



## **Civilisations**

Revue internationale d'anthropologie et de sciences humaines

**49 | 2002**

**Pain, fours et foyers des temps passés**

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### **Édition électronique**

URL : <http://journals.openedition.org/civilisations/1353>

DOI : 10.4000/civilisations.1353

ISSN : 2032-0442

### **Éditeur**

Institut de sociologie de l'Université Libre de Bruxelles

### **Édition imprimée**

Date de publication : 3 juin 2002

Pagination : 27-36

ISBN : 0009-8140

ISSN : 0009-8140

### **Référence électronique**

Delwen Samuel, « Bread in archaeology », *Civilisations* [En ligne], 49 | 2002, mis en ligne le 01 juin 2005, consulté le 19 avril 2019. URL : <http://journals.openedition.org/civilisations/1353> ; DOI : 10.4000/civilisations.1353

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Delwen Samuel

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*I am grateful to Kai Fechner for inviting me to write this introduction, and for the organisation and publication of the 1995 Bread, Hearths and Ovens meeting. I have drawn heavily on the references provided by Renfrew (1973) and Hansson (1995a ; 1995b ; 1996) for examples, work on ancient European bread. I have benefited from discussions with Ann- Marie Hansson and I thank Mark Nesbitt for his helpful comments.*

## 1. Introduction

- 1 Bread has rarely been recognised as an archaeological artefact, either as a class of material which survives in the archaeological record, or as remains which deserve detailed post-excavation analysis. Because ancient bread is uncommon, often difficult to recognise and little studied, its investigation has had a low profile. In many ancient and modern societies, however, bread has been a staple foodstuff, a focus not only for nutrition but for social cohesion and symbolic thought. As such, it plays a key role in culture. The archaeological study of the production and role of bread has the potential to provide unique insights into ancient society.

## 2. Early work

- 2 Despite their neglected status, some ancient remains of bread were recognised very early in the modern development of archaeology. Amongst the earliest finds were loaves recovered in the late Neolithic Swiss lake villages (Keller 1866 : 48, 63). Early Medieval cremation graves at Birka on the island of Björkö excavated between 1873 and 1895 by Hjalmar Stolpe yielded large quantities of bread (Hansson 1996 : 62). Although they are often well preserved, awareness of or interest in the presence of desiccated bread loaves in ancient Egyptian graves and tombs seems to have come later than the European finds. Occasionally, finds of bread loaves are mentioned in excavation reports, such as that of Qurneh by Petrie (1909).

- 3 As scattered finds of bread began to be unearthed, a few pioneers began to analyse them. Heer (1866 : 338) investigated the morphology of plant remains which were incorporated in some of the late Neolithic Swiss finds, identifying free-threshing wheat, linseed (*Linum usitatissimum* L.) and millet (*Panicum miliaceum* L. and *Setaria italica* (L.) Beauv.). Rosendahl (1912a ; 1912b) applied light microscopy to examine fragments of plant tissue from an early Medieval loaf found in a Swedish cremation grave, using cell anatomy to identify Scots pine inner bark (*Pinus sylvestris* L.) and field pea (*Pisum sativum* L. var. *arvense* (L.) Poir.). Rosendahl (1912a ; 1912b) also used chemical analysis to identify starch granules in the bread. The discovery that starch granules survived in ancient bread and reacted with iodide potassium iodide (IKI) had also been made by Wittmack (1896), working on specimens of desiccated ancient Egyptian loaves.
- 4 These and other investigators showed that a range of information could be obtained from ancient loaves. Whole and fragmentary cereals, seeds and chaff embedded in ancient loaves were identified by morphological or anatomical means, establishing bread ingredients. Early work could be hampered by a lack of well-established, widely used identification criteria, which in some cases led to incomplete or inaccurate identifications. The principle, however, that identifications could be made of embedded, sometimes broken plant remains, was established. As well as ingredients, bread shape and decoration were described when whole loaves or sufficiently large fragments survived. The status of bread as leavened or unleavened bread was suggested on the basis of the degree of porosity of the crumb.
- 5 Apart from the work already mentioned, few analyses of ancient bread were undertaken in the early and middle decades of the twentieth century. The Glastonbury buns were studied by Reid (1917 : 629) and by Helbaek (1952 : 212, Pl. 23a, b). In the early 1930s, an admirably detailed study of an ancient Egyptian desiccated loaf was carried out by Borchardt (1932) and Grüss (1932). This encompassed a range of approaches, including consideration of archaeological evidence for ancient baking technology, description of modern traditional Egyptian baking procedures, artistic evidence, and a description of the loaf on both macro- and microscopic levels.

### 3. New approaches

- 6 More recently, two scholars turned their attention to ancient bread, and helped to establish a more modern approach and a revived interest in the topic. In Sweden Hakon Hjelmqvist carried out detailed analyses of Scandinavian bread, working out principles and methods by which ingredients could be identified from surviving plant tissues. He studied specimens of early Medieval bread from Birka and from Ljunga (Hjelmqvist 1984 ; 1990).
- 7 In Switzerland, Max Währen's interest in ancient bread and baking has resulted in an extensive set of publications. He considered bread and baking technology in a number of ancient societies. For a list of his publications up to and partially including 1995, see Währen 1995. More articles have since been published in *Helvetia Archaeologica* (see Währen, this volume). Währen was amongst the first to use a multi-disciplinary approach to the study of ancient bread. He has used appropriate ethnographic analogies in order to establish how ancient people prepared and produced their bread. He realised that

evidence such as ancient ovens and ancient depictions was needed to make comparisons with modern traditional bakery and to explain ancient bread production.

- 8 Although ancient bread studies do not have a high profile in archaeology today, they certainly are much better and more widely established as a result of the work done by Hjelmqvist and Währen. The contributions to this volume demonstrate the current interest in the study of ancient bread and baking. They also show, as other areas of archaeological investigation, that there has been an expansion in the techniques which can now be applied to the preserved loaves themselves. Traditional methods based on simple observation and light microscopy still play a fundamental role, but more recent technologies such as scanning electron microscopy and chemical analysis are providing important new insights.

## 4. Preservation

- 9 To some extent, analytical methods are applied according to the way ancient bread has been preserved. Most commonly, ancient bread is charred. This may be a result of deliberate burning, for example on funerary pyres or offerings burnt during religious practices. Charring may be due to isolated chance incidents, as when a loaf was unintentionally dropped into a domestic oven during the baking process. More dramatic are catastrophic events. One well-known example is from the city of Pompeii, where charred loaves were recovered from a baker's shop (Mayeske 1979).
- 10 Desiccation is the other way that bread can be preserved. Loaves which survive thanks to complete drying are more rare than charred bread because they are restricted to arid places. One of the richest sources is ancient Egypt. The majority of recovered Egyptian loaves were offerings to the dead placed in tombs and graves.
- 11 Waterlogging, another way in which organic remains can be preserved, does not allow processed cereal foods like bread to survive. The bread from the Swiss lake villages, for example, is all charred (Keller 1866 : 63), as are the loaves from Glastonbury (Reid 1917 : 629). Starch, proteins and soluble organic components disperse in water, causing objects like loaves to disintegrate. The difficulties of recovering waterlogged processed cereal foods is clear when one considers the state of ancient uncharred, waterlogged cereal grains and other starch- rich seeds. These are preserved as empty sacks composed only of the bran ; the endosperm, the bulk of the cereal grain, has gone (e.g. Körber- Grohne 1964).
- 12 The potential for analysis differs somewhat between charred and desiccated bread. Desiccated loaves can be exceptionally well preserved. They often retain many original characteristics which are easily assessed, such as shape, decoration, texture and occasionally even scent. Their colour is darker than the original, but is observable. It can vary throughout the crust and interior, providing helpful information about how the loaf was made. Because the state of preservation is so good, ingredients are often very easy to identify.
- 13 The microstructure of desiccated loaves is equally well preserved. As a result, the morphology of starch granules can be used to identify ancient processing methods (Samuel 1996b), while yeast cells and other microscopic components can be detected. Because structure at macroscopic and microscopic levels is so clear, the identification of

fragments as pieces of bread is often straightforward. However, good structural preservation is not necessarily an indicator of good biochemical preservation.

- 14 If charred bread is well preserved and relatively undamaged, many features such as ingredients, texture, shape and decoration can be determined. Problems arise when the distortion and degradation of organic components caused by high temperatures have destroyed the original bread structure. For example, it can sometimes be difficult to determine whether a charred lump made from cereal is porous because it was so prior to burning, or whether vesicles formed as a result of exposure to high, charring temperatures. Such changes make charred fragments more difficult to identify as bread.
- 15 Techniques appropriate to the study of ancient bread include detailed observation, scanning electron and light microscopy and chemical analysis. In the case of desiccated bread, scanning electron microscopy can be used not only for the study of tissue anatomy but also for the investigation of microstructure.

## 5. Find contexts, funerary and domestic

- 16 Provenance plays an important part in the interpretation of ancient bread. Loaves and bread fragments are more commonly recovered from funerary contexts than domestic areas, even though it is likely that in ancient life there was far more bread circulating in domestic spaces than was provided for the dead. There are two main reasons for this, one taphonomic and one recovery- based.
- 17 Firstly, unless destined for a special purpose, most prepared food was intended to be eaten. Only in unintentional or unusual situations would bread have been deposited or burnt during daily domestic activity. Any bread left uneaten by people was most likely to have been deliberately given to domestic animals or scavenged by other organisms, including insects. In contrast, funerary offering loaves, often several or many for each burial, were placed in a protected place. Unless there was subsequent ancient activity or modern looting, the graves usually remained undisturbed.
- 18 The second reason that domestic bread is rarely found is due to archaeological recovery. Any bread from domestic contexts was likely to have been in fragments, or to have been fragmented shortly after deposition because of trampling, redeposition of hearth contents, and other activities of daily life. Given the low awareness of the presence of bread in archaeological sites, and the difficulty of recognising bits of bread – especially when charred, such fragments are likely to be missed during excavation. Funerary loaves, usually complete or nearly so and carefully placed, are much more easily recognised.
- 19 Funerary loaves can provide valuable information about funerary practices and beliefs, and may give broader social and economic insights, provided the sample size available, is sufficiently large. For example, comparison between the funerary loaves and the age, sex and associated grave goods of the dead may show that, bread in general or particular types of bread were a reflection of social or economic status, or desired status (e.g. Hansson 1996).
- 20 Because of their specific function, however, there are also limitations inherent in the study of funerary loaves. They are separated from their place of production, so that archaeological information relevant to bread production may be lost. Bread which comes only from funerary contexts does not allow an assessment of whether their

characteristics were unique to funerary loaves, were produced for other special occasions, or were typical of bread made for daily life as well.

- 21 When bread remains are found in domestic contexts, a broader range of questions can be addressed. For example, the location of the finds may indicate something about the area of production, who made bread, where bread was consumed or who had access to particular types of bread. The ingredients in bread remains may be compared to archaeobotanical assemblages and their contexts to look for similarities and differences. Associated tools and installations may give information about the technology of baking and about the way different types of bread were produced. Obtaining answers to such points depends entirely on the recovery of adequate numbers of bread specimens.

## 6. The way forward

- 22 After a promising but slow start and a revival of interest in and analysis of ancient bread, the study of bread and baking in archaeology is beginning to gain momentum. The following papers are to some extent a reflection of this renewed interest. The contributions to this volume show that bread can be found at all types of site, early and late, rural and urban, and that a variety of techniques are in place for their comprehensive analysis. Much remains to be done so that the information available from ancient bread loaves can be fully exploited.
- 23 Food is a highly complex subject, even if the social and ritual connections which are inevitably bound up in food preparation and consumption are left aside. The gaps inherent in the archaeological record adds - to the challenge presented by the study of ancient food (Samuel 1996a). As the most informative studies of ancient bread and bakery demonstrate, an accurate and detailed view requires a multi-disciplinary approach. Fechner's (1992 & in this volume) and Monah's (in this volume) surveys demonstrate this and provide a European-wide collection of archaeological data about ancient bread and baking.
- 24 One area which can usefully be applied to ancient bread studies is the development and application of new techniques. In practice, this means chemical analysis. Chemistry can enhance other methodologies, for example, by providing confirmation of ingredients difficult to identify by morphological means. It also has the potential to generate information which cannot be obtained any other way. One possibility is the detection of ingredients such as syrups and extracts which leave no visible trace. Ways to detect ancient processing techniques may be developed.
- 25 New methodologies have much to offer. They are not, however, the most important way in which the study of archaeological bread can be improved, particularly since they remain expensive and time-consuming.
- 26 Recovery method has a critical impact on the way in which ancient bread can be interpreted. A attitude common amongst both the general public and archaeologists is that food and food technology in the past, was quite simple. As more archaeologists turn their attention to food, it becomes apparent that ancient food preparation techniques could be remarkably sophisticated. Pervasive assumptions about plain or primitive ancient cuisine most likely spring from a current lack of evidence or lack of investigation of the available evidence about ancient food. As the topic, bread included, receives more

widespread attention and as greater effort is put into recovery of data from archaeological sites, this idea must surely lose credence.

- 27 One of the problems hampering research into ancient bread is that many of the specimens available for study were excavated decades ago. Not only were recovery techniques less thorough than they can be now, but recording procedures were frequently very sketchy. As a result, there is often a lack of basic information such as provenance and date. Useful notes on conditions of recovery, associations with other artefacts and conservation methods (if any) are rare.
- 28 If, as is possible, social and economic differentiation and ritual practice and belief are to be properly addressed through the study of ancient bread, recovery methods for domestic areas urgently need to be improved. The required techniques are already available and cheap : large- scale flotation of charred material ; careful large- scale sieving of targeted contexts in desiccated regions ; systematic and detailed recording. Their use at archaeological sites must be more widely applied, and this can be accomplished if archaeologists in general are made aware of the existence of bread remains and the type of information they can give.
- 29 Once bread is recovered, there are a number of approaches which can be used in a multidisciplinary analysis. Ethnographic analogy has an important role for understanding baking technology, as well as for learning more about the social, economic and symbolic roles of bread in different societies.
- 30 It is important to choose analogies with care. Geographical proximity to a given archaeological site, or apparent cultural continuity, are not necessarily relevant factors. There are two criteria for the appropriate choice of comparative modern cultures. In the first place, there should be good technological parallels between the ancient society under investigation and the modern traditional society providing the analogy. Equipment recovered in the excavations should match that of the modern comparison. Current- day villagers who use rotary hand querns for milling flour, for example, are not good models for ancient activity at a site from which saddle querns have been recovered. Secondly, there should be close similarities between the modern and ancient raw ingredients. Ideally, the plant species are the same, but most important is biological equivalence. It is not generally valid to compare, for example, the ancient processing of hulled wheats, with their abundant and persistent chaff, with modern traditional free- threshing wheat processing (for traditional processing of these two wheat categories, see Hillman (1984 ; 1985) and papers in Padulosi et al. 1996).
- 31 An occasional tendency in archaeological discussions about ancient bread and bakery, as with other aspects of ancient daily life, is to refer to Classical works such as Pliny's *Natural History* and the writings of Athenaeus. Classical authors provide a wealth of ethnohistorical information, but of varying reliability and detail. One of the main problems with these sources is that they are most directly relevant to the classical eastern Mediterranean world, yet paradoxically, at very few sites in the region dating to this period have excavators recovered and published evidence for food preparation. The archaeological parallels for the written sources are missing and the accuracy of the historical accounts is hard to assess. Furthermore, the Classical eastern Mediterranean world had little in common with many of the ancient cultures from which archaeological evidence for bread has been found. Neither the technology nor the ingredients for bread making were analogous. Reference to Classical authors, with their ancient credentials and

their sometimes detailed descriptions, is tempting but best avoided unless they are also critically assessed and their relevance clearly established.

- 32 A valuable supporting form of evidence in a multi-disciplinary study of ancient baking is experimental replication. This, too, needs to be approached with care. Again, ingredients and equipment should be as authentic as possible. To be valid, each step needs to be justifiable by reference to archaeological or appropriate ethnographic data. In particular, it is essential to avoid applying assumptions about modern bakery – especially modern industrial methods – to ancient cultures without explicit reasons. Indeed, this applies to the study of archaeological bread in general. One example of careful cereal processing and flour production experiments is the one carried out by Meurers- Balke and Lüning (1992).
- 33 Food is a fundamental biological need and bread is a dietary staple of many modern societies. As such, today we can well understand the ancient importance of this common foodstuff. Bread may appear at first sight too commonplace, too simple, to be worth detailed scholarly analysis. But its central role in the cuisine of many cultures, and its resulting economic, social and symbolic significance shows that it is closely connected to some of the most important aspects of society that students of culture seek to elucidate. As previous work and the papers on bread in this volume show, ancient bread is more commonly preserved than is generally supposed, and its analysis can provide a fascinating window onto the past.

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## RÉSUMÉS

Cet article introductif présente l'histoire des recherches sur les pains archéologiques du dix-neuvième siècle à nos jours. Les différents aspects qui déterminent une analyse efficace et l'interprétation correcte des restes de pains sont décrits, ce qui permet de formuler des perspectives pour les recherches à venir.

This introductory article gives a history of the research on archaeological bread from the nineteenth century until recently. The different aspects that are relevant to adequate analyses and the correct interpretation of bread remains are discussed with a particular stress on future prospectives.

## INDEX

**Mots-clés** : Pain, artefact archéologique, pratiques funéraires, vie quotidienne

**Keywords** : Bread, archaeological artefact, funerary practices, everyday life

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