



Iron Age bow shooting at the Lejre Experimental Centre, Denmark. ■

How to publish Experimental Archaeology?

• EuroREA is a magazine dedicated to publishing reports on experiment and education in archaeology. But what are the ways of publishing archaeological experiment? We asked this question and here we present the answers we received.

Publishing Archaeological Experiments: a quick guide for the uninitiated

Alan K. Outram, Department of Archaeology, University of Exeter, UK

As an academic archaeologist engaged in experimental archaeology, I frequently find myself frustrated by three different types of archaeological publication. The first are articles written by academic colleagues without an

experimental or scientific background, who, despite lacking technical or practical knowledge, still insist upon speculating on issues of primitive technology. The second are archaeological scientists who know the technicalities well, but not

necessarily the practicalities, and tend to come to some archaeologically naïve interpretations. The third group are those who are involved in experimental work, reconstructions and primitive technology and have a vast practical working knowledge that could be a great value to archaeologists and scientists. However, they often do not publish much of their work and when they do it is not always in form appreciated by the other groups. I generalise, of course, as there are certainly some people with all-round ability and others who form mutually beneficial collaborations. However, I think most would recognise some of the problems I have outlined.

EuroREA and, in America, *The Bulletin of Primitive Technology* provide good forums for people to publish their experimental work. This short article provides some basic guidelines for those who are not so familiar with academic publishing. My aim is to encourage people to publish their work in a way that will be useful to the widest possible audience within the field of archaeology.

A standard experimental write-up in a scientific academic journal will usually have the following sections:

- Introduction and Aims,
- Materials and Methods,
- Results,
- Discussion and Conclusions.

They may not use those words in all cases, but all those sections are likely to be there. The introduction and aims will contain the background to the experiment and what will be achieved by carrying it out. A hard-line scientific paper will express the aims in terms of a very specific hypothesis that will be tested. Having read many experimental archaeology reports, I have found that it is the aims and ration-

ale of the experiment that are frequently missing. It is often not clear why a given experiment was conducted and, as a result, it is rarely clear what we have learnt from it. The aims need not be expressed as a hypothesis, but the experiment and its publication will be far more useful and rewarding if carried out with some aim in mind. In many cases aims are missing from a report because the experimenter was really just trying something out they had not tried before, just to see what happened. Even so, one can still frame some questions about the process that will make it so much more worthwhile.

Setting clear aims will help produce a clear methodology. If one identifies questions, such as how long, hot or fast something will be, then that will lead to obvious need to record those variables. Within the materials and methods section, experimental accounts often lose their value because they are not specific enough. Scientists like to be able to repeat experiments. In fact, part of the scientific definition of an experiment is repeatability. Reports need to say how and where things were measured and what they were measured with. This may well require you to produce diagrams or take photographs to show how the equipment was set up. One also needs to be detailed about the precise materials used.

The results should be clearly discussed and displayed. Tables and graphs may well convey your results better than simple description. When using diagrams, pictures, tables and graphs, remember to give them suitable captions so that people know what they show and to number them so that you can refer to them from the text when their contents are being discussed. One thing that tends to be missing from a scientific paper is any kind of reflection on the experience of carrying out the experiment. This can

be very important to experimental archaeology, however. Archaeologists will be very interested in the experiential side of experiments. After all, they do study the human condition. So discussion about the difficulty, awkwardness, ease, speed, conditions, smells, technique, skill level, danger etc. of a process are interesting, just as in the same way as ethnographic accounts are interesting. The discussion and conclusions should, of course, relate back to the original aims and you should clearly sum up what you have found. It is at this point that it might be useful to identify future work that would take the study further or reflect upon better ways to carry out the experiment.

Academic papers are almost always referenced throughout. They will not only have a bibliography at the end, but will have references throughout the text that relate to the items in the bibliography. Referencing is invaluable to academics. It allows researchers to identify exactly where somebody obtained their information from so that they can locate those sources if they want to find out further information. It also gives the work credibility, by building upon the work of others. The most common system used in archaeological publications is the Harvard Referencing System. If anybody wants to find out about it, there are many guides available on the World Wide Web.

Checklist:

- Provide background information on the experiment and why it is interesting.
- Provide clear aims for the experiment.
- Be detailed in describing how the experiment was conducted, including recording methods and details of the materials used.
- Provide enough information to allow somebody to repeat what you have done.
- Use diagrams and photographs where necessary to explain aspects of the method that are not easily described in words.
- Use tables and graphs where appropriate to display results
- Make sure all figures have adequate captions and labels and number them so that you can easily refer to them from the text.
- Unlike a standard scientific report, feel free to reflect upon the experience of carrying out the experiment.
- Relate conclusions to the original aims
- Perhaps suggest the direction of future work
- Reference your work if at all possible, using the Harvard System.

For the Reader's Sake: Publishing Experimental Archaeology

James R. Mathieu, University of Pennsylvania
Museum of Archaeology and Anthropology, United States

Archaeological experiments should be presented as concisely as possible, with a clear explanation of the reason (or justification) for the experiment and the significance (and limitations) of the results. The publishing of archaeological experiments should always involve five things.

First, one must clearly state the reason for doing an experiment. What will be learned or achieved? Why is this important? Too often the purpose of an experiment is assumed to be self-evident.

Second, there should be a discussion (or at the very least a good bibliography) of similar experiments. What other experiments have been undertaken? What problems did they face? What results did they achieve? Why is this new experiment different and/or necessary? Too often the reader is left with the impression that the experimenters should have read more widely, learned from mistakes made by others, and built upon previous work rather than repeating it.

Third, there must be a clear description of the different aspects of the experiment. Which materials were used? Which procedures were followed? How and why did these vary from trial to trial? This is best presented in a clear outline format, with as few words as possible. Too often this (boring) section becomes the bulk of the publication, forcing the reader to search for insights and conclusions within a rambling narrative that lacks focus.

Fourth, the experimental results, data, and details should appear in the text only in summarized form—in tables, graphs, and/or other illustrations. The full set of results should be saved for

an appendix at the end of the publication or, ideally, as a digital file (e.g. database) on an accompanying CD or hosted on an accessible website. This allows the reader to focus on the “processed” data and assess the experiment, while making the base data easily available for re-processing if desired. This section of the text will often present the specific observations and interpretations made by the experimenters on different aspects of their work, laying the groundwork for any larger interpretations.

Finally, the experimenters must summarize the main objectives of the experiment, assess the results in light of these objectives (indicating successes and failures), and present the reader with any overall conclusions. A discussion of further implications and suggestions for future research (including, but not limited to further experimentation) should be encouraged.

Publishing archaeological experiments in this way helps the experimenter and the reader. The experimenter is forced to consider and explain their purpose in doing an experiment. Is the purpose to make a replica? To demonstrate or test a procedure? To explore certain possibilities and further our understanding of the past? The experimenter then summarizes their procedures and results in such a way that they are forced to get to the heart of the matter, clearing away the potentially distracting detail. The reader is thus rewarded with a clearer understanding of the purpose, procedures, results, and limitations of the work, and can assess the overall value of the experiment.

Remarks to the publication of archaeological experiments

Martin Schmidt Niedersächsisches Landesmuseum Hanover, Germany *

Archaeological experiments are published in a large variety of ways. To me, it seems that most of these are experience focused rather than result oriented messages, or rather essays (see as well *Kelterborn 2001, 1987 and this volume*). Often, older experiments are not observed or are hardly known and apparently little read.

Lots of information is left out, either deliberately or not. The publication of an archaeological experiment should – just as with an excavation report – be understandable and replicable to outsiders. If no more can be understood from a publication than that someone has done this or that, it is useless and superfluous. All in all, I would prefer a tight, pragmatic and precise way of writing. Epic descriptions distract rather than that help making things clear.

It will nevertheless be impossible to publish an ideal publication. But this should not stop us spending effort on a report.

Apart from that, it would be desirable if in every country at least one single (open air) museum or university institute would be appointed to collect the publications centrally so that they can be made available to as many users as possible.

How experiments should be executed has often been described (for example *Kelterborn 1987, and this volume; Schmidt 1993*). From this, I think, the following important points of departure for the publication of an experiment can be made:

- What is it about? Is this about a real experiment or a preliminary test? Or is it a repeated experiment? Or a presentation / show or did you actually simply want to try something out without higher pretensions?
- A clear description of the archaeological starting point and its environment.
- Hence, what does the hypothesis look like? What do I want to learn from the experiment?
- Which relevant experiments and which ethnographic observations were already made on this subject? What separates the new experiment from the old ones?
- Exact description of the executed experiment
- Unrelenting mentioning of problems and possible mistakes: this point is extremely important for a valuation by outsiders. Were there any technical problems, was technical equipment missing? Were the materials and tools, the environment fit? Did the persons involved have enough knowledge and experience?
- Reflection: was the experiment – looking back at the hypothesis – right? When repeating, what should or could be done better or different? How could or should follow up experiments be designed? Partly this is about technical questions, but as well about the production of new hypotheses.

* Translation Roeland Paardekooper

- Extended list of literature. Often it appears, older experiments are hardly known. In this list, only those publications should be listed, which were actually used. Quoting without using publications only leads to confusion for the reader of the report.
- Sufficient attachments with images, tables et cetera. In general, many technical parameters and observations can be better and more clearly presented in a table instead of hiding them in endless descriptions. As space in publications is limited, images and graphs should give information. Images with craftspeople at a camp fire or a graph with a lonely find on a map of Europe are generally speaking superfluous.

Summary

Wie sollte Experimentelle Archäologie publiziert werden?

Archäologische Experimente sollten so prägnant und genau wie möglich veröffentlicht werden. Eine standardisierte Publikation eines Experimentes sollte die folgenden Gliederungspunkte aufweisen: Einleitung und Ziele, Materialien und Methoden, Resultate, Diskussion und Ergebnisse. Eine klare Erläuterung der Begründung des Experimentes ist erforderlich. Das Festsetzen klarer Ziele hilft auch bei der Erarbeitung einer klaren Methodik. Die Publikation sollte einen Diskussionsteil über andere, ähnliche Experimente enthalten, so dass der Leser nicht mit dem Eindruck hinterlassen wird, dass die Autoren nicht umfassend die Literatur studiert hätten, nicht von den Fehlern anderer gelernt hätten oder nicht auf vorhergehenden Arbeiten basieren bzw. deren Ergebnisse nur wiederholen würden. Die Veröffentlichung sollte leicht verständlich und durch Außenstehende wiederholbar sein, d. h. dass z. B. darzustellen ist, wie und wo die Beobachtungen festgehalten und womit sie durchgeführt wurden. Die gewonnenen Daten sollten in Tabellen, Graphiken und anderen Arten von Illustrationen aufgeführt werden, um dem Leser eine eigene kritische Bewertung des Experiments zu ermöglichen. Der Diskussions- und der Ergebnisteil sollten sich auf die ursprünglichen Ziele beziehen.

- Depositing further data, images et cetera on the Internet, either in an open or a closed off area and / or physical in an archive.
- Address, phone, e-mail of the people involved to enable direct communication.

Bibliography

Kelterborn, Peter, 1987: Principles of Experimental Research in Archaeology. In Bulletin of Experimental Archaeology, No 8, pp 11-12. Department of Adult Education, University of Southampton.

Kelterborn, Peter, 2001: Die wissenschaftlichen Experimente in der experimentellen Archäologie. In Zeitschrift für schweizerische Archäologie und Kunstgeschichte, Band 58, Heft 1/01, pp 21-24.

Schmidt, Martin 1993: Entwicklung und Status quo der Experimentellen Archäologie, in: Das Altertum 39, pp 9-22

Publier les expérimentations en archéologie

C'est d'une façon claire et concise qu'il faut publier les expérimentations en archéologie. Une publication standard devrait impliquer les parties suivantes: introduction et objectifs, matériaux et méthodes, résultats, discussion et conclusion. On devrait mettre en évidence les raisons qui justifient la réalisation d'une telle expérience. La fixation des objectifs clairs permet d'élaborer une méthodologie claire. La publication devrait impliquer une discussion sur des expérimentations pareilles pour que le lecteur ne souffre de l'impression que l'expérimentateur devrait étudier davantage, tirer une leçon des erreurs des autres et renouer avec les travaux accomplis, pas redécouvrir. La publication devrait être facile à comprendre et encore rendre possible la répétition de l'expérimentation aux autres ce qui impose, par exemple, d'indiquer comment, où et avec quoi on a pris les données numériques. Les résultats devraient être présentés sous formes des tableaux, des graphiques et d'autres figures pour faciliter l'appréciation de l'expérimentation au lecteur. La discussion et la conclusion devraient avoir rapport aux objectifs de début.



Experimental firing of pottery with measurement the development of temperatures. ■

Presentation of Archaeology and Archaeological Experiment

Radomír Tichý, Society for Experimental Archaeology, Czech Republic*

● This article discusses the relationship between presentation of archaeology and archaeological experiment in open-air museums.

Presentation of the results of archaeological research represents a wide range of activities. Among these are the already classical popular archaeological books and magazines, history textbooks, TV educational programmes, history lessons at schools or universities, museum exhibitions, conferences on reconstruction or education and opening archaeological sites to the public. The modern or fashionable is represented, for example, by presentation on internet or open-air museums/archaeoparks. I personally hope that

books and magazines will keep their place among the above mentioned activities, also that teaching and museum exhibitions will survive modernization and that virtual or electronic form will not completely edge out the others. On one hand the position of virtual reconstructions is irreplaceable because of its ability of depicting far-off realities, multitudes of variants and the speed of reaction to new information. On the other hand it reduces the possibilities of a sensual experience and its two-dimensionality separates people from the

* Translation J. Kateřina Dvořáková

actuality. Therefore a welcome possibility is a so called **'touch prehistory'**, meaning a visit to a 'real' prehistoric world, where the visitor is surrounded by structures and artefacts made at a 1:1 scale from authentic materials. The presence of a 'human factor', we can call them instructors, whether an archaeologist or informed teacher is also of importance.

In this paper I will attempt to consider the significance and problems of open-air museums. These museums attract several times more visitors from the ranks of the lay public than classical museum exhibitions, but they have their own problems. One of the fundamental ones is the definition of the terms **'presentation of archaeology'** and **'archaeological experiment'**. With presentations we usually mean reconstructions in the sense of our idea of the past, while experiment should be an objective scientific method. Their relations are more complex and we can outline it with the help of further terms, such as experimental archaeology, experience, time, physical performance and dexterity, building reconstruction, documentation and publication of experiments or conditions of archaeological experiment. In the next part of this paper I would like to comment on them.

1. The activities, which most correspond to the strict definition of experimental archaeology are **scientifically structured experiments**, for example firing pottery in reconstructions of various types of kilns, experiments with glass melting, bronze casting or iron smelting. Their common denominator is the high number of measured variables (tempera-

ture, time, humidity, hardness and so on) and the impression of a separation of the experimenter from the development of the experiment. According to some any activity, which lacks this underlying scientific character is not an experiment. But such a limit dramatically decreases the range of the activities available to study through experiment. The remaining activities are transferred from the category of 'archaeological experiment' to the category of **'archaeological reconstruction'**. The definition of a reliable experiment is not fully clear, for example Czech historian Dušan Třeštík says that *"today even natural scientist do not doubt that the observer is a part of the object of his observation"*. A practical (non compromised) solution can be seen in the defining of a social science experiment. It demands the formulation of a hypothesis to be tested by the experiment. The process is described by fundamental parameters which are necessary to allow for its repetition. In addition the difference between the starting and final stages has to be well documented.

In practise experimental archaeology covers a wide range of activities. One of them is so called 'living prehistory', the leisure activity of laymen, who often carry it out to the limits of perfection from a presentation point of view. The critics sometimes describe such activities as only the gaining of experience and make the 'real' experiments dependent on the existence of laboratory conditions without the influence of the human factor. 'Experience archaeology'⁽¹⁾ has become an opposite pole to specialist experiments.

⁽¹⁾ Experience archaeology is a term introduced into Czech archaeology by Zdeněk Smetánka to describe reconstructive archaeological activities which do not fulfil the criteria of natural scientific experiment. It overlaps with experimental archaeology in the cases of experiment demonstrations and a preparation of experiments and causes controversy.

2. Another problem is the **position of experience** in archaeological experiment. Let's discuss this with several examples. The first example: Any visitor to an archaeopark on meeting for the first time with an unknown material or artefact can set up for themselves a simple experiment. It is not possible to deny that this is an 'experiment'. But what about their experience, or rather inexperience? This fundamentally influences the nature and results of the experiment. Another example is an instructor at an open-air museum, who shapes from clay a vessel in the form of known pottery shape of some archaeological culture in front of a visitor. The difference between the instructor and the visitor is evident. The latter is described as 'experience' archaeology. Where is the border between 'experiment' and 'experience'?

The third example: A number of commonly accepted notions of the function or nature of archaeological artefacts was gained at the beginnings of experimental archaeology. At that time though it lacked exactly measured variables. Despite this the information gained has become a part of history text-books. For example the fact that the making of a polished axe was not started by a grandfather and finished by a grandson, as was thought originally, or that these tools were not used for ploughing but working wood. This was shown by a simple experiment but without measured variables. Was it considered an experiment then but not any more?

A reasonable compromise therefore is an admission that the situation is more complex than mere opposition of a laboratory scientific experiment to human experience, or admission that experience is one of the integral variables of archaeological experiment. From this point of view the visitor's experiment

is on the level of a school laboratory test and the instructor is here in the role of a teacher carrying out a demonstration. In certain areas experience with immeasurable variables can gain reliable information, as long as it verifies a theory. I cannot think about any other term than '**experimental archaeology concerning immeasurable variables**'.

3. **Time**, necessary for the activity, **physical performance**, necessary for the realization of a task, and **dexterity** in the manipulating the replicas or artefacts are important variables in characterising presentation and experiments. The majority of questions from the members of the public concern these variables. How far can experimental archaeology go? Do we know anything about the working times and physical performance of ancient people? The main problem is the experimenter – a modern person with different experiences, motivation, beliefs and physical condition. But we do not need to derive this from the person; we can derive it from the nature of the artefact. Current experience for example shows that some archaeologically documented and well known artefacts like axes or hoes limit physical performance by their weight and suitability to the given task. Prehistoric wooden hoes with their restricted possibilities of sharpening create bigger resistances to the soil than modern mattocks. It has to be used by somebody who can overcome these forces. The time necessary to reach the work target is, of course, an inaccurate data but is more suitable than a mere estimate. We can gain an interval expressing with certain probability the necessary time or physical performance, which gives us orientation values. For example an interval of data from an experienced experimenter in good condition to

an experienced experimenter in poor form. We cannot project into the past data gained by an inexperienced experimenter.

4. Another important range of problems concerns the building of **reconstructions of archaeological structures**. Their major parts belong to a surface space which is not generally covered by archaeological excavations. It is possible and necessary to use lucky finds of construction elements of organic materials, finds of models and prehistoric depictions. Even then the number of unknown variables dramatically rises for even a simple experiment. The late Peter Reynolds from Butser Ancient Farm justly demanded the differentiating between the term reconstruction, rebuilding the original form, and construction, building one of the possible forms of a prehistoric surface building. In practise there are always several possibilities for hypothetical forms of prehistoric structures. Here, drawings and virtual reconstructions can play a vital role. The construction at 1:1 scale is for financial and organisational reasons realized only once. The advantage of virtual reconstruction is that it is possible to change the hypothesis according to increasing knowledge in the drawing/virtual form and at the same time we have an idea on the building demands of the chosen archaeological structure. This can concern a house, outbuilding, production device, fortification element etc.

5. Important part is played by **documentation and publication**. Documentation should record the gist of the basic formula of an experiment that means the difference between the starting and final stage while registering all the acting variables. While the difference between the starting and final stages is usually evident the single factors are

problematic. Sometimes the effort to approximate the experiment to the condition of a natural scientific laboratory experiment is excessive. Then there are measured insignificant variables. The practical problem is again the position of the experimenter who is engaged in the experiment and cannot attend the recording of the measurements, respectively the attempt to measure causes an unnatural progress of the activity.

Introducing the archaeological context of the experiment, which means the correlation of the experiment and archaeological material, should be an integral part of any publication. In ideal situations it might be possible to use a natural scientific analysis. Cautiously and in my opinion only as an illustration, ethnographic and ethological parallels can be used. They are mostly alien to the conditions of prehistoric Europe but they contain a level of experience typical for aboriginal unlike modern people. At the phase of the publishing itself there is a wide range of possibilities on how to improve the clear representations of the results. The fundamental role is played, as elsewhere in archaeology, by drawing and photographic documentation, charts, tables etc. Publication of results of any type of experiments is of a fundamental importance. As it has already been said elsewhere the difficulty of carrying out certain demanding experiments, caused in the past repetition of certain questions as if previous results had been forgotten. One of the possible explanations of this is the basis of experience which is difficult to transfer and thanks to this new generation of researchers commit the same errors and invalid ideas on the solution of certain problems of experimental archaeology as others in past did. The previous findings have

been either insufficiently published for their needs, inaccessible, or scattered. The publication of results and their natural surpassing but also recognition of classical results achieved earlier is the main asset of learning. Personally I believe it is possible to recognize good and sustainable results from those, which are bad and easily discarded.

6. The securing of conditions of archaeological experiment is complicated. For example there are experiments which do not allow for everyday reality to follow some basic conditions of an experiment, as repeatability. That concerns, for example further experiments with replicas of ancient vessels where new experiments are prevented by, for example a change in political situation or changes in environmental conditions. The problems with the controlling of an experiment have been outlined in the previous paragraph. On the other hand without following certain conditions an experiment or reconstruction loses sense even for presentation. Among those are nonobservance of authenticity of the cultural placement of an artefact or structure, used material, sizes and so on. We see it often in presentations, which are aimed only at creating a visual impression. Here I would like to put forward my belief that in the recognition of a useful experiment we are not helped by a control of the presence of several principles, rather the relation between expectancy and fulfilment of ideas of target groups. Many experiments will be for a technologist of a certain discipline for their interest, archaeologists appreciate contact with original material, laymen are interested in everyday life in the past and follow possibilities of tools, time or energy demands, and general consumer outstanding performances with a pos-

sibility of danger or at least actions. It is at this point that the contact with archaeology finishes and living prehistory becomes only inspired by archaeology, more a theatre performance or artistic representation. The possibility that even these can bring new knowledge only complicates the situation.

In the conclusion I would like to, for reasons of clarity, introduce the position of experiments of various degrees as used by open-air museums:

1. Experiment

Open-air museums are suitable forums for the presentation of the results of archaeological research to the public. Their programmes should be based on the possibilities of archaeology. It is an introduction to past life, functions of artefacts and structures and the presentation of technologies. Archaeological experiments should be present in the programme. The fundamental principle is that the scientific can be also presentable. In a version, which is more difficult to realize, they can be presented with the help of multimedia, presenting the recorded experiment or in presence of experienced experimenters. This can concern pottery firing, glass making, iron or copper smelting, bronze casting. The common features of these usually are large demands on time, the presence of physical measuring appliances and a seeming detachment of the experimenter from the process. It seems that the experimenter does not interfere, which is connected to the mentioned time demands rather than reality.

2. Experiments with unmeasured variables

The experimenter in the case of activities, which are reduced to quality experience, is very visible. Through

it he/she justly entertains visitors and shares knowledge. We can describe it as an experiment with variables, which are difficult to measure or immeasurable. The perception of correctness is underscored by the use of the correct materials, production methods and authentic tools. Even simple measuring appliances (time, weight) are not present as the values are not measurable in practise and their presence seems to be either irrelevant or affected by the presence of a modern experimenter. Despite this the dexterity of the experimenter increases and does not exclude overcoming already determined values. This type of experiment usually also relates to activities which happen in short bursts and are interrupted by the modern rhythm of life. They can concern pottery making, bone and stone working, cooking and baking, smith craft, hoeing or working wood with tool replicas. These activities are probably related to the past reality although not always directly documented in archaeological material.

3. Experience

When gaining experience the original technology or material is not always strictly followed. Despite this the result of such activities can correct all our ideas on a given problem. If the model is connected by at least part of its characteristics to the characteristics of the archaeological originals it can be an asset to learning. For example the recognition of the function of a door latch or the quality of fired roof tiles dating to Great Moravian period. If the activity is carried out by an inexperienced person who compares his/her results with the life long experience of a prehistoric craftsman then it is teaching. But if the instructor of an open-air museum is inexperienced then it is a fundamental fault.

4. Original archaeological finds

These cannot be missing in the offering of open-air museums. Not to remind us of the museum shelves filled with dead artefacts but to make the authenticity of originals accessible to the visitors. This is also a reason why many open-air projects are part of the presentation of an important archaeological site or archaeology of a certain region. In these cases it is not about the experiment, nor even about experience of touching the past. Only about the visual impression. Maybe, we are used to perceive these fragmentary or damaged original artefacts as a faithful depiction of the past. Therefore ancient tools continue to surprise us with their small sizes, differing functions or the effectiveness of simple technologies. In spite of this many original artefacts have as yet not been successfully replicated.

Conclusions

I have tried to ponder the problems of archaeological presentation and experiment. The simple conclusion is that the use of experiment for science and presentation is difficult to define. Although if it was unambiguous or easy it would have been done long time ago.

If I was to summarise it in one sentence, which is clearly difficult, then it is good if the presentation is related as closely as possible to a quality experiment within its wider definition: from controllable repeatable through to immeasurable and well managed craft. This of course means that the functioning of an open-air museum is a project with high demands on knowledge, physical condition, experience, organisation and in the end also finances. Therefore we need to improve the exchange of information.

Summary

Zur Darstellung von Archäologie und archäologischer Experimente

Die Darstellungen der Resultate archäologischer Forschungen umfassen eine große Spannweite unterschiedlichster Möglichkeiten und Aktivitäten. Eine der bedeutendsten Plattformen sind hier Freilichtmuseen, die wesentlich mehr Besucher anziehen als traditionelle Museumsausstellungen. Eines der wesentlichen Probleme von Freilichtmuseen ist es, eine ausgewogene Balance zwischen der „Darstellung von Archäologie“ und dem „archäologischen Experiment“ zu finden. „Darstellung“ bedeutet hier zumeist Rekonstruktion im Sinne einer Idee bzw. Vorstellung von der Vergangenheit, während ein Experiment eine objektiv nachvollziehbare wissenschaftliche Methode sein sollte; in der Realität ist die Beziehung dieser beiden Punkte zueinander jedoch viel komplexer.

Vielfach wird die Meinung vertreten, dass jede Aktivität, die keinen wissenschaftlichen Charakter (im naturwissenschaftlichen Sinne) besitzt, kein Experiment sei. Solch eine Eingrenzung vermindert jedoch dramatisch die Spannweite möglicher Aktivitäten, die durch Experimente untersucht werden könnten. Das Hauptproblem ist hierbei nämlich die Person selbst, welche das Experiment durchführt – es ist ein moderner Mensch mit anderen Erfahrungen, Motivationen, Vorstellungen und körperlichen Fähigkeiten als wie sie ein urgeschichtlicher Mensch besessen hat. Wichtige Variablen bei einem archäologischen Experiment sind die Zeit, die für eine Tätigkeit benötigt wird, die praktische Durchführung, die für die Realisierung einer Aufgabe notwendig ist, und die Geschicklichkeit bei der Herstellung der Repliken; die überwiegende Zahl von Fragen durch die interessierte Öffentlichkeit bezieht sich auf diese Punkte. Ein weiteres bedeutendes Problemfeld betrifft die Errichtung von Gebäuderekonstruktionen. Hier steigt die Zahl der unbekanntenen Variablen sogar bei einem einfachen Experiment extrem an.

Freilichtmuseen sind geeignete Foren für die Darstellung der Ergebnisse archäologischer Forschung und archäologische Experimente sollten hier zum Programmangebot dazu gehören. Das fundamentale Prinzip ist es hierbei, dass das Wissenschaftliche darstellbar sein kann und muss.

Présentation de l'archéologie et l'expérimentation en archéologie

La présentation des résultats issus des recherches archéologiques implique plusieurs activités. Accueillant quelques fois plus de visiteurs que les musées traditionnels, les parcs archéologiques constituent l'une des plate-formes les plus importantes. Et là, le problème du rapport idéal de la présentation à l'expérimentation compte parmi les plus essentiels. D'habitude, pour la présentation de l'archéologie, on tient des reconstitutions sorties de nos idées sur des réalités anciennes, tandis que l'expérimentation en archéologie devrait constituer une méthode objective scientifique. En fait, le rapport des deux est bien compliqué.

D'après les uns, aucune activité qui manque de caractère de l'expérience scientifique, telle qu'elle est définie pour les sciences naturelles, n'est considérée comme expérimentation. Cette restriction fort diminue le nombre des activités susceptibles d'être étudiées à l'aide de l'expérimentation. Le problème principal, c'est l'expérimentateur - homme moderne, avec des expériences, foi, motivations et condition physique tout différentes. Temps de travail, performance physique, habileté dans le maniement des répliques constituent des variables importantes. En fait, la plupart des questions posées par les visiteurs y ont rapport. Un autre domaine de problèmes importants touche l'architecture des constructions. Voilà une multiplication dramatique des inconnues, même pour une expérimentation simple.

Les parcs archéologiques, ce sont des forums favorables à la présentation des résultats sortis des recherches archéologiques et l'expérimentation devrait figurer dans leurs programmes. Le principe fondamental ne change pas: ce qui est scientifique, c'est également susceptible d'être présenté.

● **Note from the editors:** We believe that our readers, particularly the younger ones in the arena of experimental research, could profit from reflecting on some constant principles of scientific experimentation. Therefore, and with the permission of the author, we condensed his publications on the subject as follows:

Principles of experimental research in archaeology

Summary from three previous publications by **Peter Kelterborn**

● **This article characterizes some basic aspects of carrying out an archaeological experiment.**

When discussing in theory the strengths and weaknesses of experimental archaeology, or when observing in practice current projects, invariably some aspects of the following four key issues arise. What follow is the personal opinion and the experience of the author, presented in the form of very concentrated and simplified headlines.

Key issue 1: state of the art

When does an experiment agree scientific standards as they are accepted today? When it is:

- 1.1 Clearly goal and solution oriented.
Experimenting is not learning by doing.
- 1.2 Correctly modelled.
- 1.3 Measurable.
- 1.4 Repeatable.
- 1.5 Professionally planned and supervised during all seven basic activities.
- 1.6 Executed with the correct manual skill, not too high and not too low.

Key issue 2: basic activities

What is common amongst all trustworthy experimental projects? When all seven basic stages are well executed:

- 2.1 Procure, analyze, exploit the existing data base and make logical conclusions with a regard to the future project. The data base includes literature, archaeological originals and opinions of experts.
- 2.2 Conceive and plan, not only the experiment, but the whole project in its archaeological context.
- 2.3 Prepare and equip the infrastructure and the location of the experiment (lab or field).
- 2.4 Supply all original or substitute raw materials.
- 2.5 Make or buy tools, instruments, fixtures and gadgets.
- 2.6 Run the experiment, evaluate and draw conclusions simultaneously. If needed, make corrections
- 2.7 Document, store and report.

Key issue 3: convincing quality

What is needed to become an expert in experimental archaeology? Besides experience:

- 3.1 A profound understanding of the technology and archaeology of period and culture being researched.
- 3.2 Familiarity with the experimental approach to problem solving.

- 3.3 Having the practical skills necessary for the activities in the project.
- 3.4 Talent to organize and improvise.
- 3.5 Ability to observe and report with precision.
- 3.6 Curiosity, honesty and self critique.

Key issue 4: winning strategies

Just as a game may be won in different ways, so a problem may be solved by following different paths or strategies. What can lead quicker to success in which situations?

4.1 „one after the other“

Indicates that all 7 basic activities must be thoroughly executed in the exact order as given in key issue 2. Recommendable for routine experiments or when surprises and changes are surely not to be expected.

4.2 „the art of reduction“

Is chosen when it is possible to isolate key problems and to define relevant information to be measured, even when it requires pre-testing. A very useful speed-up strategy when large volumes of possibly useless numerical data could be gathered in the course the experiments or already when procuring the data base. Also a helpful strategy before deciding to use computer supported working methods, which tend to accumulate superfluous data, costing time and work.

4.3 „cross link and backfeed“

Instructs to conduct all 7 basic activities as much as possible simultaneously with constant input of every bit of progress into all the other activities under way. This very flexible approach is best when there is much interdependence between the seven basic activities to be expected or when the learning steps in one activity immediately influence the work in others.

4.4 „divide and control“

Advise to split a large problem into smaller independent problems and to solve these separately with separate experiments. This is particularly suitable for questions which involve large systems or when different stages are likely to occur in a single problem.

4.5 „overview first, details later“

Gives a clear priority to approximate and quick solution of the overall problem, before looking at exacter details or optimizations. This is for large scale projects and also as a defence against being side-tracked by secondary discoveries or secondary difficulties.

4.6 „eliminate first, solve later“

Uses the experiments to find what does not work or leads to a dead end first. This can save much time, while giving the opportunity to gain practical experiences in the area of the problem.

4.7 “try now, think later”

Means that the actual experiment is started right away. While all other basic activities are postponed until absolutely required. This can be used as an opening move or as a break-through strategy when the problem is very complex or very new, or when the barriers are so high that the project would get stuck even before an experiment is started.

Sources

Earlier versions of this article were published in:

- Kelterborn, Peter, 1987: Principles of Experimental Research in Archaeology. In Bulletin of Experimental Archaeology, No 8, pp 11-12. Department of Adult Education, University of Southampton.*
- Kelterborn, Peter, 1990: Preconditions and Strategies for Experimental Archaeology. In Le Silex de sa Genèse à l'Outil, Tome 2, Cahiers du Quaternaire No 17, pp 599-602. Editions CNRS, Paris.*
- Kelterborn, Peter, 2001: Die wissenschaftlichen Experimente in der experimentellen Archäologie. In Zeitschrift für schweizerische Archäologie und Kunstgeschichte, Band 58, Heft 1/01, pp 21-24.*

Summary

Prinzipien experimenteller Forschung in der Archäologie

Bei der theoretischen Diskussion der Stärken und Schwächen experimenteller Archäologie tauchen einige Aspekte regelmäßig auf: Ein Experiment muss mit den heutzutage anerkannten wissenschaftlichen Standards übereinstimmen, es sollte ein klares Ziel aufweisen, ergebnisorientiert durchgeführt werden und wiederholbar sein. Bei seiner Vorbereitung ist es notwendig, die bestehenden Kenntnisse und Daten – zu denen Literatur, archäologische Originalfunde und die Thesen von Experten gehören – heranzuziehen, zu analysieren und auszuwerten. Das Experiment muss dokumentiert und als Bericht zusammengestellt werden. Bei der Durchführung eines Experimentes benötigt der Ausführende profunde Kenntnis der damaligen technologischen Möglichkeiten und der archäologischen Kulturgruppe, deren Periode untersucht wird; darüber hinaus sind die praktischen Fähigkeiten für die jeweiligen Projektaktivitäten von entscheidender Bedeutung. Abschließend bleibt festzustellen, dass es niemals nur eine Möglichkeit gibt, ein Problem zu lösen. Wie auch ein Spiel auf verschiedene Weise gewonnen werden kann, so kann ein Problem auch durch die Nutzung verschiedener Wege oder Strategien gelöst werden.

Principes des recherches expérimentales en archéologie

En discutant les performances et les faiblesses de l'expérimentation en archéologie, certains problèmes reviennent toujours. Pour répondre au standard scientifique conventionnel actuel, l'expérimentation doit avoir un objectif clair, vérifier une hypothèse et être renouvelable. Au cours des préparations, il faut se procurer, analyser et profiter des informations actuelles, y compris la littérature, les pièces archéologiques et les consultations avec des spécialistes. L'expérimentation doit être documentée et publiée. En vue de pouvoir réaliser une expérimentation, l'expérimentateur doit connaître les cultures technologique et archéologique de la période en question et assimiler le savoir-faire visé par les activités liées au projet. Enfin, il n'existe pas seulement une seule façon de résoudre le problème. Ainsi qu'on peut gagner une partie avec des tactiques différentes, les problèmes peuvent être résolus à l'aide des stratégies différentes.