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Experiments in archaeology – A view from Lejre, an “old” experimental centre

by MARIANNE RASMUSSEN

The Historical-Archaeological Experimental Centre in Lejre

The experimental centre in Lejre was founded in 1964 by Hans-Ole Hansen with the help of such important and visionary authorities as the late professor Steensberg and the late professor Glob. The centre was established as a scientific field station for experiments in archaeology. This was a consequence of a research approach mainly introduced by professor Steensberg and characterized by the application of ethnographic analogies and practical experiments for the study of living conditions in the past. The experimental work of the first years focused on building full-scale models of iron age houses (Fig. 1) and on cultivation experiments. Thus, the centre was established for scientific purposes, but fairly soon the range of activities

was diversified. The public was eager to watch the experiments, and an interpretative and demonstrative part of the centre developed with events, topics, and special areas of its own. Finally, a comprehensive educational programme for schoolchildren complying with new teaching methods was established.

During the past 35 years, the focus on the three “legs” of the centre – education, public demonstration, and research – gradually changed. In the seventies and early eighties the educational and public parts grew significantly and received much acknowledgement from the outside world. Research was reduced to a very modest level, and experiments were conducted without any connection to the established academic archaeology in Denmark. It could not satisfy scientific demands and therefore did not earn any credit.



Fig. 1 A model of an iron age village was established in 1964. It is still the best known and core part of the centre.

Today, education, demonstrations for the general public and research are considered to be equally important, and Lejre is characterized by maintaining a combination of all three parts. This is obviously a fruitful and sometimes very troublesome challenge, but this is also what makes Lejre unique.

The area of the centre is divided into reconstructed environments, educational environments, and areas for experiments and handicrafts not attributed to a specific period. The most famous reconstructed environment is the iron age village, which has undergone many changes since it was built. At the moment, it consists of four longhouses and eight smaller buildings, all full-scale models of houses from the Danish area between 200 BC – 200 AD. Over the

The iron age village is surrounded by pastures, meadows, fields, and a wood with a sacrificial bog. All is part of the reconstructed environment. A small stone age area is another reconstructed environment. It is not permanently staffed, but occasionally it houses research projects as well as teaching-sessions for schoolchildren. Finally, the so-called farmcottages must be mentioned. They provide a reconstructed smallholder environment from around 1850 AD. The environment comprises two dwelling houses, a workshop, fields, and very beautiful gardens. The area is mainly used for interpretation and teaching programmes. Similar to the houses in the iron age village, the farmcottages are built to be used, and in the summertime they are inhabited by “historic families”.



Fig. 2 Fruitful dialogues often arise between the families living in the reconstructed environments and the visitors of the centre.

years, the houses have been built and pulled down, fences and fields established, taken down or moved. Varying experiments with iron smelting, revolving querns, kiln building, the pruning of trees and bushes, and many more have left their marks on the village and its surroundings. The iron age village houses all dimensions of the centre's activities. It demonstrates Danish iron age living conditions to the public, it contains daily and structured visiting-programmes for schoolchildren and it is the field of many experiments among which the most famous is the experimental burning down of a full-scale house model. The activities include the so-called “prehistoric families”. These are ordinary families, who spend part of their summer holiday living like inhabitants of an iron age village. Their diet, their clothes and their equipments are in line with our most recent interpretations of iron age habits. Thus they form a living part of the reconstructed environment and of our specific understanding of it (Fig. 2).



Fig. 3 Every season about 20.000 children take their way through the experiences and simple learning of the Fire Valley and spend many hours here.

The educational environments include first of all the camp school area and the so-called Fire Valley. The latter is a very simple but successful concept. It takes for granted that children wish to do things by themselves, and represents practical demonstration in its widest sense. The children and their families sail in dug-out canoes, they grind grain, bake biscuits, use copies of iron age axes, or they just enjoy the fireside (Fig. 3).

The camp school area houses children in their own village-like environment for a week. Lately, the area has been extended by a Viking market place, which offers shorter stays in tents. New learning situations based on the meeting between “the people of the market place” and “the permanent settlers” in the village are developed in these years. The focus is put on Viking age, while the Fire Valley reflects simple technology and general activities rather than a specific time-period. In principle, all areas of the centre may be used for educational purposes. However, the two men-

tioned above are the main areas especially established for the purpose.

Finally, the centre contains areas for experiments and handicrafts not belonging to a specific period. The staff of the experimental workshops are professional craftspeople, who demonstrate the technology of pottery, textile and iron-forging to the visitors. However, a main task is to carry out experiments using old technologies. The co-operation between the skilled craftsmen and the archaeologists is very important in this respect. Several visiting researchers are assisted in their projects by craftspeople, whose contributions are appreciated because of their comprehensive knowledge of the basic technology of the raw material. Obviously, the archaeological questions, the planning of the experiment, the documentation, and the reporting must be defined and managed by the archaeologist.

A new area designated to experimental work with prehistoric graves and monuments is now being established. It is not a reconstructed environment, as the monuments are the result of very different experiments, representing various time-periods. Projects on the building of megaliths have been running for four seasons (Fig. 4). A large original, late neolithic stone-cist has been constructed in order to test two different ways of placing the upper stones. An early neolithic long dolmen is under construction now. The most important questions concern the work and resources used for the various elements of the monument. Both are typical Lejre-projects because of their perfect combination of research and public demonstration.

The future is full of visions, ideas and plans. However, the realisation as always depends on the financial circumstances. A continuously improved quality concept is maintained in all activities. The main objective for the Lejre-centre has not changed for many years: to conduct archaeological research by means of experiments and to interpret and demonstrate the results to a broad public, to schoolchildren and to the professional colleagues as well. It is an ongoing challenge for Lejre to integrate experiments in the academic archaeology, of which it is a genuine part, maintaining and developing at the same time the scientific application of the method by participating in education. But being a centre for interpretation, demonstration and teaching, Lejre is also part of another category of institutions of varying quality, called visitors centres, archaeological parks, etc. Nowadays, their number has increased enormously. Sticking, however, to the basic concept of asking questions and not just giving answers, Lejre's position is rather different from that of most new centres and archaeological parks.

Surveying some experiments in archaeology at Lejre

Basically, it is agreed that the use of experiments in archaeology is a method corresponding to the use of analogies, ethno-archaeology etc.¹ An experiment is not only a tool, but also a partner in the interpretation process: during the

experimentation new aspects on the prehistoric material emerge and the researcher returns to the record with new questions. This process encourages new experiments and consequently a fruitful hermeneutic circle is established. This means that experiments must be evaluated just like other analogies by discussing the relation between the analogy and the archaeological material and problem in

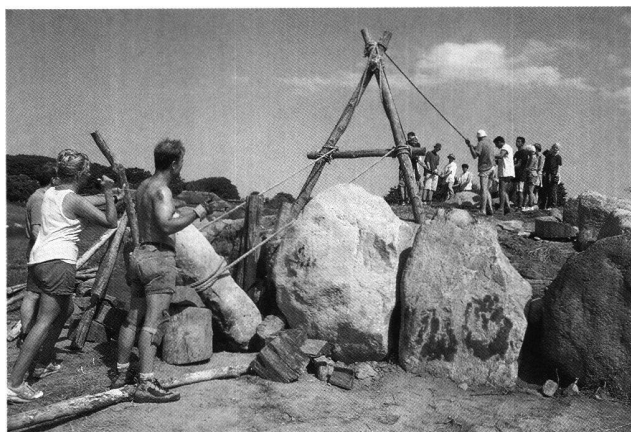


Fig. 4 The megalith-building has thrown new light on the effort needed for this kind of project in terms of organisation, manpower, planning etc.

question: what demands have been made on the experiment, its design, character etc. in relation to the problem. Thus, the criteria of success are, how much further has the process brought us, how many new aspects are we offered, etc.

Fundamentally, experiments aim at identification: an analogous situation is created and similar traces are looked for, as, for example, when examining hitherto unknown and not recognised traces like the presence of wood splinters in antler axes,² or the already known striations on flintknives, or the patterns in the growth of trees that have been used for pollarding,³ or the identification of soil structures resulting from the cultivation by specific ard-types.⁴ The value of the experiment rises with the possibility of identification.

Experiments may be categorised in many different ways, based on their character and the character of their performance. At Lejre, distinctions are made between technological, short term experiments, process-oriented, long term experiments, and experiments that consider taphonomic questions.⁵ The various classifications suggested in scientific publications very seldom work. The reason lies in the nature of the experiment itself: every experiment originates, is planned and conducted, and in all ways relates to a

specific archaeological problem – which means that experiments are just as varied as archaeological questions.

However, the most important points to consider are the usefulness of the experiments, the requirements they must meet, the purpose of their results, their significance for the research-process and the scientific recognition. This is where evaluation and scientific value can be discussed.

process based on thousands of tests, but with very convincing results (Fig. 6).⁷

An experiment on the construction of bronze age turf barrows was based on less controlled circumstances, but did nevertheless create a framework for renewed interpretation of the archaeological record. The project questions and analyses the processes behind the unique preservation

TWO DIFFERENT EXPERIMENTAL APPROACHES IN ARCHAEOLOGY

The choice is dependent on the archaeological problem.

Both are evaluated by their relation to the archaeological problem and evidence

THE CONTROLLED ARCHAEOLOGICAL EXPERIMENT

- seeks to isolate as many variables as possible
 - changes one variable at the time, keeping the others constant
 - provides measurable and repeatable results
- The approach embraces different levels of control of variables.

THE CONTEXTUAL ARCHAEOLOGICAL EXPERIMENT

- does not intend to isolate as many variables as possible
 - provides arguments and evaluates relevance
- The approach embraces different levels from identification to inspiration/eye-opener.

Fig. 5 Two approaches to the use of experiments in archaeology: the controlled archaeological experiment and the contextual archaeological experiment.

When looking at the research process as a whole, a general distinction must be made between the controlled archaeological experiment and the contextual archaeological experiment (Fig. 5), though many experiments in fact overlap. In his paper⁶ Peter Kelterborn discusses the content and aspects regarding the controlled archaeological experiment. The controlled archaeological experiment is related to the way experiments are made in natural sciences with a basic rule of changing one parameter at the time and keeping the others constant. The contextual archaeological experiment does not claim to control the variables, but searches for identical situations to be inspired from.

Jacques Pelegrin's experiment on the production of long blades at Lejre is an excellent example of a controlled archaeological experiment. Carefully changing only one parameter at the time, the production-process has been mapped by comparing experimentally produced tools with original tools and identifying tiny patterns of striations, notches, and other micro characteristics – a slow working



Fig. 6 For more than ten seasons Jacques Pelegrin worked at Lejre with research-problems on the production of long blades. – An excellent example of the controlled archaeological experiment.

conditions in early bronze age mounds in especially the southeastern part of Denmark, conditions that have lead to the preservation of oak-coffins and their content of bodies, woollen costumes, wood bowls, furs etc. On the basis of new soil science investigations, it was claimed by geologists that an iron pan created by a reduction/oxidation process (gleying) and not podzolization, as usually claimed, formed the impenetrable closing of the special anaerobic environment of the inner mound-core.⁸ But how was this wet and anaerobic environment established from the beginning, when it could be testified that the building material consisted of ordinary dry grass-land turfs, and not wet meadow turfs? In 1995 the first of a series of barrow-models in 1:4 was built. It was equipped with a small oak-coffin with a piece of pork – resembling the famous Egtved-burial. The turfs in the core were watered and stuffed tightly together (Fig. 7a). A more loosely built outer mantel finalized the barrow-construction (Fig. 7b). Both procedures are part of one and the same building-process, but the specific constructive elements form different layers, when they are

interpreted archaeologically. In 1998 the barrow was excavated (Fig. 7c), and in spite of difficult chemical preconditions, it was demonstrated that the soil-chemical processes of an iron pan could be established in this way, and further that a unique preservation state of the burial was achieved (Fig. 7d).⁹



Fig. 7b The finished burial mound model was about 1.1 m high.



Fig. 7a The horizontal layers of sods in the core of the burial mound model were wetted and walked upon for compaction.



Fig. 7c The core and mantel of the burial mound model could easily be distinguished in the profile during excavation.

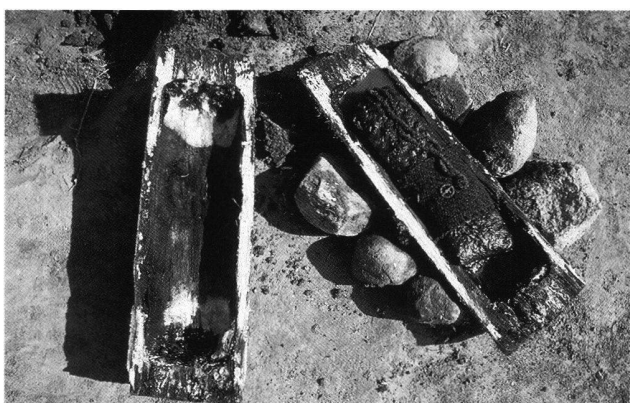


Fig. 7d The oak coffin as well as its content was surprisingly well-preserved after three years in the burial mound model.

This is an example of an experiment in dialogue with the archaeological problem and evidence. The value of the experiment as a contributor to the interpretative process is huge. It is impossible to control all variables and only change one parameter at the time. Certain aspects and processes of this experiment could be claimed to be more reliable if calculated in a laboratory on the basis of classical natural science experiments or if simulated in a computer. However, such an approach will only offer the predictable results: you will never get more out of the computer than what you put into it. In a contextual experimental approach like the barrow-experiment, the possibility of observing unpredictable aspects and phenomena is kept open. The experiment recreates the process and it is multivariable. Its main contribution is the supplying of an interpretative framework, rather than providing proofs. Having gained new insights, the experimenter will be able to go back to the archaeological record.

The well-known building of and trial-sailing with Viking ship replica at the Vikingship Museum in Roskilde are also very good examples of multivariable and contextual archaeological experiments.¹⁰ It is impossible to go back and test whether the Vikings actually did manoeuvre their ships in the suggested ways. What can be concluded are statements like: a Viking ship replica *can* make tacks, a Viking ship replica *can* load a certain amount of cargo etc.

In the other end of the spectrum, we find activities that must be labelled experiences rather than experiments. For three winters, a group of students of archaeology have studied problems of wintering in iron age houses by living in the full-scale house-models for a couple of weeks and observing various aspects of the indoor climate. This informal simulation of “daily life” – as far as such a situation can be reconstructed – is a valuable source of inspiration. The students question their ideas and conceptions of iron age “daily life” – they create an environment and atmosphere that is useful for their thinking. The results do not concern living in an iron age house during the Iron Age, they concern living in a full-scale iron age house-model in the present. Thus, the students do not get any scientifically acknowledged results, but they will be aware of all irrelevant factors for the investigation of the archaeological evidence of iron age daily life (Fig. 8). Experience cannot be documented, but it can serve as an eye-opener.

By conducting experiments, first of all, one creates a platform or frame for the interpretation of the past.

The future

It is inevitable that experimentation as a method in archaeology must be accepted and acknowledged. Experiments offer a great potential for solving *How?*-questions: How was a tool made, how did it function, how can you produce iron from ore, etc. Archaeology cannot do without experiments, but they do not necessarily have to be conducted in an environment of school-education or public demonstra-

tion as it is done in Lejre. Obviously, it would be much easier without the “disturbance” by children and visitors. On the other hand, such combined centres are the perfect stage for keeping alive public interest in archaeology – and consequently maintaining a public funding of archaeology. The centres must also serve as stages for good interpretation of primitive, but clever technology, a task that in the end would benefit such noble purposes as increasing tolerance and avoiding alienation among young people.



Fig. 8 When studying the environment in the iron age full-scale house-models at Lejre, it must be kept in mind that it is our own interpretations we study.

What we should do is keep together and keep apart. If we want to make archaeology popular and interesting for the general public, we must aim at bringing together experiment and interpretation/demonstration.

We must keep experiment and interpretation apart when we wish to work as scientists solving archaeological problems. It is important to know exactly what is going on in the different areas of archaeology. All aspects have a *raison d'être*, but the message about the specific character of the actual event must be clear. The present confusing mix of concepts and labels of activities, as well as the suggested mix of location in centres entail a constant pressure on the standard of the scientific experiment. This challenge must be met by education, continuity, debate, and evaluation. For educational purposes, Lejre has introduced the Lejre Seminars, intensive graduate courses with international participation in the methodology of experimentation. The seminars are developed in co-operation with universities in order to be included into their curriculum. Publication is another key-word for keeping up scientific standard and reliability of experiments in archaeology. Preferably, experiments and their results must be published in journals of

general archaeology, rather than just made available in separate journals for experimental archaeology. This touches on the core-issue of the development of experiments and their continuing integration and contribution to the interpretation in archaeology: experimentation must never

become an isolated area, conducted by specialists, separating themselves from other archaeologists and establishing their own societies. The main goal is to contribute markedly to the debate on archaeological theory-building in general.

NOTES

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- ² GITTE JENSEN, *Ubrugelige økser? Forsøg med Kongemose- og Ertebøllekulturens økser af hjortetak. (Unusable axes? An Experiment with Antler Axes of the Kongemose and Ertebølle Cultures)*, in: BO MADSEN (ed.), Eksperimentel Arkæologi. Studier i Teknologi og Kultur nr. 1, Lejre 1991, p. 9–22.
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- ⁵ BJARNE GRØNNOW / MARIANNE RASMUSSEN, *The Historical-Experimental Centre at Lejre, Denmark: 30 years of experimenting with the past*, in: PETER G. STONE / PHILIPPE G. PLANEL (eds.), *The constructed Past. Experimental archaeology, education and the public. One World Archaeology 36*, London 1999, p. 136–145.
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- ¹⁰ ERIK ANDERSEN / OLE CRUMLIN-PEDERSEN / SØREN VADSTRUP / MAX WINNER, *Roar Ege. Skuldelev 3 skibet som arkæologisk eksperiment. (Roar Ege. The Skuldelev 3 ship as an archaeological experiment)*, Roskilde 1997.

SUMMARY

The contribution of experiments to the development of theories and interpretation in archaeology is of growing importance. In order to ensure that this will lead to significant results, ongoing discussion and evaluation of the use and concept of experimental archaeology is necessary. The paper poses some questions and issues raised at the Lejre experimental centre on the basis of the experiences collected here.

Vermehrt tragen Experimente dazu bei, zu neuen archäologischen Erkenntnissen zu kommen. Um sicher zu gehen, dass sich dabei gültige und glaubwürdige Resultate ergeben, ist es immer noch notwendig, den Begriff an sich und die Anwendung von Experimenten als Methode zu erörtern. Der Artikel beschreibt das Versuchszentrum von Lejre und die hier gemachten Erfahrungen. Das Durchführen von Experimenten wird als eine Methode angesehen, die auf die gleiche Art wie alle anderen Analogien in wissenschaftlichen Prozessen angewendet und ausgewertet werden kann. Oft lässt sich dieser Prozess als hermeneutischen Zirkel beschreiben, in dem man zum Ausgangspunkt zurückkehrt und das archäologische Quellenmaterial konfrontiert, um daraufhin ein neues Experiment durchzuführen. Aufgrund des engen Zusammenhangs zwischen Experiment und archäologischer Problemstellung ist es schwierig, Experimente zu klassifizieren; sie zeigen die gleiche Vielfalt auf wie die Problemstellungen. Bei der Ausführung von Experimenten ist es jedoch notwendig mit zwei verschiedenen Ansatzpunkten zu operieren: dem kontrollierten archäologischen Experiment und dem kontextuellen archäologischen Experiment. Dieses Abwägen ist wichtig für Sinn und Zweck des Versuches und für die Bedeutung, die den Ergebnissen beigemessen werden. Der Artikel zeigt Beispiele von Experimenten mit unterschiedlichen Ausgangspunkten. Alle leisten jedoch einen wichtigen Beitrag zur weiterführenden Interpretation von archäologischem Quellenmaterial. Abschliessend wird erörtert, auf welche Weise wissenschaftliche Experimente in Zentren durchgeführt werden können, die sich schwerpunktmässig auch mit Vermittlung und Unterricht befassen, und wie diese verschiedenen Aspekte sich gegenseitig, ohne grosse Begriffsverwirrung, unterstützen können.

L'expérimentation contribue de plus en plus à éclairer certains aspects de l'archéologie. Pour être sûr de la validité et de la fiabilité des résultats, il est cependant nécessaire de réfléchir sur le concept et l'utilisation de l'expérimentation en tant que méthode. L'article présente le centre d'expérimentation de Lejre. L'expérimentation est considérée une méthode qui peut être utilisée et exploitée comme toute autre méthode scientifique basée sur l'analogie. Souvent, ce processus peut être décrit comme un cycle herméneutique, par lequel le point de départ est confronté au matériel archéologique pour ensuite effectuer une nouvelle expérience. Problématique archéologique et expérience sont intimement liées, de telle sorte qu'il est difficile de classer ces dernières. Elles sont aussi variées que les problématiques archéologiques. L'expérimentation nécessite deux approches différentes: l'expérience contrôlée et l'expérience contextuelle. L'équilibre entre ces deux approches donne un sens à l'expérimentation archéologique et elle est importante pour la signification attribuée aux résultats. L'article évoque différents exemples d'expérimentation. Tous cependant apportent une contribution importante dans l'interprétation du matériel archéologique. Pour finir, nous abordons le problème de la place de l'expérimentation archéologique dans des institutions à vocation didactique et pédagogique et les possibilités de relier ces différents aspects, sans que cela ne conduise pour autant à une confusion entre les différents concepts.

RIASSUNTO

Per ottenere nuove conoscenze l'archeologia ricorre sempre di più allo strumento dell'esperimento. Per avere la certezza che i risultati ottenuti siano validi e credibili, è tuttora necessario valutare cosa sia un esperimento e cosa comporti la sua applicazione in quanto metodo. L'articolo descrive il centro sperimentale di Lejre e le esperienze fatte da tale centro. L'attuazione di esperimenti viene ritenuta un metodo che può essere applicato e valutato in procedure scientifiche come tutte le altre analogie. Spesso questo processo può essere descritto come circolo ermeneutico, poiché si ritorna al punto di partenza e si confronta il materiale alla fonte, per poi procedere con un nuovo esperimento. In base alla stretta connessione fra l'esperimento e il problema che l'archeologia pone è difficile classificare gli esperimenti, in quanto denotano la stessa varietà dei problemi posti. L'esecuzione di esperimenti implica necessariamente che si parta da due punti diversi: l'esperimento archeologico controllato e l'esperimento archeologico contestuale. È una valutazione importante ai fini del senso e dell'obiettivo della sperimentazione nonché del significato che viene attribuito ai risultati ottenuti. L'articolo mostra degli esempi di esperimenti con punti di partenza diversi, che danno nondimeno un contributo importante a un'interpretazione più estesa del materiale archeologico alla fonte. Infine viene valutato come sia possibile eseguire esperimenti scientifici in centri che si occupano principalmente della mediazione e dell'insegnamento, e come questi concetti così diversi si sostengano a vicenda senza provocare grossi malintesi.