-1998), 49 per cent of finds were recorded to the nearest 100 square metres or better (DCMS 2000). Now (2003-4), 73 per cent of finds are being recorded to the nearest 100 square metres or better and over one third of all finds are actually being recorded to the nearest 10 square metres. Some finders are even using handheld Global Positioning Systems (GPS) devices to provide good findspot precision whilst in the field and this must be the way forward.



Fig. 3 The Ringlemere cup

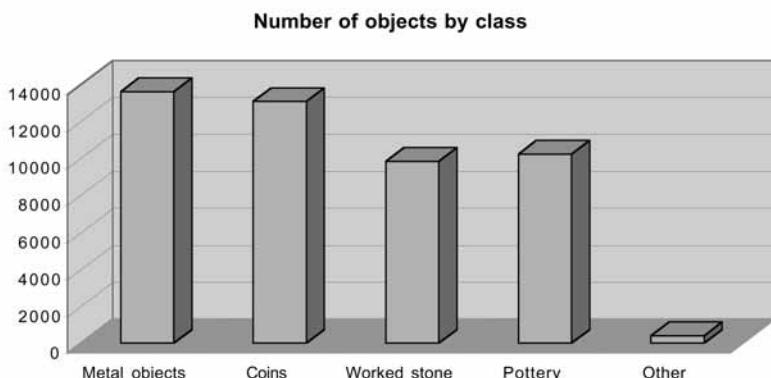
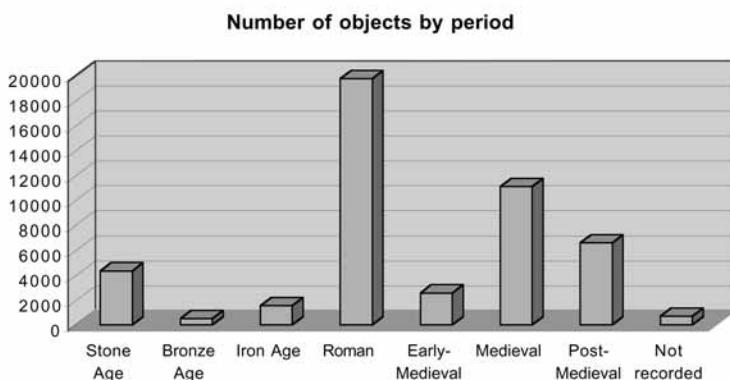


Fig. 4 Objects recorded in 2003/4 by class

In 2003/4, 56 per cent of objects recorded were metal, but over one third of all finds recorded are pottery and this may reflect the fact that the Finds Liaison Officers encourage metal-detectorists, amongst others, to pick up pottery whilst searching as all finds can add vital clues about the historic environment.

² All statistics for 2003/4 are to be found in MLA, Portable Antiquities Scheme Annual Report 2003/4 (forthcoming).

Figure 5. Objects recorded in 2003/4 by period



The quantity of Roman finds recorded by the Finds Liaison Officers is significantly the highest, followed by medieval and post-medieval finds. Generally, the Finds Liaison Officers will not record finds less than 300 years old, unless they are particularly interesting or significant, hence the numbers of post-medieval finds is less than might be expected.

2.2 The finds database

The data generated by the Portable Antiquities Scheme is made available to Historic Environment Records – the key record holders of the historic environment – and is published on the Scheme's website – www.finds.org.uk.

Between May 1998 and April 2003 all finds recorded by the Scheme were entered onto local versions of the finds database, which were periodically transferred centrally. Unfortunately, the process did not allow immediate public (or internal) access to the information about recently discovered finds and caused a lot of work (and problems) collating the data centrally. Therefore in December 2002 Oxford ArchDigital (www.oxarchdigital.com) was commissioned to design and implement a new finds database for the Scheme. This was up and running in April 2003 (for internal use and development trials) before being launched to the public in September 2003. The new system, which has been designed on cutting-edge Open-Source products (Linux and PHP), now allows the Scheme's staff to work from any computer with Internet connection and this data is automatically transferred to the central database: as soon as any find is recorded it can be made available online. It should be noted that the Finds Liaison Officers can only use approved MDA thesauri terms when recording objects and data standards are monitored (and approved) by the Scheme's Finds Advisers.³

The use of this new technology has facilitated an expansion in the quantity and quality of data generated by the Finds Liaison Officers. In 2003/4 a further 24,000 images and around 20,000 new records have been added to the database (some records can include details of more than one object). Further, the image to find ratio has risen sharply from around 10 per cent (before April 2003) to 95 per cent (by 31 March 2004) allowing more people to make use of the data.

The database uses technology which has many additional benefits. For example it is now possible to produce detailed analysis of how people use the dataset; where they come from, when they access the database, and what objects/records they look at. Amongst many other features available to the public, visitors are now able to produce detailed distribution maps and group multiple images.

³ The Scheme's Finds Advisers also have an important role training the Finds Liaison Officers in finds identification and recording, supporting

their work, talk about the Scheme and finds to the wider academic community, contribute to academic publications and identify areas of new research.

The success of the new database, can be measured in the significant increase in user hits (7,808,438 page requests of www.finds.org.uk in 2003/4) and by the worldwide audience the database now reaches, including people across the EU, and as far away as Bermuda, Kazakhstan and Oman.

2.3 Education

The Portable Antiquities Scheme has an important educational remit; both for adult learners and younger people.

The Scheme offers children a different and exciting learning experience that is based around real archaeological objects that provide a tangible link with our past. Artefact based learning, which has a local focus, gives those handling these objects a means of touching the past. This is an ideal way for children to develop an interest in archaeology and an understanding of the past. Learning through the Scheme can be formal, such as part of a lesson at school, or be informal, such as an activity day at a local museum or with members of the local Young Archaeologists Club. Through the work of the Scheme to date hundreds of children have had the opportunity to handle, draw and record archaeological finds and experience archaeological fieldwork.

The Scheme has also benefited those in further and higher education. The Finds Liaison Officers and staff of the Central Unit regularly talk to archaeology students and others about the Scheme and the benefits of liaison. In 2003/4 the Finds Liaison Officers and members of the Central Unit have given over 300 talks to nearly 9,000 people about the work of the Scheme, including both those in formal education and members of local archaeological groups and historical societies. Further, the Scheme's database is an important archaeological resource which is utilized by academics, students and the public alike. Increasing numbers of people are now undertaking important research based on the data generated by the Scheme.

The vast majority of adults learning through the Scheme are the finders themselves. In 2003/4 the Finds Liaison Officers liaised with more than 2,300 finders and attended at least 523 metal-detecting club meetings. The Finds Liaison Officers also organize regular finds recording and identification days - known as Finds Days - to encourage those that have found archaeological objects and have them recorded. In 2003/4 the Finds Liaison Officers organized 587 Finds Days, exhibitions or other events, which were attended by more than 13,000 people. Amongst the events organized in 2003/4 was a British Museum exhibition about Treasure and the Portable Antiquities Scheme called 'Buried Treasure'. 36,097 people visited the exhibition, including 637 school groups, and analysis shows that 51,981,795 people were exposed to press coverage about the exhibition. Also in October 2003 the Scheme organized a series of finds identification and recording 'roadshows' to coincide with the BBC2 television series 'Hidden Treasure', at which the Finds Liaison Officers examined over 1,300 objects.

Many of those who record their finds with the Scheme have traditionally been excluded from formal education, but have developed an interest in archaeology and history later in life: a postcode analysis showed that 48 per cent of finders recording with the Scheme are from social backgrounds C2, D & E, which compares favourably with a MORI poll of museum visitors.⁴ Liaison officers finders



Fig. 6 Children recording finds



Fig. 7 Finds Liaison Officers recording finds at a metal-detecting rally

⁴ MORI 2001, shows that 34 per cent of visitors to museums are from social backgrounds C2, D or E.

Fig. 8 Metal-detecting on an archaeological site in Lincolnshire



an opportunity to broaden their knowledge. The Finds Liaison Officers also encourage finders to become involved with archaeological fieldwork in order that they better understand how metal-detecting and other search methods can add to archaeological knowledge. In the last year members of the public have helped monitor the erosion of a Roman cemetery site in Cumbria and survey an Anglo-Saxon site in Essex.

2.4 Publicity

The Portable Antiquities Scheme website – www.finds.org.uk – continues to be an effective means of promoting the work of the Scheme. In the period of this report (especially since September 2003) use of the site has increased dramatically. This seems to be due to the showing of the BBC2 television series ‘Hidden Treasure’ (which referred to the work of the Scheme) and the launch of the Scheme’s new finds database. By the end of this reporting period web usage of www.find.org.uk is approximately 10 times greater than it was a year previously.

The Finds Liaison Officers produce both local and regional newsletters to disseminate information about the Scheme. Likewise, MLA produced a leaflet – ‘Advice for Finders of Archaeological Objects’ – which has proved very popular. The work of the Scheme also features regularly in the local press, radio and television: an article in the *Yorkshire Evening Post* about the work of Anna Marshall (South and West Yorkshire Finds Liaison Officer) referred to her as ‘Indi-ANNA Marshall’!

The Scheme has also received national and international coverage. The discovery of a unique Roman pan found in the Staffordshire Moorlands and reported to Jane Stewart (Staffordshire & West Midlands Finds Liaison Officer)

The screenshot shows the homepage of the Portable Antiquities Scheme. At the top, there's a navigation bar with links for 'Finds', 'Getting Involved', 'News', 'Background', and 'Learning'. Below the navigation is a banner with the title 'The Portable Antiquities Scheme' and a subtitle 'Finding Our Past'. The main content area has several sections: 'Introduction' (with text about the scheme), 'Regional' (with a map and 'Launch map' button), 'Showcase' (with a thumbnail of an object and text), and 'Database Search' (with a search bar and 'Read more' link). On the left sidebar, there are links for 'Skip Navigation', 'Home', 'Contact Us', 'Sitemap', 'Print Page', 'Database Search' (with a search bar and 'Read more' link), 'News' (with links to various news items like 'Portable Antiquities at the English Heritage Festival of History'), and 'Heritage Lottery Fund'.

Fig. 9 The home page of the Portable Antiquity Scheme
www.finds.org.uk

resulted in coverage in UK daily papers, such as *The Daily Mail*, *The Times*, *The Daily Telegraph* and *The Guardian*, as well as abroad in *Dawn Wednesday* (Pakistan), *Mf Nnes* (Czech Republic) and *Newsweek Polska* (Poland). Similarly, a hoard of about 15,000 Roman coins found in Thornbury, Gloucestershire featured on the BBC1 children's programme *Blue Peter*. Likewise, the discovery of a possible Viking Age ship burial in Yorkshire was covered by *BBC news*, *CNN* and Simon Holmes (North and East Yorkshire Finds Liaison Officer) was interviewed by *BBC Radio 5live* and *Radio Sweden*.

3 Summary

To date the Portable Antiquities Scheme has been a great success. Many important and interesting objects have been recorded and new archaeological sites have been discovered, most of which would remain unknown to archaeologists. There is now better cooperation and liaison between archaeologist and finders, ensuring that the historic environment is better understood, protected and preserved. The Scheme is a useful and inclusive education tool, bringing the past to life, particularly for children and those traditionally excluded from formal education. It is therefore no surprise that in a recent parliamentary debate Estelle Morris, Arts Minister, said that 'I am determined to ensure that the Portable Antiquities Scheme continues' and, of course, we welcome that news!



Fig. 10 The Staffordshire Moorlands pan

References

- DCMS, 1999. Portable Antiquities Scheme Annual Report 1997/8, 4. London.
- DCMS, 2000. Portable Antiquities Scheme Annual Report 1998/9, 43. London.
- DCMS, 2001. Portable Antiquities Scheme Annual Report 1999/2000, 4. London.
- DCMS, 2003. Treasure Annual Report 2001, 3. London.
- Dobinson, C. and S. Denison, 1995. Metal Detecting and Archaeology in England, 8. London & York.
- MLA, forthcoming. Portable Antiquities Scheme Annual Report 2003/4.
- MORI, 2001. Visitors to Museums and Galleries in the UK. London.

11 Museum catalogues and a framework for publishing new reference collections

Øyvind Eide, Jon Holmen, and Christian-Emil Ore

Abstract

In this paper we present some of the methods used at the Museum Project in Norway relating to electronic reference collections. The paper concludes by suggesting a system for creating reference collections based on artefact databases.

1 Introduction

When we were invited by Guus Lange at the ROB to give a presentation at the *eRC* conference, we were wondering if our collections were reference collections at all. After some thought however, we concluded that the material in our collections can very well be seen as reference collections. They are printed and electronic reference collections, not physical ones.

Since 1992 the Museum Project (before 1998 known as the Documentation Project) has focused on archaeological collections in Norway. A major part of the work has been to create an information system for archaeological museums. The Museum Project does not do fieldwork, but it builds databases of information from excavations, research analyses and other archaeological work. These databases contain data from on-going researches as well as digitized material from about 200 years of archaeological investigations. Norway does not have a national museum of archaeology, but the university museums fill that position for 4 of the 5 Norwegian archaeological regions.

2 The Norwegian artefact catalogues

The first aspects of the work of the Museum Project to consider are the artefact databases. For almost 170 years the archaeological museums in Norway have published specially prepared acquisition catalogues of artefacts. The descriptions of finds in these catalogues are quite extensive: they include information on the finds, the find contexts, their place and time of discovery, the finder or excavator, as well as detailed descriptions and classifications. The series of catalogues serves for practical purposes as the main artefact inventory of each museum.

The work of the Museum Project includes electronic text collection, thus it was quite natural to apply standard methods from the text encoding community and to use SGML to mark-up the catalogue texts. In 1992-2000 almost 30,000 printed pages of text were converted and SGML tagged (Holmen and Uleberg

B 6375
Migration Period grave find from Lower Stedje, Stedje parish, Sogndal parish, Northern Bergenhus County.
I.
a. Iron sword beater like Rygh fig. 150, defective. The end of the handle once had a cylindrical iron ferrule.
b. Fragments of a spindle whorl of fired clay.
[...]
d. Bucket-shaped pot made of greyish mica tempered clay, with an iron band around the rim. The body is divided by three horizontal ribbons, a single ribbon directly below the iron band, a double ribbon a little lower, - both are heavily modelled - and a more weakly incised triple ribbon a little above the bottom. The rest of the surface is covered in dense, deep, vertical furrows. On the bottom there is a three-armed motif made from incised rings. The pot as well as the decoration is poorly made. 11 cm. high, 12 cm. in diameter across the rim.
II.
a. Bronze brooch, like Rygh fig. 256, but plain and simple. See Cruciform Brooches fig. 181. The foot is slightly defective. Present length 4.9 cm. The needle was made of iron. Ill. fig. 24.
b. Bronze brooch, like B.M. Aarb. 1904, no. 6, fig. 14. Along the bow there is a groove. Iron needle. 3.9 cm. long. Ill. fig. 25.
c. One half of a small clasp with two small undecorated silver buttons on a piece of textile. The lower part of the brooch was obviously made of lead and was 2 cm. long.
d. Bronze buckle loop, closed, circular with a sharply incised groove around the entire outer edge. The needle was made of iron. The ring has an outer diameter of 3.4 cm.
[...]
Found in a long barrow, 26 m. long and 12 m. wide, of regular oval shape, aligned northwest - southeast. The mound was made of sand
[...]

Fig. 1 Parts of a museum catalogue entry.

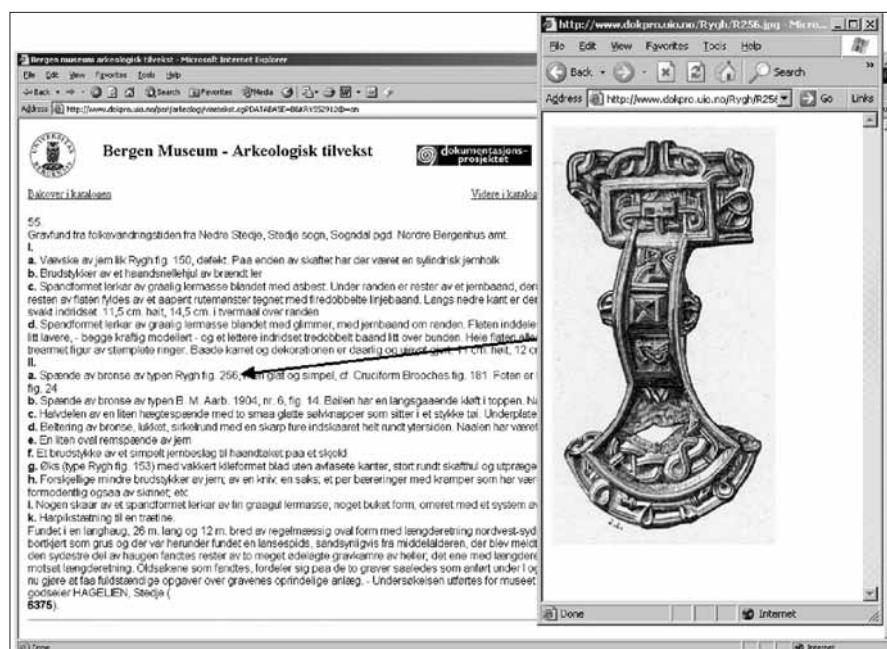
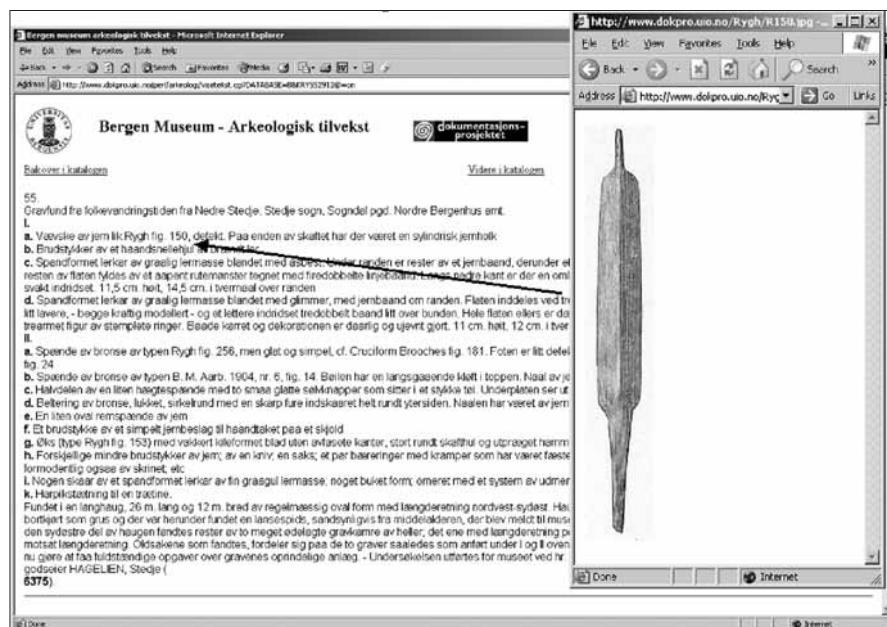
1996). The records from the SGML files were then imported into a database for a digital publication of the catalogues. At present the Museum Project is importing the same data into the new artefact collection system for the four university museums.

3 References in the catalogues

It is interesting to note that some of the references in the text of old acquisition catalogues can be described as reference collection documentation. The example below (Fig. 1) shows a fragment of a text about a group of artefacts translated into English.

The terms noting that an artefact is 'like' another example are quite comparable with a link to a reference collection. In the Museum Project system there are hyper-links from such terms to scanned images taken from approximately 750 figures held in the old but often used publication *Norske Oldsager* by Oluf Rygh (1885). When records are returned from a search in the database, links to scanned images of Rygh are automatically inserted where 'like Rygh' terms are found as shown in figures 2 and 3. The system is freely available, but only in Norwegian.¹

Fig. 2 and 3 Links to scanned images in the publication of the acquisition catalogues.



1 <http://www.dokpro.uio.no/arkæologi/bergen/hovedkat.html>

The task of making the connection to the Rygh images was relatively simple, as the tagging of the material made the information explicitly available to the computer program. An example of tagging is shown below (Fig. 4).

```
B 6375
Migration Period grave find from Lower Stedje, Stedje parish,
Sogndal parish, Northern Bergenhus County.

I.
a. Iron sword beater like Rygh fig. 150, defective. The end of
the handle once had a cylindrical iron ferrule.
b. Fragments of a spindle whorl of fired clay.
[ ... ]

Tagged text
<NRPARA><CATNR NR='B6375'>B 6375</CATNR>
<SHARED><PERIOD> Migration Period</PERIOD> <FINDTYPE>grave
find</FINDTYPE> from <FINDLOC><FARM>Lower Stedje</FARM>,
<PARISH1>Stedje</PARISH1> parish, <PARISH2>Sogndal
parish</PARISH2>, <COUNTY>Northern Bergenhus</COUNTY>
County.</FINDLOC>
<SUBPARA><SUBID>I.</SUBID>
<SUBSUBPARA><SUBSUBID>a</SUBSUBID><ARTIFACTDATA><MATERIAL>Iron
</MATERIAL> <ARTIFACT>sword beater</ARTIFACT> <FORM>like
<LITREF>Rygh fig. 150</LITREF></FORM>, defective. The end of the
handle once had a cylindrical iron
ferrule.</ARTIFACTDATA></SUBSUBPARA>
<SUBSUBPARA><SUBSUBID>b</SUBSUBID>. <ARTIFACTDATA><ARTIFACTPART>
Fragments</ARTIFACTPART> of a <ARTIFACT>spindle
whorl</ARTIFACT> of <MATERIAL>fired
clay</MATERIAL> . </ARTIFACTDATA></SUBSUBPARA>
[ ... ]
</NRPARA>
```

Fig. 4 Plain and tagged text.

The authors are not suggesting that an electronic reference collection system should look like this, but rather present this as an example of how such information in older documents can be put to use. The Museum Project's experience has other possibilities for a reference collections system; these are illustrated by work on archives from Egge in Norway.

3.1 The Egge Example

The digital archives describing archaeological activity and features in and around Egge do not describe an electronic reference collection as such, but give an example of how information from different databases can be combined in a web system (Eide et al. forthcoming).

ID	Category	TOPARK ID	TOPARK page	Acquisition catalogue id	sub id	Other source	Other source year	Other source description	Other source page	Other source filename
21	Annual report	3435					1871	Round Barrow (Zieglers nr. V ?)		
22	Report	5388	9				1971	Long elevation (natural?)		
23	Litt.					Gerhard Schøning	1774	Round Barrow	184	Schoning
25	Report	5432		T 545-546			1869	Round Barrow with grave		
44	Report	5414		T 20362	d and q		1978	Casual find from the barrow (Almås)		
45	Newspaper	4612		T 20362			1982	Beautiful Viking sword		
46	Report	5431		T 20362			1984	Late Viking age boat burial (barrow 11)		

Table 1. Part of the link table used in the Egge web system.

As part of the Museum Project's work related to the EU-funded ARENA project, we have set up a system that in principle allows the linking of any combination of archive documents to any combination of collection object records and any combination of images to any combination of sites in the Sites and Monuments Register (SMR). This opens up the possibility of creating dynamic web-publications based on any theme an archaeologist can think of as long as it is documented in the main national Norwegian databases. To demonstrate this, the authors have created a webpage for the farms Egge and Hegge in the centre of Norway.² The Egge resource uses a map to navigate sites in the area, where information from various sources can be found. Examples are the note on site number 3 stating 'No documents – plundered mound', the description for site number 19 of artefact records from the museum catalogue with images of some of the artefacts and various reports and letters, and site number 14, described by excerpts from 19th century books and a drawing from the mid 1770s. The basis for creating the webpages is a link table storing references to the various databases. A part of this table is included as Table 1, with the headers translated into English.

4 The suggested electronic reference collection system

Having considered the potential demonstrated by aspects of the Museum Project work one can ask the question: How would it be possible to base a future electronic reference collection on the large and growing collections of digital information available today?

A system similar to the Egge system could be set up to help archaeologists to create reference collection webpages. If the rows in the link table referred to items in collections held in different institutions, and the institutions made images of the artefacts available via their artefact collection databases, a webpage with information about and images of the artefacts could be created by a program similar to the one used for the Egge webpage.

² <http://www.muspro.uio.no/arena/kartpek>

ID	Institution	Ref	Inst. ID	Description
1	The Museum Project	Z39.50:...	C13247	This sword is an example of...
2	ADS	Z39.50:...
3	Danish Agency for Cultural Heritage	Z39.50:...
4	Archaeological Museum in Stavanger	http:...
5	cIMeC	OAI:...
...

Table 2 A possible link table for an electronic reference collection application

To build such a system, the various source databases will have to be connected (Table 2). Several projects have taken a similar approach, among them the ARENA project. There are problems to be solved. Firstly, technical interconnections will have to be made. A number of protocols and standards exist and are used for archaeological databases, HTTP, XML, Z39.50, CIDOC/CRM and Dublin Core being among the important ones.

When the technical interconnection problems have been solved, any project will be faced by a second set of problems. The interconnection of contents from different databases is difficult, not least because of language barriers.

5 Static or dynamic?

In addition to the questions of technical, semantic and linguistic standards, there is also the question of whether the connections in such a web-based reference collection should be dynamic or static (Eide et al. forthcoming). If an object – say a sword – from the Norwegian collection is included in a reference collection as a typical Viking age sword, the record will include only the image that exists today, e.g. a scanned black and white image.

Three years from now a series of colour images of the object may be created, and in ten years a 3D model. It would be important to have these images included in the reference collection as they are included in the database. This is an argument for dynamic publication, where the website includes whatever information is available from the database.

But what if the object is re-classified? Then the digital e-reference collection might read: ‘Type Viking age sword from Norway: Polish Viking age sword’. Of course, a reference collection including objects with a classification that is different from the one in the museum that owns it is bad practice, but a reference collection with self-contradictory information is worse. In that case, a dated publication would be better, as the information was at least correct at the time of publication.

One possible solution to this is that if a digital e-reference collection is to be dynamic, it will have to have an editor. If something happens to an object in a database, and the owner of the database has included a ‘send a message’-directive, then the database will send an e-mail to the editor stating the changes. The editor can then take action: if the change is a new image, he/she can in-

clude it in the e-reference publication. If the change is a re-classification, he/she can take the necessary action, e.g. removing the object from the e-reference resource.

6 Conclusion

The system suggested here puts the electronic reference collection external to the collection databases. But in linking the items in the electronic reference collection to selected objects in museum databases, it also links each item in a reference collection to all other related object records in the databases. All database objects pointed to from such an electronic reference collection system have a physical object in the collection as the final target, so handling the physical object is always possible (given that access is permitted by the museum and with travel expenses as a limiting factor). If such an application is made with a good user interface and a number of important artefact databases connected, the technical part of creating a reference collection webpage should be solved by the system, so that the archaeologists can invest their efforts in the work they know best: to select which artefacts are to be included in the collection.

References

- Eide, Ø., J. Holmen, and A.B. Høy-Petersen, forthcoming. Between the book and the exhibition. Creating archaeological presentations based on database information. In: Beyond the Artefact, Proceedings of the CAA2004 conference at Prato, Italy.
- Holmen, J. and E. Uleberg, 1996. Getting the most out of it - SGML-encoding of archaeological texts. Paper at the IAAC'96 Iasi conference, Romania.
URL: <http://www.dokpro.uio.no/engelsk/text/getting most out of it.html>
- Rygh, O., 1885. Norske Oldsager. Christiania.

12 Visibility of knowledge: bringing archaeological references to the fore

Irina Oberländer-Târnoveanu

1 Introduction

Archaeology is one of the largest and most important parts of cultural heritage in Romania, considering its covering in time and space, its value and diversity. From Early Palaeolithic hand axes to splendid Neolithic painted pottery, from Bronze Age hoards to remains of Roman and Byzantine civilizations, from medieval citadels to churches and cemeteries, from the Carpathian Mountains to the Danube and the Black Sea, the territory has always been a border area where influences from the South, East and West meet. Archaeological excavations and chance discoveries have brought to light archaeological material since the middle of the 19th century. Unfortunately many finds remain unpublished. Some finds have been lost, others have become useless through lack of documentation. Important archaeological cultures in Romanian archaeology are defined in a few preliminary reports and, sometimes, identified by only a few published potsherds. This is an undesirable situation not only for us in Romania, but also for colleagues abroad. Progress of knowledge about our past depends on good documentation of material culture in every part of Europe. There is a growing need for easier access to reference resources on material culture across our national borders in order to compare, identify and interpret our finds.

We should not repeat the mistakes of the past. Only a few years ago, new legislation on the protection of archaeological heritage in Romania made reporting mandatory (through Government Ordinance no. 2053/2000 regarding the protection of archaeological heritage, with its following modifications and additions). Every year about 450 excavations are undertaken in Romania. Like everywhere else in the modern world, more and more of these are preventive and rescue excavations. The modern requirements of efficiency in our work, the growing number of short-term preventive excavation projects and the pressure to produce reports and conclusions soon after excavation, as well as the current professionals' mobility impose a much shorter road from discovery to identification, processing and publication of the scientific results. Therefore better access to knowledge and reference material to assist our work is vital.

2 Dissemination of information in multiple ways

Since a few years in Romania, the preliminary archaeological reports of the previous year's excavation campaign have been published in May - June of the next year by the Institute for Cultural Memory (CIMEC)¹, with the financial support of the Ministry of Culture and Religious Affairs. It is a unique source of fresh data and a good example of using multiple ways to disseminate archaeo-

¹ www.cimec.ro

logical information: since the year 2000 we have been publishing the reports in a paper volume, on CD-ROM (with many images and hypertext links) and on the Web. The volume on paper contains the texts and only one figure for each site, due to its limited space (not more than 500 pages). The issue is also limited to 500 copies and goes mainly to authors, and libraries and archaeological organizations. The CD-ROM version offers not only the text of the reports in HTML format, with various navigational options (access through hypertext menus and through indexes on institutions, people and historical periods). It also has hundreds of images, maps and plans, and links. It is easy to carry and to study on a local computer, using an Internet browser. As many copies as necessary can be burnt at low cost. The main advantage of publication on the Web is that the same content can be accessed anytime, from anywhere, by anyone. It is there and the cost and speed of access depend on the user. For the publisher it is very convenient to use the same HTML format for both the CD-ROM and Web versions². Using the same design and structure every year is also convenient for both publisher and reader, as they become familiar with certain patterns, abbreviations and indexes. On a Web server we can publish more than only a copy of the annual CD-ROM. An online database of the archaeological excavation reports allows the user to search through thousands of short reports selected by site location, period or year of excavation. Another great advantage of the Web is the possibility of interlinking various pages and aggregating the content in new ways. The three (or even four) different forms of presentation address various user groups and complement each other in a harmonious way.

2.1 Archaeological Reference Resources on the Web

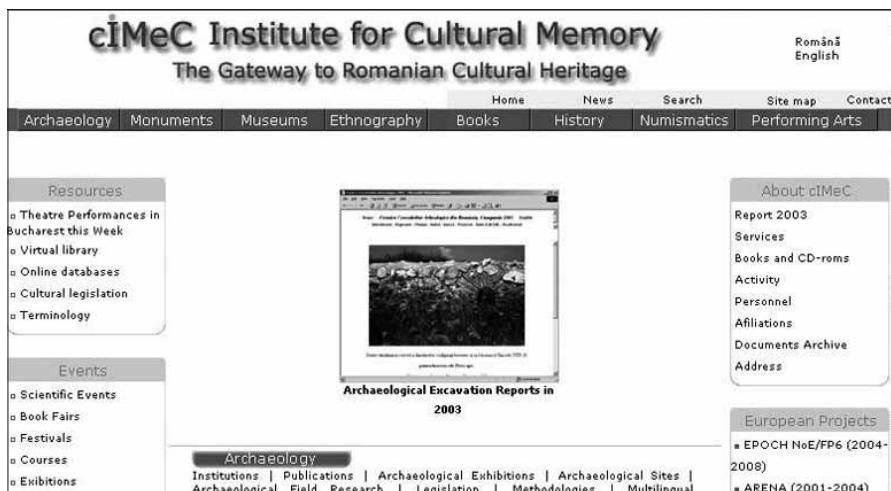
Preliminary excavation reports do not contain detailed descriptions of the finds but offer the user the basic information on what, where, when, by whom. We need more. The same methods of information dissemination, using alternative media support, can be applied to catalogues and archaeological archives. They offer specialized information much needed by professionals, but make this same information also available to education, amateurs and, sometimes unexpectedly, other purposes like inspiration for contemporary artisans. There are more monographs and catalogues available in print today than before, but the cost of publishing and distribution is high. Therefore alternative ways of publishing and disseminating knowledge in order to improve its visibility may provide a viable solution.

2.1.1 Where can archaeological reference information be found and how can access to it be improved?

Usually we look for published books, and more rarely for unpublished object cards, inventories and documentary archives. Access to documentation resources is often slow and difficult. Where do we search for archaeological references? In libraries – for published books; in archaeological organizations – for unpublished archives and reference collections; and on websites – for electronic information. The digital medium can be a good option to bring together various reference resources and make them available to a larger circle of archaeologists and other interested people. More and more people have access to the Internet and become familiar with it. More and more people go first on the Web in search of information and expect to find there what they

² <http://archweb.cimec.ro>

Fig. 1 CIMEC homepage:
<http://www.cimec.ro>



need. Last year for the first time American libraries saw a severe drop in the number of readers (20%), while the users of Google increased. Recent comments in the media on electronic libraries replacing the traditional show a trend we cannot ignore (Manera 2004). We will have to bring more knowledge to the Web.

2.2 Resources

A couple of years ago the Institute for Cultural Memory (CIMEC) started a programme of publishing reference catalogues for archaeological finds in Romania, later extended to archaeological archives too. For practical reasons, we were not able to design a comprehensive scheme to cover systematically all periods, all regions and all types of artefacts, and then follow the schedule chapter by chapter, in a logical order, using standards and controlled vocabulary, to ensure the unity of the whole picture of material culture in Romanian archaeology. It would have been ideal but entirely unrealistic due to cost, volume of work and lack of basic resources. Instead, we choose to place here and there a piece of the puzzle whenever an opportunity arose, be it in the form of a funded project, an available source already compiled and offered by its author for free, or the voluntary contribution of other organizations. We thus managed to publish on the website of our institute (Fig. 1) various reference catalogues and other resources, most of them bilingual, in Romanian and English or French.

We started from printed books, old and new, exhibition catalogues, archaeological culture monographs and original manuscripts. This means that the layout, the structure and the illustration are not uniform and can only be accessed one at a time, like books in a library. In some cases we got digital files from the authors, in others we digitized the material ourselves. Electronic publication is not a static copy of the traditional one. It is and must be an added value resource. One way or another, our work of importing, converting, checking, editing, indexing, image processing and tagging was very intensive. A selection process was used to identify those collections, topics and authors of recognized interest.



Fig. 2 Zoomorphic vase from Aeneolithic Gumelnița
3 <http://www.cimec.ro/Arheologie/gumelnita/index.htm>

Our reference resources cover several periods:

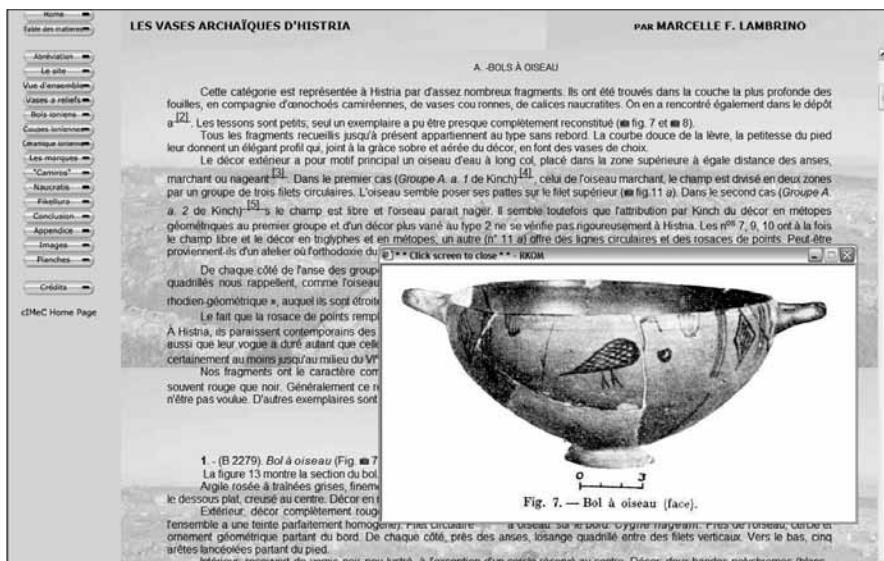
- Aeneolithic: Gumelnița culture in the Danube Plains;
- Iron Age: Dacian Finds in the South-East Carpathian Mountain Area;
- Archaic Greek: pottery from the Histria site, on the Black Sea Coast;
- Hellenistic: bowls with relief decoration from Histria;
- Roman: pottery from Histria; anthropomorphic bronze statuettes from Dacia.

Most of the resources are pottery catalogues – pottery being one of the most important archaeological find categories – but also included are collections of tools, ornaments and figurines. Some examples are:

'An Unknown Civilisation: Gumelnița' is a digital monograph published in 2003 on CD-ROM by CIMEC with contributions by archaeologists and researchers from 17 museums and institutes, and co-ordinated by Dr Silvia Marinescu-Bilcu and Dr Marian Neagu. The monograph is an up-to-date resource of the present state of knowledge: history of research (including old photos and manuscripts), general view of areas, reports on important sites, a catalogue of object finds with 300 good quality digital images (Fig. 2), bibliography, and a repertory of sites, with maps and photos. This is the first publication on that culture that is so well illustrated with coloured images. It is an archaeological reference resource based on artefacts kept in several collections, some of which unpublished until then. An itinerant exhibition of the finds and the publication of the CD-ROM on the Web drew the attention of professionals and the general public alike.

'Dacian Civilisation in the South-East Carpathians Mountains Area' is a regional catalogue of finds, most of them recent and published or exposed for the first time, and accompanying a temporary exhibition organized by Dr Valeriu Cavruc, director of the Museum of the South-East Carpathian Mountain Area in Sfantu Gheorghe in 1999. The printed catalogue of the exhibition, issued in a very

Fig. 3 Greek Archaic Vases from Histria by Marcelle Lambrino, electronic version of the catalogue published in 1938.
<http://www.cimec.ro/Arheologie/Lambrino%20vases/start.htm>



limited edition, was given a new life and better exposure in its digital version on the Web³. Its life was prolonged after the close of the exhibition and reached beyond the small circle of people who got the printed catalogue.

For the interest in reference resources on material culture, both examples illustrate the value of combining public exhibitions and their printed catalogues with Web versions. I would also like to emphasize the importance of presenting the finds catalogue together with the contextual information of the discovery, and with specific background knowledge on the history and geography of the site/area.

For a single site, the Greek and Roman City of Histria (Istria commune, Constanța County) we published pottery catalogues for three periods of the 14 centuries history of this important ancient site: Archaic Greek, Hellenistic and Early Roman. ‘Archaic Greek Vases at Histria’ is a digitized electronic version of a rare catalogue for Archaic Greek pottery discovered in the city before the Second World War and published in 1938 by Marcelle Lambrino. The importance of this digital edition is not only that it makes available a rare text to Romanian and foreign scholars. Some of the described and illustrated finds were lost later and the book may be the only evidence left. The electronic edition follows the table of contents of the printed book which became the main entry index to chapters dedicated to pottery categories and styles. But it also offers multiple ways to see the several hundreds of images, notes and references, possible only in the digital medium (Fig. 3).

The other two catalogues, ‘The Hellenistic Bowls with Relief Decoration’ by Catrinel Domăneanu⁴ and ‘The Early Roman Pottery, 1st-3rd centuries A.D.’ by Alexandru Suceveanu are new catalogues but very classic in style, focusing on description of pottery finds grouped in categories according to quality, shape, decoration style, and motifs. The text catalogue is separated by illustration, represented mainly by simplified drawings of shapes and profiles grouped in plates at the end of the volume (Fig. 4). The catalogues were published simultaneously by CIMEC in paper volumes, on CD-ROM and on the Web.

³ http://www.cimec.ro/Arheologie/mcr/html_eng/index.htm.

⁴ <http://www.cimec.ro/Arheologie/web-histria/6bibliografie/1monografie/XI/fr/histria11fr.htm>

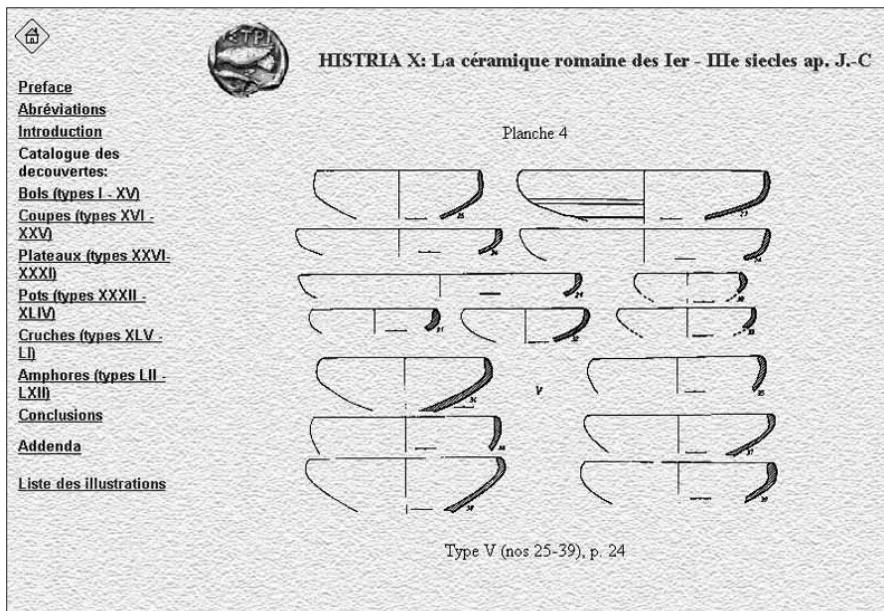


Fig. 4 Early Roman Pottery from Histria: plate with pottery profiles.
<http://www.cimec.ro/Arheologie/web-histria/6bibliografie/1monografie/X/fr/histria10fr.htm>

Again in those cases we made a French only version on paper, but added a Romanian version, more images, links and search facilities in the digital versions of the catalogues.

2.3 *Electronic or printed?*

Is there any danger that the printed book will be in competition with the digital edition?

Usually each seems to address different needs and user groups. We can say that parallel versions cover the range of options better. Sometimes the book was ordered after being browsed on the Web. Libraries order printed volumes and the CD-ROM, while CD-ROMs are easier to carry abroad or study locally without the stress of a slow Internet connection.

It is a great loss for science that so many reference resources, although processed in digital format for printing, are not published with minimum effort on the Web as well. The catalogues on the Internet are today's bricks for a future construction.

3 Digital archaeological archives as reference

The second direction in our plans to give access to archaeological reference resources is focused on historical archaeological archives. There are at least three main types of archaeological archives: private archives, institutional archives of research organizations, universities and museums, and national archives, as a result of the development of national or regional inventories of sites, monuments and collections during the 20th century. The development of the scientific research methodologies and techniques towards the end of the 19th century and the beginning of the 20th century went hand in hand with the

growing interest in the context of the finds, in the sites and cultural landscape, in the study of the past societies and in their economic, social and intellectual achievements. In institutions and private collections, the finds were increasingly accompanied by documentation: inventories, excavation diaries, notes on field walks, correspondence, drawings, plans, maps, and photos. In some countries they are well kept and filed, in others not.

In Romania we have not preserved much. Many things were lost due to wars, fire, bad management, neglect, censorship, improper storage space, and lack of conservation. Time erosion added its contribution. Only a part of these early archives have been studied or are even known.

4 Why are archives important for referencing?

Archaeological archives are important for several reasons, apart from the sentimental one, with respect to the history of the discipline:

- they contain valuable primary information on field researches;
- they were gathered at a time when archaeological remains were much more visible than today;
- the information can be revised, reanalysed and compared in accordance with progress in theory, excavation techniques and new archaeological discoveries.

5 Current projects

We are currently involved in several digitization projects. One project is the digitization of the paper card archive of the 'Vasile Pârvan' Institute of Archaeology in Bucharest, known under the name of *Archaeological Repertory of Romania*. The other is the digital archiving and electronic publication of manuscripts and documents of the historic archive of the former National Museum of Antiquities, which is kept at the 'Vasile Pârvan' Institute of Archaeology in Bucharest (Fig. 5). The Digital Archives of Archaeology can be visited by the public at the CIMEC website. The project of digitizing the Archaeological Repertory of Romania archive started in 2001, following a co-operation agreement between CIMEC and the Institute of Archaeology (Oberländer-Târnoveanu 2004). It aims at critically extracting the basic information from the manuscript into a database (location, site type, period, and bibliographic reference), and selectively scanning the original manuscript cards for digital archiving. A working group proposed the data model. A database application (Access 2000) was designed for the aims of the project. The Institute of Archaeology is responsible for cataloguing, and CIMEC is responsible for the database maintenance, the scanning of the original cards, image processing, inscribing the files on CD-ROMs, and publishing the data of public interest on the Web. At least one copy is stored in each location. The database will act as a search index, and the user also has the possibility of reading the original cards on screen. The result of this enterprise will be a digital archive with searching facilities, on CD-ROMs, suitable for reference, research and further study, up-dating and dissemination.

The project followed several stages. The first operation was to make an inventory of the archive, as nobody knew beforehand whether we had 50,000 or 100,000 pages. After the identification and recording of the localities for each county, we could establish the volume of information: there were 32,000 documents, covering 4,600 localities. This kind of descriptive statistics allowed for the first

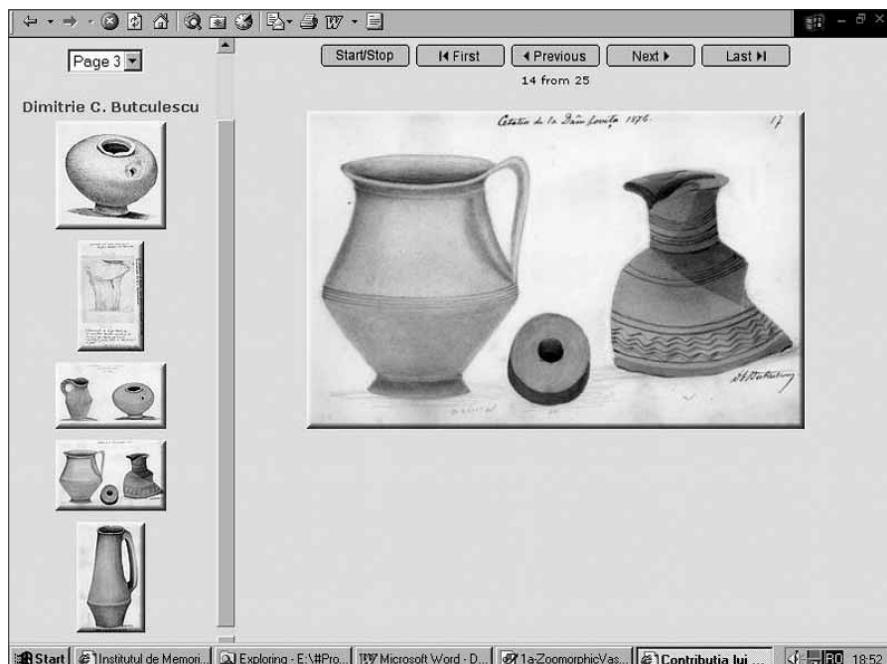


Fig. 5 Dimitrie Butculescu
Archaeological Archive: Drawings
of finds from 1867.
[http://www.cimec.ro/Arheologie/
ArhivaDigitala](http://www.cimec.ro/Arheologie/ArhivaDigitala)

time to get an overview of the contents of the archive. Two months after the work started, we solved the puzzle of the number of cards and had given identification numbers to each card page, for reference. At CIMEC, the localities and areas of discovery were identified in the official file of the administrative organisation in Romania (SIRUTA), and unique administrative entity identification codes were provided.

With the purpose of creating an index database, the second project on digitizing the archives of the archaeological institute was started. The scanning of the text archive and the extraction and recording of its basic content were done in parallel.

What are the expected results?

- To save the archive and to facilitate access to it in digital format;
- To provide search indexes on location, period, site type;
- To include the information in the National Archaeological Record Database;
- To provide a bibliographic reference index;
- To create a searchable digital resource with a friendly user interface for searching, browsing, zooming and printing;
- To publish in digital format.

A similar approach is suitable for processing and bringing to the Web museum collections catalogues on paper cards whenever there are scarce human and financial resources to enter the entire catalogue on computer. A combination of creating a database for searching the content and scanning the documents for consultation on screen can speed up the process of digitizing large amounts of valuable data with limited access and making them available on the Web and on CD-ROM/ DVD.

6 Integrating the resources

If we can agree that making archaeological knowledge available online is useful, may save time and stimulate research, we can also agree that collaboration and will of the professional community is required for integrating the present and future resources in the Internet virtual library in a meaningful way. Reference collections in archaeology embrace real objects but also catalogues and repertoires of artefacts, with their associated image archives. There are problems of access because of language, different classification systems, poor standards for images and lack of authority files at national and European level. The analytical archaeology of the 1960s and the expert systems of the 1980s tried to identify and classify the artefacts based on geometrical shapes, angles and dimensions. Today it is obvious that artefacts cannot be understood and explained independent of context, function, meaning, using interdisciplinary approaches. Material culture is the source of knowledge for the history of Europe. We need to maintain and develop the capacity of recognizing it and attaching sense to it.

References

Manera, L., 2004. Una cultura made in Google. In: Corriere della Sera, 20 April 2004, p. 35.

Oberländer-Târnoveanu, I., 2004. Access to Romanian Archaeological Archives, Archaeology Data Service News, Spring-Summer 2004, <http://ads.ahds.ac.uk>.

13 Addressing the reference collections dilemma: the eRC (European Reference Collections) bid for European Commission funding under Culture 2000

Jonathan Kenny

1 Introduction

This paper outlines a bid made to the European Commission under the Culture 2000 programme to create the foundations of a European Reference Collection (*eRC2004*) resource. The bid was made for projects beginning in 2004. At the time of the conference at which this paper was given the results of the call were not fully known.

The project sets out achievable objectives with an immediate benefit to multiple user groups whilst at the same time providing the groundwork for a broader vision for reference collections in the future. The *eRC2004* project will develop basic common ground amongst eleven partners from separate states across Europe:

- Locating reference resources.
- Enhancing their discovery through an online metadata resource.
- Encouraging the creation of exemplar resources amongst the partners and promoting the use of these resources throughout Europe.
- Developing multilingual resources and ontologies (towards a knowledge infrastructure)

Through these four activities the project is designed to create a lasting resource and lay the foundations of a broader 'open knowledge infrastructure'. Any such infrastructure will feed into the development of future information technology developments such as the 'grid' or 'semantic web'.

The inspiration for the *eRC2004* bid came from the work of Guus Lange and Annet Nieuwhof at the Rijksdienst voor het Oudheidkundig Bodemonderzoek (ROB) in the Netherlands. Their report published in 2003 revealed a dilemma in the creation, use and management of reference collections in Holland. Lange followed up the report with a 'straw poll' of colleagues across Europe that suggested the same problems exist elsewhere. Following a number of conference papers given by Lange on the subject, a partnership developed between those keen to address the dilemma (Lange 2002, 2004). The Archaeology Data Service (ADS) at the University of York took on the role of coordinating a bid to create an *eRC* project with Culture 2000 funding.

The ADS is lead partner in ARENA, a current Culture 2000 project; all of the ARENA partners became founding partners in *eRC2004*. In addition to the six original ARENA partners five more were added to create a strong group with a wide range of skills. This paper outlines what the *eRC2004* bid intends to do and why it wants to do it. The first question that needed addressing was inevitably the definition of a reference collection?

1.1 *What is a reference collection?*

Understanding the past through the practice of archaeology is founded on our understanding of materials and material culture. Recent research at the ROB (Nieuwhof and Lange 2003) in the Netherlands has identified a growing gap between the practice of archaeology and the continued gathering, dissemination and classification of knowledge about material culture. Knowledge of materials and material culture is generated and disseminated by groups of specialists.

These specialists identify common types of material and by classifying and interpreting meaning from this material, according to the context in which it is found, enhance our understanding and interpretation of the past. These classifications are used on a day-to-day basis to interpret archaeological sites, yet those wishing to apply, learn or develop skills in this field do not easily find physical or written representations of the classifications.

It should be stressed that the eRC2004 partnership recognizes that setting a particular reference collection in stone as the only interpretation of material culture is a seriously flawed approach. The research process can and should challenge and revise existing reference collections; online resources such as those proposed by eRC2004 can easily allow such revisions to be published alongside the original.

The publication of reference collection discovery aids and online resources based on specific collections will provide archaeologists with classifications to aid day-to-day interpretation that should be used in a reflexive manner. The strength of providing reference collections as part of a digital resource is that differences between reference collections will be highlighted, thereby encouraging debate rather than stifling it.

The ROB study distinguished three types of archaeological reference collections:

- Excavation Archives: Collections with a more or less complete set of excavated remains, which are the ‘monuments ex situ’. One can use these collections for comparison with one’s own data. Access is through the excavation documentation and finds repository.
- Themed Collections: A collection of selected archaeological remains with a special theme or purpose: for example for aesthetic reasons or for historical or scientific value. An example could be the archaeological remains from one period, or region or of one type of material (amateur collections and museum collections are good examples).
- Specific Reference Collections: A collection, as complete as possible, systematically ordered, of remains from one material group or subset of a material group. The purpose of these collections is to allow interested parties to answer questions about material that they have: what is it, what do we call it, what date is it and where is it from?

The eRC2004 project is designed to be a virtual reference to physical reference collections in Europe. This will be achieved through two activities:

- Metadata creation and searching. The metadata will include descriptive metadata, reference to literature, and reference to locations of physical collections.
- Specific exemplar Internet reference resources of European significance based on reference collections held at local or regional levels.

1.2 Putting the e into eRC

The title of the project developed during Guus Lange's workshops on the subject and at the early stages of the Culture 2000 bid. The use of the lower case e in the title of eRC has a dual meaning. It refers to the electronic nature of this resource, symbolizing the potential inherent in electronic archives and resources. The second symbolism of the e in eRC is of course the European nature of the project.

1.3 Addressing Multiple Audiences

The National Reference Collection recommended by the Nieuwhof and Lange report was aimed at archaeologists and researchers in the first instance. An important aspect of the eRC2004 partnership is to promote the use of knowledge and resources about reference collections to a wide range of users through the use of information and communication technology (ICT). ICT will allow the same basic data to be made available to a wide range of targeted users. In the first instance contract archaeologists, researchers, academics, teachers and students. In addition to the professional, research and educational user, eRC2004 will also inform people wishing to study their local heritage or tourists preparing their visits. All will benefit from some aspect of the eRC knowledge base. This innovative approach to material culture is being developed only slowly in some parts of Europe; eRC2004 is designed to be an exemplar of what can be done to serve a variety of users.

1.4 The Reference Collections Dilemma

The study of material culture is central to the interpretation of the past through the process of archaeology. The research carried out by the ROB has identified a gap between the specialists in this field of study and the materials with which they work. Specialists have to rely on their own resources to identify finds from sites and excavations. There is a lack of specially gathered comparative collections and a lack of knowledge about the location of such resources that can be used in the research process.

This knowledge gap is not confined to the specialist working with material culture. The European citizen experiences the past through expert interpretation, this is often skilfully achieved through heritage or museum presentations but the role of finds in the interpretive process is not often made clear.

It is this knowledge gap that eRC2004 seeks to address. In addressing the knowledge gap eRC2004 will work in a Europe wide context highlighting the common cultural heritage of Europe by making it possible to search for resources and access key collections of European significance from 11 nations.

2 Project work and partnership

The eRC initiative has broad and long-term ambitions, illustrated at the workshop held in Amersfoort in May 2004, from which this paper is derived. To achieve these ambitions a number of actions are required. First the momentum of the workshop needs to be carried forward, keeping those who

support the eRC concept in touch with each other; this can potentially be achieved through meeting at the European Association of Archaeologists every year. But to take matters forward in a practical sense finances need to be raised to allow people to work on the initiative. This is the objective of the eRC2004 bid, to create a model by which, on the one hand communication in a network is kept open and on the other hand specific project work takes the initiative forward.

2.1 *The Partnership*

Who then were the partners in the eRC2004 bid to Culture 2000? The roots of the partnership were in the established ARENA project (<http://ads.ahds.ac.uk/arena/>). This brought together:

- The Archaeology Data Service, University of York, UK
- The National Agency for Cultural Heritage, Copenhagen, Denmark
- The Museum Project, University of Oslo, Norway
- CIMEC, Institute for Cultural Memory, Romania
- FSÍ, The Institute of Archaeology, Iceland
- Poznan Archaeological Museum, Poznan, Poland

The ARENA network works on the preservation of digital archaeological archives and on making such archives accessible and searchable through web and portal technologies (Kenny and Kilbride 2002; Kenny et al. 2003; Kenny and Kilbride 2004). Consequently the ARENA partners were all interested in the application of information technologies to the reference collections dilemma highlighted by Nieuwhof and Lange. Interest was high amongst other archaeological heritage organizations leading to the rapid addition of five more partners to the eRC2004 bid:

- PIN scrl – Education and Research Services for the University of Florence Prato Italy
- Institute for the Archaeological Heritage, Scientific Institution of the Ministry of Flanders, Brussels, Belgium
- Laboratorio de Arqueoloxía Instituto de Estudios Galegos Padre Sarmiento (IEGPS), Spanish High Council for Research (CSIC), Santiago de Compostela, Spain
- Rijksdienst voor het Oudheidkundig Bodemonderzoek (ROB), The National Service for Archaeological Heritage, Amersfoort, The Netherlands
- National Board of Antiquities, Helsinki, Finland.

This partnership is strong in many ways, bringing together organizations, some with a national heritage remit, some with special collections ideal as exemplar reference resources and others with the required technical skills to make the project work.

3 Project work deliverables

The important advantage of taking the eRC initiative forward on the back of project work is that each project has to have defined and achievable deliverables. Thus although the eRC2004 bid had room for the discussion of principles at conference sessions it also had to carry out practical work to achieve an ultimate goal in a three-year period. eRC2004 set out to achieve three goals: to innovate,

demonstrate and educate. To meet these goals practical steps were set out:

- To create exemplar reference resources.
- To create a metadata resource facilitating the discovery of reference collections.
- To create multilingual resources based around a tightly specified ontology.
- To disseminate and publicize the project through appropriate conferences.

3.1 Exemplar resources

The objective of the eRC2004 exemplars is to create Internet resources based on reference collections that allow archaeologists and researchers access to specific online collections or for citizens to engage in study or 'lifelong learning'. Each exemplar resource is to be aimed at a specific group. This is to include archaeologists and researchers but also other potential user groups. The exemplar resources are to act as demonstrators of the potential in reference collections as part of a common European heritage.

Each resource is to be used as an 'out-reach' demonstration of the value of European reference collections to a variety of targeted user groups. 'Out-reach' exemplars are to be located online, they are to be promoted by the partnership and some are to be demonstrated at suitable local community centres or museums depending on the objectives of the work package. Each eRC2004 partner is to be responsible for a resource and the subsequent 'out-reach' work associated with it. Technical assistance is to be provided by other partners where required, utilizing the shared resources of the partnership. Such resources are becoming available in the UK, for example: The Worcestershire On-Line Fabric Type Series¹ and the Lower Palaeolithic technology, raw material and population ecology².

3.2 A Searchable Metadata Resource

The eRC2004 project is designed to unlock the potential and rich content of European Archaeological Reference Collections for citizens and experts alike. To achieve this eRC2004 will develop an Internet-based knowledge management system intend to allow citizens and experts to discover reference collections across Europe. All partners will be active in locating archaeological reference collections and creating metadata records describing them. This metadata will then be used to create a resource discovery facility made open to all through an interoperable Internet- based knowledge management system.

The objectives of creating the Metadata resource are:

- To create and maintain a project website that will allow access to the main eRC2004 resources.
- To collect, create and make available online, metadata describing reference collections held by institutions, groups, companies or individuals in the region of each partner. The metadata will also contain details of specialists working with such material. This will become the core information resource that could be searched through the eRC2004 network online presence.
- Interoperability will be necessary to make the web resource work easily; this will require maintenance and the development of technical infrastructure to allow cross searching of metadata and web delivery of exemplar projects.

¹ <http://www.worcestershireceramics.org/>

² <http://ads.ahds.ac.uk/catalogue/specColl/bifaces/index.cfm>

The eRC2004 partners will investigate and demonstrate the value of interoperability between resources for the European citizen. This will take forward the work of projects such as ARENA by developing an interface that will allow multiple user group access to the same resources. This will involve the practical use of metadata standards and communications protocols to allow interoperability between numerous data providers. The day-to-day collection of metadata will be aided by the development of a tool for the creation of metadata, including agreed controlled terms and standards.

This eRC2004 activity will meet an urgent need to bridge the gap between people who wish to study material culture and the material itself. By locating and encouraging the use of reference collections, the value of these resources will be re-established with both those who maintain them and the users.

The expected result of this activity is to create a key resource for anyone wishing to locate reference collections in Europe. Interoperability will be achieved between data holders who have a wide variety of technical and financial profiles. The activity will also create a state-of-the-art multilingual search interface and a multilingual metadata collection tool for archaeological reference collections.

3.3 Disseminate and Publicize

The eRC2004 network will hold workshops, roundtables or sessions at two international conferences each year. The conferences used will be the annual Computer Applications and Quantitative Methods in Archaeology conference (CAA) and the meeting of the European Association of Archaeologists (EAA). Conference participation will disseminate knowledge about the development of the eRC2004 network. The eRC2004 network will also organize a conference or symposium at the end of the project proposing the metadata, thesauri and ontologies used in the project as European standards. The concluding conference will result in a guide to good practice in managing metadata for reference collections in archaeology.

The objectives of this eRC2004 activity are:

- To disseminate the lessons learned in the technical development of eRC2004 to appropriate European audiences in archaeology, archiving and museums fields.
- To leave a lasting legacy through the dissemination of knowledge and by publicizing and publishing the metadata standards, thesauri and ontologies created by the project.

This activity will put the eRC2004 network at the centre of investigation into the use of archives and collections as resources available to many user groups across Europe. The activity will in particular inform academics, managers, researchers, technicians and heritage professionals. By informing the above target group of the potential demonstrated by the eRC2004 network, the European citizen is to benefit from many other applications of the same technologies and network approaches to knowledge systems.

It is anticipated that this eRC2004 activity will raise awareness of threats to archaeological reference resources, promote standards and interoperability at a European level and continue the development of European archaeological archiving networks such as ARENA. The activity will also have promoted both the use of the eRC resource and the preservation and value of European archaeological reference collections.

3.4 Developing multilingual resources and ontology (towards a knowledge infrastructure or even the semantic web)

The eRC2004 partnership will develop a tool for the creation of metadata and a search interface, permitting multilingual and intuitive searching of the eRC2004 resources. To facilitate this will require the development of a multilingual thesaurus and ontology to sit at the heart of the metadata tool and the search system. The partners will hold regular meetings to develop multilingual resources, monitor progress and facilitate exchange of skills and knowledge.

The objectives of this activity are:

- To coordinate the development of a multilingual thesaurus of controlled terms in specific areas.
- To coordinate the development a multilingual ontology from the controlled terms above.
- To develop eRC recommended standards in specific fields as part of metadata creation.
- To develop multilingual metadata searching.

In the first place this activity will target the eRC2004 partners as they develop the metadata tool and search interface. Once the activity is complete, it will have direct application for the European citizen and expert, as it will facilitate searching of the metadata collected in the activity described in 3.2. The development of standards and the creation of a good practice guide to managing metadata for reference collections in archaeology will have direct benefit for archives and museums professionals throughout Europe. The eRC project will ensure that it relates to other projects developing multilingual resources in cultural heritage, in particular HEIRIN and MICHAEL.

This eRC2004 activity is designed to facilitate the development of a metadata collecting tool and multilingual resources required for use in the search interface. The completion of the thesaurus and ontology work will allow multilingual searching in specific areas and will allow the metadata collection tool to become multilingual in specific areas. The thesaurus and ontology meetings will also allow the exchange of skills and knowledge between partners with varied areas of expertise.

3.5 Where is eRC going?

The outcome of the eRC2004 bid to Culture 2000 was unknown at the time this paper was given. Even if this bid is not successful the partnership that it brought together is still strong and in place to bid for other project work. Whilst project funding is not available there are of course opportunities to discuss specific issues on a European scale. In addition to these actions the eRC concept may be of interest to other bodies, particularly the newly formed EU Framework 6 networks of excellence (EPOCH) and integrated projects (BRICKS).

References

- Kenny, J. and W.G. Kilbride, 2002. Networked Access to Digital Archaeological Archives in the European Arena, CSA Newsletter Vol. XV, No. 2 - Fall, 2002.
Online at: <http://csanet.org/newsletter/fall02/nlf0202.html> (last checked November 2004).
- Kenny, J. and W.G. Kilbride, 2004. Europe's electronic inheritance: The ARENA project and digital preservation in European archaeology. In: K.F. Ausserer, W. Borner, M. Goriany, and L. Karlhuber-Vockl (eds), Enter the Past: The E-way into the Four Dimensions of Cultural Heritage, Computer Applications and Quantitative Methods in Archaeology 2003, BAR International Series 1227, 130-133.
- Kenny, J., W.G. Kilbride, and J.D. Richards, 2003. Enter the ARENA: preservation and access for Europe's archaeological archives. In: M. Doerr and A. Sarris (eds), Computer Applications and Quantitative Methods in Archaeology 2002, Archive of Monuments and Publications, Hellenic Ministry of Culture, 349-353.
- Lange, A.G., 2002. Co-operation in the development and exploitation of National Reference Collections, The European Archaeologist, vol 18.
- Lange, A.G., 2004. International Reference Collections. In: K.F. Ausserer, W. Borner, M. Goriany, and L. Karlhuber-Vockl (eds), Enter the Past: The E-way into the Four Dimensions of Cultural Heritage, Computer Applications and Quantitative Methods in Archaeology 2003, BAR International Series 1227, 137-140.
- Nieuwhof, A. and A.G. Lange, 2003. Op weg naar een Nationale Referentiecollectie Archeologie: Eindrapport Haalbaarheidsonderzoek NRc, Rijksdienst voor het Oudheidkundig Bodemonderzoek, Amersfoort.

14 Top down and bottom up – two perspectives on reference collections

Henrik Jarl Hansen

1 Introduction

Two different approaches are taken in this paper to the concept of reference collections. The first one is the ‘top-down approach’ describing the efforts made in Denmark to establish a national overview of museum collections, and as such also an index to reference collections. The other view is the ‘bottom-up approach’, which examines the possibility of contributing information from archaeological excavations, in this case one excavation which has the status of a classic reference site.

2 The top-down approach

The Danish National Cultural Heritage Agency¹ was established at the turn of the year 2001 as one of the consequences of the revision of the Museum Act in 2001. The new Agency was created as a merger of different institutions of the Ministry of Environment and the Ministry of Culture. Among others the Cultural Heritage Agency was given the responsibility for the further development of a number of national heritage databases. The databases were of different age, made for diverse purposes and used a number of different techniques and platforms. Despite their differences they can be grouped into two families representing respectively the movable and the non-movable cultural heritage. The Agency is at the moment in the process of upgrading the databases to a common technical platform and implementing a three-layered architecture matching the recommendations for public information systems and digital services. This means easier access to information and facilitates information retrieval.

The initiative is important for the establishment of a national overview of the collections in the Danish museums and as such relevant for the topic of reference collections dealt with in this paper. Denmark has approximately 150 museums that are either state museums or museums partly funded by the state. The latter is the major category.

The first step has been taken with the development of a new system for the recording and presentation of the collections in Danish museums. The concept behind the system is that each museum makes its recordings in a central database using a web browser interface. The central database is operated and maintained by the Agency and the data is stored in such a way that each museum has its own private domain, where they can record and archive text, pictures as well as information that is only relevant for the museum in question.

1 www.kuas.dk

A subset of the recorded information from each museum is exported to the public sphere in order to create a national overview of collections in the Danish museums. The system, called 'Museernes Samlinger' (The Museum Collections)^{2,3}, was implemented at the beginning of 2004 and during the first year of its existence a systematic conversion of data from an older, widely dispersed decentralized system has taken place in parallel with the education of museum personnel. It is expected that by the end of this year (2004) fifty local museums will be represented in the system and basic information about approximately 100,000 items will be public available. Ten percent of these will probably represent archaeological artefacts. The first version of the system is aimed at the many local culture history museums. A version for the art museums will follow during 2005, while there are no actual plans for the few natural history museums. Within the next five years it is expected that all 150 museums will participate in the national overview either by direct use of the recording system or by XML-based imports. The latter possibility is likely to be used by larger museums such as the two national museums for art and for culture history, both of which have implemented their own recording systems years ago. According to the Museum Act all state museums and state-supported museums must contribute to the heritage databases in order to establish the national overview.

The initiative of establishing a national recording and presentation system is backed by central funding for the decentralized recording of information over the coming years. It is expected that this will mean a pronounced growth in available information in 'Museernes Samlinger' and a strongly improved national overview of the collections in the form of both text and pictures. We expect within the next 5-10 years to be able to present the total overview of the collections in Danish museums. This will give both the museum professionals and researchers and the public access to the relevant information about the cultural heritage collections.

The National Cultural Heritage Agency has also taken over the responsibility for a web presentation called 'Danish Museums Online' (DMOL)⁴, which is meant to be a presentation of the Danish museums and their diversity. The presentation is both focusing on the different types of museum collections and on facts about the individual museums aimed at the visitors. DMOL is most likely to be merged in the near future with 'Museernes Samlinger'. The result will be one integrated recording and presentation system to be used both by museum professionals and the public. This system can be expected to function as an advanced index to the different types of collections held by the Danish museums.

The above-mentioned initiative is focussing on the movable heritage and it represents the first phase towards the integration of the national cultural heritage databases on the described common platform. Phase two is the upgrading of the recording systems for the non-movable heritage. First in line, and hardly relevant for the topic of reference collections, is a revision of a recording system for the built-up heritage, which in this case covers the buildings worthy of preservation and scheduled buildings. The system will be launched during summer 2005 and will integrate a new version of the mapping interface (GIS), which again will later be used in coordination with the archaeological databases.

The archaeological databases are expected to be upgraded during the following two years (2005 and 2006) aiming at the integration of the existing systems used for the recording, management and presentation of the archaeological

2 www.kulturhistorieonline.dk

3 until the beginning of 2005 only an older test version is available from this address.

4 www.dmol.dk

heritage in Denmark. The systems in question are the large national sites and monuments record 'Fund og Fortidsminder'⁵ and a national database for the protected monuments 'Fredede Fortidsminder'. The two databases have common roots going back to the 1980s but have since then served different purposes in different ministries until they were recently joined again in the Agency. The national archaeological sites and monuments database is accessible to the public, while the database of protected monuments is not yet made publicly available.

Related to the implementation of the revised museum act, a special archaeological recording project is taking place in order to register the so-called 'Kulturarvsarealer' (Cultural Heritage Areas)⁶. The aim is to identify and record known but not scheduled archaeological areas of national importance. The information about the cultural heritage areas are made publicly available through the national sites and monuments record. The result can be seen as an important extension to the publicly available information system for archaeology.

With the above described initiatives on the merging of databases of the non-movable heritage we should be able to offer an advanced index to the archaeological knowledge in Denmark and as such also to reference collections.

As a response to a number of initiatives on the regional collaboration between museums, archives and libraries, the Ministry of Culture has commissioned a working group to draft recommendations on the exchange of information across the sectors and to establish common search facilities. The work is in progress in mapping selected major cultural heritage databases to 'Dublin Core' metadata. Such cross-searching initiatives can be of importance for reference collections and for the possibility of finding related relevant information. For archaeology it is both important to get information on the artefacts and on the sites where they were found. The web-based pilot project 'Guder & Grave' (Gods & Graves)⁷ of 1996/97 illustrates this point, based on Danish Bronze Age material. Cross searching will be a significant issue in the further development of the heritage information systems.

The mapping of heritage databases to Dublin Core metadata has also been the focus during the Culture 2000 funded Arena project⁸, which is near its conclusion. As described by Richards (this volume), the Arena search portal is providing access to a number of national or regional archaeological databases, one of these being the Danish sites and monuments record (Fund og Fortidsminder)⁹.

3 The bottom-up approach

In some ways Arena is also connected with the bottom-up approach to reference collections. Within the framework of the project, the five partners have established archive facilities for digital information from archaeological excavations. One of the archives is the rich Iron Age site of Dankirke¹⁰, which is regarded as a Danish archaeological reference location even though it is limited in size, covering an excavated area of approximately 3000 square metres. The site is located in the southwestern part of Jutland, Denmark, close to the North Sea and was found as a result of the search for the Viking Age settlement of the present town of Ribe. Dankirke was excavated during the second half of the 1960s.

Part of the information about the excavation was digitized in the mid-1990s and pictures were taken of the many artefacts found on the site as part of the

⁵ www.dkconline.dk

⁶ www.kulturarvsarealer.dk

⁷ www.guderoggrave.dk

⁸ <http://ads.ahds.ac.uk/arena/>

⁹ www.dkconline.dk

¹⁰ <http://udgravningsarkiver.ancher.kulturhotel.dk/dankirke.htm>

National Museums systematic recording process. The pictures of the Dankirke artefacts were later digitized. They can be downloaded, together with the digitized excavation plans, for research purposes either through the Arena portal or the national excavation archive held by the Agency.

Dankirke is of interest to the topic of this paper, because the site is often referred to in scientific discussions even though the material has only partly been published. This is a fate well known from many other archaeological excavations. Digital access to the material may help to solve this problem in the future.

The finds from Dankirke cover a period from around the 2nd century BC until late 8th century AD; they represent a significant inventory especially from the late Roman and the Migration periods including many metal artefacts and types of imported glass. The combination of finds has led to the description of Dankirke as a site of prosperity, a rich farm as well as a centre of trade.

At the time of excavation both the rich finds and the pronounced house plans from the 4th - 5th century were quite remarkable. The situation has changed completely since then, not least due to the frequent use of metal detectors on Iron Age locations. Thanks to this change of situation Dankirke has lost some of its original importance. However, it is still important to present the finds and documentation of the site in its entirety in order to facilitate archaeological research. One way is to make the material digitally available.

Within the framework of a project on reference collections we plan to digitize the remaining material and describe the finds and structures using metadata in order to develop and test advanced search facilities. Dankirke is considered a test case representing the type of older excavations, where the original documenting material was not yet digital.

4 Conclusion

The two opposing perspectives described in this paper sets out possible routes to reference collections. Taking the top-down approach it is both possible and realistic within a few years to establish a national overview of all the collections in the Danish museums and as such to generate an index to reference collections. The bottom-up approach examines the possibility of contributing in detail to reference collections by making substantial digital information from an archaeological excavation available to different user groups including researchers. The two approaches are not contradictory, they are meant to supplement each other. One can envisage the two approaches converging over time in order to supplement and enrich each other.

15 ICT and the future of reference collections

Franco Niccolucci

Abstract

The present paper presents some reflections concerning the use of ICT to manage Reference Collections and invites researchers to maintain a rationally critical attitude towards such applications. Some techniques that may help on this regard, as fuzzy logic and XML data encoding, are briefly summarized with archaeological application examples, and it is suggested how these may be beneficial in digital reference collections management.

1 Introduction

The presence of Information and Communication Technologies in the everyday life of most of us is nowadays so pervasive that, unless we are very old or very conservative, we cannot conceive working without them. Such an unconscious dependence on technology occurs even in archaeology, where most professionals still prefer to do their job the hard way, but soft technologies – as laser scanning, non-invasive analysis and automatic data recording – are making their way in daily practice and are eventually going to prevail on trowels and paper notepads. In everybody's opinion, the right way to manage information is to digitize it and store it into a computer, better if it can be remotely accessed through the Internet. However, daily practice, easiness of use and transparency of user's interface make us less conscious that even today's sophisticated computing tools have limits and just improving their performance or storage capacity cannot cancel such defects at all. We must live with the stupidity of computers and their lack of *esprit de finesse*, so we must devise survival strategies.

This paper is dedicated to provide some hints and caveats relating to these problems, as far as digital reference collections are concerned.

2 Subjectivity and uncertainty

It is well known that Archaeological Theory has dealt since long with the issue of data objectivity/subjectivity. The so-called post-processual school has insisted that the impact of the researcher's individual perspective inherently imprints data acquisition and processing so that a hypothetical objective archaeological dataset is, more than unfeasible, not existing.

Some of them have proposed (see for instance: Hodder 1999 or Wolle and Tringham 2000) to overcome this issue without renouncing to information technology by making the best of the latter by means of an intensive use of

multimedia that can help in providing a reflexive, multi-faceted and subjective way of storing and communicating the archaeological record. Such computer tools may be invaluable for communicating a synthesis, but perhaps are difficult to use at a more granular activity level, for instance the one involved in classification.

Subjectivity and uncertainty are still present here – and in fact cannot be removed, one will find what he/she is looking for and will never be sure of the interpretation of what was found – so an useful strategy re-conciliating computers and post-modernism may based on appending to statements the level of trustworthiness attributed to them, and programming the computer to preserve it through all the processing. The perspective proposed here is the same introduced in Statistics by Leonard Savage (Savage 1972) and in Probability Theory by Bruno de Finetti (de Finetti 1970) when it became clear that a foundation of both disciplines on a naïve frequentist point of view led to inconsistency and an exclusively abstract foundation made them unintelligible to most people and drastically reduced their practical applications. The ‘subjective’ point of view introduced by these two scholars produces on the contrary a sound theory without loosing the flavour of real life.

Anyway, the idea, originally introduced by Zadeh (Zadeh 1965), of ‘fuzzy logic’ consists in assigning a weight to every statement so that belongingness to a category is not just liquidated with a yes or no, it is on the contrary expressed to a higher or lower degree by a numeric coefficient. This theory helps in representing real life complex situations with a complete greyscale, relegating black-or-white archetypes in Plato’s World of Ideas. As yet, it does not fit very well with computer schemes, in particular with current database management systems, where attributes of subjects are represented by a ‘logical’ value, yes/no, or by a well-determined choice within a list of possible values.

One such situation is archaeological classification: real objects are compared to an ideal definition and identified with it or discarded. A Reference Collection is the reification of such ideal definitions. For instance, a Reference Collection of flint tools includes not only the theoretical definition of a flint scraper, but also a physical object (or possibly more) which is the REAL one, the epitome of scrapers. A reference collection is in fact a set of such objects, definition + physical representative.

Unfortunately, archaeological classification is not an automatic process, because there is no precise definition of categories, because we do not know what these items were used for (we just imagine their use), and because no object will ever fully correspond to the definition, no matter how loose may it be. The researcher’s subjective experience still plays a greater parts in classification: ‘...le bon typologue perçoit avec l’expérience après avoir analyse quelques milliers de pièces...’, spending a good deal of time ‘...au cours de longs tête-à-tête avec les outillages lithiques...’ (Demars and Laurent 1991:20).

Several previous papers (for instance: Hermon and Niccolucci 2002; Hermon and Niccolucci 2003; Hermon et al 2004) have described how to use the fuzzy perspective to circumvent the apparent contraposition between the subjectivity of classification and the need of recognizing objects, and how to reason on them with the help of computer and statistical tools. Briefly, what has been proposed is to catalogue archaeological objects adding a ‘reliability’ numeric coefficient between 0 and 1 aimed at communicating the researcher’s confidence into such classification, 0 meaning ‘no, false’ and 1 meaning ‘yes, true’ while intermediate values mean ‘maybe, probable’. When one has to choice among several different categories, instead of just assigning the item to one – and only one – of them, the fuzzy approach defines a set of indicators each of which represents the degree of belongingness to the category.

So, for instance, statements concerning flint tools change: instead of stating 'This item is a scraper' one says 'This item is a scraper (0.8), it is not (0.2)'. Or, one says 'This item is a scraper (0.8), a blade (0.5), a sickle blade (0.2)' and so on. Note that no normalization is required, i.e. fuzzy coefficient need not add up to 1. Such fuzziness coefficients may then be used for counting, computing statistics and so on. The applications described in previous papers gave details and described some results, sometimes with a decisive impact on the resulting archaeological conclusions.

One of the frequent questions concerning the use of the fuzzy coefficients concern their determination. From a theoretical point of view, it is based only the subjective 'feeling' of the researcher providing the data, in order to state in a clear and unambiguous way the degree of reliability he/she assigns to the classification. Of course, objectivity and transparency are improved if the researcher also explains how that number was assigned. In many cases the involved parameters are quantitative and this helps in describing the fuzzy coefficient evaluation – which however remains the author's sole responsibility. For instance, if the assignment is based on a given minimum percentage of retouch (say e.g. 50%) above the threshold the fuzzy coefficient evaluates to 1; below the threshold, instead of going instantly to 0, meaning rejection, as it would do in an Aristotelic yes/no perspective, it smoothly decreases reaching 0 at some value, say for instance 25%. Thus in this example a percentage below 25% means rejection, i.e. 0, over 50% means acceptance, i.e. 1, between 25% and 50% means partial acceptance, i.e. an intermediate value between 0 and 1, perhaps proportional to the percentage itself. This appears as a much more realistic way of reasoning, taking decisions and cataloguing. In our experience, such a semi-mathematical procedure is very often available, looks clear to the reader and makes author's hypotheses more transparent and acceptable.

Following previous and current work on fuzzy databases, as (Medina and Pons 1994; Galindo et al 1998), also an archaeological fuzzy database management system has been created (Niccolucci, D'Andrea and Crescioli 2001). It is based on Open Source software and may be easily installed on every PC running Linux. Even if devised to store funerary data, including fuzzy assignment of the deceased's gender and age, it can be easily adapted to any situation where fuzziness is a desired feature.

Let us come back to the original subject, i.e. reference collections. What has fuzziness to do with them? Digital reference collections may induce in the researcher a false sense of reliability and their use, probably followed by intensive database usage, should be accompanied by the awareness of the subjectivity that is inherent in classification, and hopefully by some fuzzy logic, as the method described in the above examples. Digital reference collections may also invite to automatic classification, the typical engineers' dream: object to be catalogued are categorized according to the results of some mathematical algorithm applied to automatically acquired numeric parameters, as it is currently done elsewhere with fingerprints and face recognition. If such a procedure has the advantage of fast data processing, it incorporates (over-) simplification and when applied to typology using reference collections it should provide for some fuzzy classification coefficient.

One might naively conclude that the introduction of ICT creates more problems than it solves. It is not so, of course, because pro's clearly outbalance disadvantages. However, researchers should bear in mind that recognition always implies uncertainty and subjectivity, and should not believe that machines prevent deception. The fuzzy workaround, as summarily sketched

above, may be a way to correct a machine-induced excessive self-confidence with a more human doubtful thinking.

3 Documentation

Archaeological documentation is no doubt an issue. In the case of reference collections, the nature of *fossile directeur* of individual items makes it still more important. Hidden or not easily recognisable relevant features should be properly documented, while irrelevant ones for this particular scope should stay behind the scene to reduce the noise and facilitate recognition. If an individual artefact is acknowledged as the representative of a category, it becomes de-contextualized and all context information should therefore go in the background.

However, when working on digital reference collections, the organization of key attributes should facilitate research, what can be achieved only by standardization and implementing so-called Semantic Web functions and features. In other words, assuming for instance that a researcher wants to compare a Roman vase with the reference ones, it must be possible to cross search different reference collections for such vessels. Therefore data must be organized in such a way that automatic searching is feasible by stating some characteristics and, perhaps, accessing a repository of metadata to check which features are stored, being considered the relevant ones. Thus data organization for reference collections must take into account international initiatives to define cultural heritage documentation as the CIDOC-CRM (CIDOC), or, better, there should be a positive mutual interaction with them.

XML has already been proposed as a tool for archaeological documentation (Schloen 2001; Crescioli, D'Andrea and Niccolucci 2002) showing that it provides such features and that there exist search engines suitable for use within XML archives.

However, little attention has as yet been paid to standardization (but on this see Doerr, Harl and Theodoridou, 2004; D'Andrea et al, 2004), which is in fact a very relevant issue if interoperability is desired.

The use of XML – and the definition of a specialized XML dialect – appears hence as essential for digital reference collections. It may moreover help in availing of XML-compliant tools which are under development to manage 2D or 3D graphical information as SVG (SVG), X3D (X3D) and so on, also for the goals described in the following section.

4 Managing images

Images, *lato sensu*, may greatly help in using digital reference collections. Since the object is far away from the user, the researcher cannot avail of all his/her senses to guide his/her recognition, so a graphic interface (and in the future a haptic interface) may greatly help. Augmented Reality (AR) is a technology which may further sublimate the physical nature of reference objects. By means of such techniques, relevant features may be exalted and irrelevant ones obliterated, in order to make the object as close to the idea it represents as possible. The risk consists of eventually creating fake objects with no reference to reality. That is why a philological method is necessary, with annotations and admitted variants, as suggested in (Frisher et al, 2002) for Virtual Reality, and switching to the 'real' (i.e. not augmented) representation should be always possible. In

this way AR will provide an additional support to facilitate and improve the use of digital reference collections.

5 Conclusions

The present summary of specific needs - in general of cultural applications, and in particular of digital reference collections – and risks is not intended at discouraging reference collections to go digital. It is expected that advantages show up spontaneously, so much are they evident. Accessibility and preservation of the artefacts are just two reasons that alone justify the passage from real objects to digital ones. This paper only aims at pointing out that there are no shortcuts. Reliability and authoritativeness have some cost. Reliable technological solutions will probably require strict co-operation among technologists and culture professionals to set up systems in which state-of-art technology does prevail on the requisites of culture.

References

- Andrea A. D', J. Holmen, F. Niccolucci, C.-E. Ore and N. Ryan, 2004. An XML-compliant CIDOC-CRM compatible Methodology for Documenting Archaeological Sources. Paper presented at Beyond the Artefact – Digital Interpretation of the Past – CAA2004. Prato, April 2004.
- CIDOC. The CIDOC CRM, <http://cidoc.ics.forth.gr/>. Accessed 1 October 2004.
- Crescioli M., A. D'Andrea and F. Niccolucci, 2002. XML Encoding of Archaeological Unstructured Data. In: G. Burenhult (ed.): Archaeological Informatics: Pushing the Envelope. Proceedings of CAA2001. Bar Int. Series 1016, Oxford: Archaeopress, 267-276.
- Demars P.Y. and P. Laurent 1992, Types d'outils lithiques du Paléolithique Supérieur en Europe, Paris, Presses du CNRS.
- Doerr M., O. Harl and M. Theodoridou, 2004. Integration of complementary Archaeological Sources. Paper presented at Beyond the Artefact – Digital Interpretation of the Past – CAA2004. Prato, April 2004.
- Finetti B. de, 1970. Teoria delle probabilità, Torino, Einaudi. English translation: Theory of Probability: A Critical Introductory Treatment, New York, NY: John Wiley, 1974, 1975.
- Frisher B., F. Niccolucci, N.S. Ryan and J.A. Barcelo, 2002. From CVR to CVRO: The Past, Present, and Future of Cultural Virtual Reality. In: F. Niccolucci (ed.) Virtual Archaeology. BAR Int. Series 1075. Oxford: Archaeopress, 7-18.

Galindo J., J. M. Medina, O. Pons and J. C. Cubero, 1998. A Server for Fuzzy SQL Queries. In: T. Andreasen, H. Christiansen, and H. L. Larsen (eds.), Flexible Query Answering Systems, Proceedings of the Third International Conference, FQAS '98, Roskilde. Lecture Notes In: Artificial Intelligence 1495. Springer, Berlin, 1998, pp. 164–174.

Hermon S. and F. Niccolucci, 2002. Estimating subjectivity of typologists and typological classification with fuzzy logic, Archeologia e Calcolatori 13, 217-232.

Hermon S. and F. Niccolucci, 2003. A Fuzzy Logic Approach to Typology in Archaeological Research. In: M. Doerr, A. Sarris, The digital Heritage of Archaeology. Proceedings of CAA2002, Athens, Archive of Monuments and Publications, Hellenic Ministry of Culture, 307-310.

Hermon S., F. Niccolucci, F. Alhaique, M.R. Iovino and V. Leonini, 2004. Archaeological typologies, an archaeological fuzzy reality. In: Enter the Past. Proceedings of CAA2003. BAR Int. Series 1227. Oxford, Archaeopress, 30-34 .
Hodder I., 1999. The Archaeological Process. An Introduction Oxford, Blackwell

Medina J. M., O. Pons and M. A. Vila, 1994. GEFRED. A Generalised Model of Fuzzy Relational Databases. Information Sciences 76, vol. 1–2, 87–109.

Niccolucci F., A. D'Andrea and M. Crescioli, 2001, Archaeological applications of fuzzy databases. In: Z. Stancic and T. Veljanovski (eds.), Computing Archaeology for Understanding the Past. BAR Int. Series 931. Oxford, Archaeopress, 107-116.

Savage L., 1972, The Foundation of Statistics, New York, Dover.

Schloen J. D., 2001. Archaeological Data Models and Web Publication Using XML. Computers and the Humanities 35, 123–152.

SVG. Scalable Vector Graphics (SVG) 1.1 specifications.
<http://www.w3.org/TR/SVG/>. Accessed 1 October 2004.

Wolle A. C. and R. Tringham, 2000. Multiple Catalhoyuks on the World Wide Web. In: I. Hodder (ed.) Towards reflexive methods in archaeology: the example at Catalhoyuk, Cambridge, Mc Donald Institute for Archaeological research, 207-217.

X3D. Open Standards for Real-Time 3D Communication.
<http://www.web3d.org/index.html>. Accessed 1 October 2004.

Zadeh L. A., 1965. Fuzzy sets. Information and Control, Vol. 8, 338-353.

16 The European Reference Collection: founding the future

Guus Lange

Abstract

The changes that are taking place in archaeology since the signing of the Treaty of Valetta, Malta, in 1992 coincide with major changes in the practice of science in general. To date the discipline of archaeology is growing fast. A growing number of players with a diversity of backgrounds are involved, in a setting where boundaries between countries are disappearing and where a wider public claims access to specialists' information and knowledge. It is demonstrated that the discipline can provide reliable answers only when very basic archaeological information and knowledge is readily accessible and up-to-date. The concept of a digital European Reference Collection is introduced and its central role in high-quality knowledge exchange both locally and internationally is explained. Available tools are indicated and a path for future co-ordinated actions is discussed.

1.0 Introduction

Democratization of information and an enhanced universality of the research practice in general are examples of processes that change the scientific world fundamentally. At the same time, since the signing of 'Malta' in 1992, the discipline of archaeology in Europe has been going through changes of its own. From a rather marginal field, that satisfied the intellect and conscience of a few initiated, archaeology has become an established partner in planning and development projects. Not only has the number of projects and participants exploded, the discipline has also become more professional, involving a diversification of functions. At the same time the government is advocating deregulation and is 'withdrawing' from practical involvement, leaving it to the discipline itself to guarantee quality. We see procedures and institutions developing that control activities, resulting in a greater formalisation and regulation of activities. These agents of change have in common an intensified exchange of knowledge and an unprecedented increase in information flow.

1.1 Quality control

In the Netherlands new institutions have taken the place of old implicit quality control mechanisms. To date there is a Council for Archaeological Quality that, among others, publishes the Quality Norm for Dutch Archaeology (KNA)¹, containing prescribed procedures for planning and executing field work. The

¹ <http://www.minocw.nl/malta/kwaliteit/kwaliteit.html>

Archaeological Inspection sees to the quality of the work of field units by checking the followed procedures, and a Register of Archaeologists is being set up, that binds the activities of individuals to a Code of Conduct. None, however, monitors the quality of the observations in the field or validates the content of the end products.

The quality of archaeological research is to a large extent assessable through its output;

- the research report,
- the final publication and
- the archived material, the field documentation, the descriptions of the finds (databases) and the finds themselves.

Site reports are published in numbers, but at times the distribution of reports is restricted. This precludes the distribution of the contents, i.e. new knowledge. But when a publication is distributed more widely, it is still often difficult to assess its value. Sometimes material is not identified beyond the most basic levels. Also, the tradition of reconstructing, measuring and drawing the finds is more and more abandoned because of the high costs involved. It is quite imaginable that, unintentionally and unnoticed, false information is fed into our knowledge base, because the responsible researcher did not have the expertise available.

The reader will have to take the information at face value, having no means to evaluate the conclusions of the research. This did happen before of course, but today the scale is so much larger.

Final publications can only be expected when extremely important sites have been excavated, while the bulk of researches will only yield site reports. Fortunately in the Netherlands a nationally funded project² is aiming to synthesize the new information of the site reports. Needless to say, that the value of any synthesis also depends on the quality of the input.

The archived material is usually checked only in an administrative way: are all prescribed documents and files produced in the prescribed format? Are all described finds actually in the boxes? To assess the scientific value of the archived material, i.e. the field documentation and the descriptions of the finds, is usually beyond the task of the keeper of the archive. In fact the scientific value of the archives is seldom checked.

More disturbing, however, is that traditional quality control mechanisms are no longer the major checks on the bulk of the excavation projects. Formerly, the chain of scientific control started with the professor/director as the final accountable person, whose reputation was at stake, via the senior to the junior and the student. In a privatized market situation these checks on quality are mostly absent. Peer review is difficult as well: where formerly one's peers were housed in clusters in a small number of larger institutions, today they are often widely dispersed over small excavation units. They have schedules to keep, are not able to answer questions from members of competing companies. In such a setting, quality is in fact checked only by the Code of Conduct, i.e. by the scruples of the individual and much less so of the management, that will have other priorities than the quality of content alone. In fact, it is nigh impossible to check the quality of available information.

It is also an illusion to think that the quality of field work and subsequent analysis can be enforced in any way.

To make up for the loss of direct quality control, the only option available is to promote digital exchange of information and knowledge. This will give an opportunity to control quality indirectly and at the same time will offer better evaluation possibilities. Essential knowledge must be made readily available

² National Science Foundation (NWO):
Bodemarchief in Behoud en Ontwikkeling (BBO)
2000-2006

for everyone at any place and any time. In addition and at the same time, we will have to construct an environment in which the individual researcher will feel part again of a larger body of peers and other actively collaborating colleagues.

1.2 Reference collections

It is of vital importance for the discipline to adjust its goals and methods to the new circumstances. What is required is an intensified and open communication of

- the methods and results,
- the sources of knowledge used.

Fortunately, to a greater extent we can benefit from developments in other disciplines and adjust these to our own purposes, a trait that in the past has been very characteristic of the development of archaeology.

Developments in Information and Communication Technology can help us to make transparently accessible dispersed high-quality, reliable knowledge bases. In our view the availability of lexicons, glossaries, dictionaries, thesauri and classifications, and the new development of ontologies, illustrated with background information, including drawings and photographs, is instrumental in safeguarding existing knowledge and promoting the accumulation of high-quality new knowledge.

This combined information we call 'reference collections'. They form the archaeological vocabulary for discussing finds. Reference collections are also subsets of all the archaeological phenomena found. They can be seen as a special kind of shorthand, as a statistic or a summary of the often overwhelming numbers of finds and are the result of in-depth analyses. In print these reference collections are normally included as catalogues following a scientific report. Although reference collections are a summary of all findings, they can still be very extensive. Electronic publication offers opportunities for the presentation of archaeological collections that the printed form lacks: the possibility of non-linear presentation and the almost unlimited number of pages available for colourful display. The relatively compact format of reference collections allows us also to show a wider audience the wealth of our heritage without the need to digitize everything that has ever been found.

1.3 Dealing with standards

When discussing reference collections, the seemingly unsolvable paradox of the need for standards in communication and the dislike of standards in analysis immediately resurfaces. This discussion became immanent from the moment systematic recording systems were first developed and overviews were made in the 19th century and it intensified with the introduction of computer databases to store primary archaeological data in the field and the laboratory (viz. Chenhall 1968, Cooper and Richards 1985, Adams and Adams 1991, Madsen 1999 and this volume). Since knowledge can only advance by communication, and communication uses vocabularies, we need to use standard terminology if we want to communicate results beyond the limits of our own project databases or, indeed, our own desks.

The problem with standards or typologies is that they are designed for one of many possible purposes and are temporary. Depending on the aim of a classification, be it for example relative chronology, cultural identity or technical evolution, different elements are chosen to define the variability within the group of phenomena. Furthermore, typologies are refined and adjusted when new knowledge becomes available. In short the knowledge structures based on typologies are as dynamic as science is itself.

2 Solutions

We will have to explore new strategies to ensure the use of standards for documentation and at the same time allow dynamic change to satisfy scientific purposes. New communication tools are gaining ground. Two major developments come to the fore, while a third has yet to be developed for the most part:

- 1 The development of ontologies based on the Conceptual Reference Model of CIDOC³, holds the promise of allowing access to multi-lingual and multi-paradigmatic classifications and typologies. A standard, chosen for a good reason by one researcher, will link to other standards for the same material that were developed for other purposes by others. So, if we know now what we are talking about, how are we going to communicate our results and ideas?
- 2 Peer-to-peer discussion forums, like MSN, are becoming very popular among the younger Internet community. Weblogs (Blogs) are rapidly becoming popular as instruments for exchanging individual knowledge and ideas. The development of Wikipedia⁴, the free encyclopaedia, and the BBC's moderated h2g2⁵, are very successful examples of democratic knowledge infrastructures, using WikiWiki collaboration software. They allow for a highly dynamic environment while keeping track of all earlier versions and modifications. If, then the infrastructure is available, what kind of symbols or language are we going to use?
- 3 Visual recognition is one of the most important tools for archaeologists. Any newly found object is compared by the specialist with other finds at hand, or more often, with the images depicted in the huge volume of literature and in the back of his/her mind. The literature is so massive because it is the only source that can lead us back to original observations in the field. Interpretations may change, but observations are unique events that cannot be repeated in the field. Therefore the knowledge base also includes the excavation reports of old. There is a relationship between the expertise of an archaeologist and the amount of literature he 'knows'. But the amount of literature has become so large and is growing so fast that it is difficult to read everything and see what has been found in one's own country, let alone abroad.

It will be evident to everyone that digital archives open opportunities for coming to grips with the mere volume of the knowledge base when efficiently accessible. Computer vision techniques can help us searching for comparable finds. Ideally, it will allow the user to compare the physical object in his/her hand with an adequate selection of digital examples from the knowledge base. Once the user chooses a particular type, all kinds of specific background information will be directly available or will be referred to. However, such programs have to be customized or even newly developed.

3 <http://cidoc.ics.forth.gr/>

4 http://en.wikipedia.org/wiki/wiki_wiki

5 <http://www.bbc.co.uk/h2g2/guide/>

2.1 NRc

Contrary to, for instance, Great Britain, thoughts on the development of a National Reference Collection (NRc) in the Netherlands are relatively recent. At the start of the development of the Dutch electronic Sites and Monument Register, ARCHIS (Roorda and Wiemer 1992), it was clear that in order to ensure high-quality input we had to endorse the use of a standard terminology. A permitted terminology, a hierarchy of broader and narrower terms called the Archeologisch Basis Register (ABR 1992), accompanied the introduction of ARCHIS, but it was also evident that with illustrations, explanatory texts, and references to the real specimen, the list would have a much higher value. Technical limitations, however, precluded any development in this direction at that time.

At the annual Dutch archaeological congress 'Reeuvensdagen' in 1997, two presentations expressed the need for a National Reference Collection. Comparable to the practice in the UK since the early 1960s (Bruce Mitford 1964, Cherry 1986, Orton this volume)⁶ here meant to be primarily a collection of physical objects, to let every archaeologist become acquainted with and refer to the same standard material, and 'talk the same language' when describing his/her finds (Bartels and Van Heeringen 1998). The idea of standard terms was taken a step higher to an international level with a project funded by the Council of Europe. To facilitate and promote cross-border researches, a multilingual glossary on Bronze Age monuments was developed (Barber and Van Regteren Altena 1999).

In 2002 we carried out a feasibility study on the possibility of a digital national reference collection (NRc) in the Netherlands (Nieuwhof and Lange 2003). Following this a pilot project will start in January 2005, with the aim of showing possible sponsors the value and the potential of the NRc and to give us realistic figures for the costs involved. The late medieval glass collection of the ROB will be the first collection to be included. Simultaneously with this pilot project, a four-year project on the automatic recognition and identification of objects from digital images will start⁷, while ontology development is part of another two-year project⁸. These projects are firmly embedded in national programmes recently devised for the cultural heritage sector where many other interesting and useful products will be developed.

2.2 European shoulders

In 2003 a consortium of 11 European partners formed the European Reference Collection initiative (eRC). The eRC wants to address the professional archaeologist, the non-professional archaeologist and the professional non-archaeologist beyond the limits of national boundaries. The consortium wants to develop an international knowledge infrastructure consisting of top-down and bottom-up approaches, building upon the knowledge gained in the successful ARENA-project.⁹ The content will be provided by a network of websites and communities of specialists, bottom up, and of one's own free will of course. These local websites will be interoperably accessible. In each country (or super-region) centrally governed portal sites will provide facilities like distributed searching, and the hosting of collections, and they will list links to relevant sites and provide discussion and publication facilities, together with background knowledge of standards and ICT. The personal computer of the researcher is part of a

⁶ Orton (this volume)

⁷ National Science Foundation (NWO): programme CATCH 2005-2009

⁸ Referentie Netwerken 2005-2007

⁹ Richards (this volume); <http://ads.ahds.ac.uk/arena/>

grid of smaller and larger knowledge centres of material culture throughout Europe.

In the UK the role of a central portal is filled by the ADS that hosts already a substantial number of digitised collections. Under their aegis the 11 countries will work together to develop the knowledge infrastructure network, and start with an inventory of the existing reference collections in each country. To this end a bid for a Culture 2000 grant is made⁸. Other European initiatives are pending.

3 Conclusion

In the light of 'Malta', internationalization and democratization of knowledge, we see that traditional institutes are redefining their roles and new institutions are being formed. The profession of the archaeologist is changing with it, and needs to change perhaps even more than we could imagine only recently.

During the conference we discussed how information and communication technology (ICT) can help us maintain the highest quality standards at the source of all our knowledge, allowing high-quality decisions and a real advancement of our knowledge of the past. The development of the eRC knowledge infrastructure is therefore considered to be of vital importance for a healthy archaeology in the future.

The challenge, however, will not be so much the development of new technology, but rather to organize and adjust ourselves to using the new tools for the good of our profession.

References

- ABR, 1992. Archaeological Basis Register, Version 1.0. Amersfoort, ROB.
- Adams, W.Y. and E.W. Adams, 1991. Archaeological typology and practical reality: a dialectical approach to artifact classification and sorting. Cambridge: Cambridge University Press.
- Barber, M. and J.F. van Regeren Altena, 1999. European Bronze Age monuments / Monuments de l'Age du Bronze européen: glossaire; a multi-lingual-glossary of archaeological terminology : a pilot project covering Denmark, France, the Netherlands and the United Kingdom. Strasbourg, Council of Europe.
- Bartels, M. and R. van Heeringen, 1998. Naar een Nationale Referentie Collectie voor de Nederlandse archeologie. Archeobrief lente 1998, 12-13.
- Bruce-Mitford, R.L.S., 1964. A National Reference Collection of Medieval Pottery. Medieval Archaeology 8, 229-230.
- Chenhall, R. G., 1968. The Impact of Computers on Archaeological Theory, In: Computers and the Humanities, volume 3, September, number one, 15-24
- Cherry, J., 1986. The National reference Collection of Medieval Pottery. Medieval Ceramics 10, 125-130.

⁸ Kenny, this volume

Cooper, M.A. and J.D. Richards, 1985. Current issues in archaeological computing : third annual conference on techniques of archaeological excavation. Oxford: British Archaeological Reports 1985.

Kenny, J., this volume. Addressing the Reference Collections Dilemma: The eRC (European Reference Collections) bid for European Commission Funding under Culture 2000.

Madsen, T., 1999. Digital recordings of excavations: do we need data standards and common strategies? In: H.J. Hansen and G. Quine (eds), Our Fragile Heritage: documenting the Past for the Future. Copenhagen: The National Museum of Denmark.

Madsen, T., this volume. Classification and archaeological knowledge bases.

Nieuwhof, A. and A.G. Lange, 2003. Op weg naar een Nationale Referentiecollectie Archeologie. Eindrapport Haalbaarheidsonderzoek NRC (with English summary and overview). Amersfoort, ROB.

Orton, C.R., this volume. Some thoughts on the history of Reference Collections in the UK.

Richards, J.D., this volume. Do reference collections have an electronic future?

Roorda, I. and R. Wiemer, 1992. The ARCHIS project: towards a new national archaeological record in the Netherlands. In: C.U. Larsen (ed.), Sites and monuments: national archaeological records, Copenhagen, 117-122.

List of contributors

Mr. Kenneth Aitchison	Institute for Field Archaeologists (UK) kenneth.aitchison@archaeologists.net
Drs. Eelco Bruinsma*	Cheperu Consulting & Multimedia bv (NL) eelco.bruinsma@cheperu.nl
Dr. David Dawson	Council for Museums, Libraries and Archives (UK) david.dawson@resource.gov.uk
Mr. Øyvind Eide	The Museum Project, Unit for Digital Documentation, University of Oslo (NO) oyvind.eide@muspro.uio.no
Dr. Kate Fernie	Council for Museums Libraries and Archives (UK) kate.fernie@mla.gov.uk
Drs. Hans de Haan*	Department of Information, Library and Archives, ROB, Ministry of Education, Culture and Science (NL) Hhaan@archis.nl
Dr. Henrik Jarl Hansen	Head of Division Dokumentation, The National Cultural Heritage Agency, (DK) henrik.jarl.hansen@kuas.dk
Dr. Mike Heyworth	Director Council for British Archaeology (UK) MikeHeyworth@britarch.ac.uk
Mr. Jon Holmen***	Unit for Digital Documentation, University of Oslo (NO) jon.holmen@muspro.uio.no
Dr. René Jongerius	Member of the Board of Directors Royal Netherlands Academy of Arts & Sciences (NL) rene.jongerius@bureau.knaw.nl
Dr. Jon Kenny	Archaeology Data Service, University of York (UK) jk18@york.ac.uk
Dr. A. Guus Lange	Department of Research and Development, ROB, Ministry of Education, Culture and Science, (NL) g.lange@archis.nl

Dr. Michael Lewis**	Deputy Head of the Portable Antiquities Scheme Council for Museums, Libraries and Archives (UK) mlewispas@yahoo.co.uk
Prof. Dr. Torsten Madsen	Associate Professor Department of Prehistoric Archaeology, Institute of Anthropology, Archaeology and Linguistics. University of Aarhus (DK) farktm@moes.hum.au.dk
Dr. Maureen Mellor, FSA	Honorary President Medieval Pottery Research Group. Institute Kellogg College, University of Oxford (UK) maureen@oxpot.demon.co.uk
Prof. Dr. Franco Niccolucci	Professor, Faculty of Architecture, University of Florence Director VAST-LAB, PIN-Prato (IT) niccolucci@unifi.it
Dr. Irina Oberländer-Târnoveanu	Deputy Director CIMEC Institute for Cultural Memory Bucharest (RO) irina@cimec.ro
Dr. Christian-Emil Ore***	Chair of CIDOC Unit for Digital Documentation, University of Oslo (NO) c.e.s.ore@muspro.uio.no
Prof. Dr. Clive R. Orton	Professor of Quantitative Archaeology, University College London Institute of Archaeology (UK) tcfa002@ucl.ac.uk
Dr. Julian D. Richards	Director Archaeology Data Service, University of York (UK) jdr1@york.ac.uk
Dr. Rien Polak*	Director Auxilia, University of Nijmegen (NL) m.polak@let.kun.nl
Dr. Kathy Perrin	Secretary to the Archaeological Archives Forum, English Heritage (UK) kathy.perrin@english-heritage.org.uk
Dr. Hedley Swain	Head of Early London History and Collections, Museum of London, UK hswain@museumoflondon.org.uk

* Unfortunately the papers presented by these authors could not be published.

** Co-author of David Dawson's contribution.

*** Co-author of Øyvind Eide's contribution.

List of Participants

Mr. Kenneth Aitchison	Institute for Field Archaeologists (UK)
Drs. Geeske Bakker	Buro 1896 / Hogeschool Utrecht
Drs. Michiel Bartels	City of Deventer
Prof. Dr. Jos Bazelmans	ROB Dept. of Research & Developm./Free University Amsterdam
Prof. Dr. Tom Bloemers	University of Amsterdam
Drs. Linda Boot	Fusion management ROB / RDMZ, Amersfoort / Zeist
Prof. Dr. Arjen Bosman	University of Gent (B)
Drs. Roel Brandt	Council for Archaeological Quality – CvAK, Amsterdam
Dr. Otto Brinkkemper	ROB - dept. of Research & Development
Drs. Eelco Bruinsma	Cheperu Consultants bv, Warffum
Mr. Guido Creemers	Gallo-Roman Museum Tongeren (B)
Dr. David Dawson	Resource, Council for Museums, Libraries and Archives (UK)
Drs. Jos Deebeen	ROB - dept. of Research & Development
Drs. Saskia van Dockum	ROB - Director
Drs. Paul Doorenbosch	Royal Library / Memory of the Netherlands, The Hague
Drs. Erik Drenth	ROB - dept. of Research & Development
Dr. Monique van den Dries	RIA (Archaeological Inspection), The Hague
Mr. Oyvind Eide	University of Oslo (NO)
Dr. Harry van Enckevort	City of Nijmegen
Dr. Kate Fernie	Resource, Council for Museums Libraries and Archives (UK)
Drs. Tessa de Groot	ROB - dept. of Research & Development
Drs. Hans de Haan	ROB - dept. of Information, Library and Archives
Drs. Daan Hallewas	ROB - dept. of Research & Development
Dr. Henrik Jarl Hansen	Ministry of Culture (DK)
Drs. Wilfried Hessing	Vestigia Consultants, Amersfoort
Dr. Mike Heyworth	Director Council for British Archaeology (UK)
Mr. Bert Hoeve	ROB – dept. of Information, Library & Archives
Ir. Michiel van Hunen	Netherlands Service for Monuments, Zeist
Dr. Luc Van Impe	Institute for the Archaeological Patrimony, Brussels (B)
Dr. Esther Jansma	ROB - dept. of Research & Development
Dr. Rene Jongerius	KNAW, Royal Dutch Academy of Arts and Sciences, Amsterdam
Dr. Hans Kamermans	University of Leiden
Dr. Eva Kars	Archaeological Service Centre – ADC, Amersfoort
Prof. Dr. Henk Kars	Free University of Amsterdam
Dr. Jon Kenny	Archaeology Data Service (UK)
Dr. William Killbride	Archaeology Data Service (UK)
Drs. Annelies Koster	Museum 't Valkhof - Nijmegen
Drs. Lara Laken	Thermen Museum - Heerlen
Dr. Guus Lange	ROB - dept. of Research & Development
Dr. Roel Lauwerier	ROB - dept. of Research & Development

Prof. Dr. Marc Lodewijckx	University of Leuven (B)
Prof. Dr. Torsten Madsen	University of Arhus (DK)
Dr. Martin Meffert	Province of Brabant
Dr. Maureen Mellor	Ashmolean Mus. Oxford (UK)
Prof. Dr. Franco Niccolucci	University of Florence (It)
Drs. Annet Nieuwhof	University of Groningen
Dr. Irina Oberländer-Târnoveanu	CIMEC Bucarest (RO)
Drs. Gert van Oortmerssen	University of Groningen
Prof. Dr. Clive Orton	University College. London (UK)
Drs. Sebastiaan Ostkamp	Archaeological Service Centre – ADC, Amersfoort
Drs. Hans Peeters	ROB - dept. of Research & Development
Dr. Kathy Perrin	English Heritage (UK)
Dr. Rob Perrin	English Heritage (UK)
Drs. Arent Pol	KPK - National Collection of Coins and Medals (Utrecht)
Dr. Rien Polak	University of Nijmegen
Prof. Dr. Eric Postma	Director IKAT, University of Maastricht
Drs. Rene Proos	Province of South Holland
Drs. Marcel Ras	DEN - Society for Netherlands Digital Heritage, The Hague
Dr. Julian Richards	Director Archaeology Data Service (UK)
Drs. Dorien Scheerhout	Director Council for Dutch Archaeology (SNA), Amsterdam
Drs. Willem Schnitger	Naturalis - National Museum for Natural History
Drs. Steph Scholten	RMO - Netherlands Antiquities Museum Leiden
Drs. Marius Snijders	Ministry of Education, Culture and Science, The Hague
Drs. Henk Stoepker	ROB - dept. of Research & Development
Dr. Hedley Swain	Museum of London (UK)
Mr. Theo Toebosch	Journalist, Amsterdam
Mr. Joop Vanderheiden	ROB - dept. of Information, Library and Archives
Dr. Allain Vanderhoeven	Institute for the Archaeological Patrimony, Tongeren (B)
Drs. Jeroen van der Vliet	SNA - Council for Dutch Archaeology, Amsterdam
Dr. Milco Wansleeben	University of Leiden
Dr. Karen Waugh	Vestigia Consultants, Amersfoort
Drs. Elsbeth Westerman	University of Groningen
Drs. Ronald Wiemer	ROB - dept. of Information, Library and Archives
Dr. Mies Wijnen	NWO - Netherlands Organisation for Scientific Research
Drs. Sonja Willems	Institute for the Archaeological Patrimony, Tongeren (B)
Prof. Dr. Willem Willems	Director RIA (Archaeological Inspection), The Hague
Drs. Mirjam Wispelweij	ROB - dept. of Information, Library and Archives
Mr. Frans van der Zande	ROB - dept. of Information, Library and Archives
Drs. Paul Zoethbrood	ROB - dept. of Research & Development

