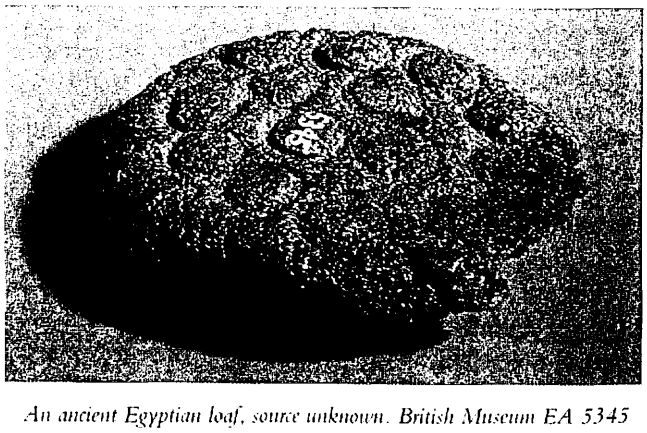
# A New Look at Bread and Beer

Traditional methods of investigating ancient Egypt's brewing and baking processes have depended largely on interpreting models, wall paintings and reliefs, which may be misleading. **Delwen Samuel** explains how modern scientific techniques allow today's experts to develop a far clearer picture of this vital aspect of daily life

*Bakers making bread and beer, a Dynasty XII model from Beni Hasan tomb 366. Photograph courtesy Fitzwilliam Museum, Cambridge*

Food is a basic necessity, and preparing it is a central activity of every culture. Perhaps with the exception of Western society, with its fast and convenience foods, a large part of any population spends a significant amount of time in food preparation. Bread and beer were staples of the ancient Egyptian diet and everyone, from pharaoh to peasant, consumed them, though the quality would surely have varied. They would have been produced on a large scale, for palaces, noble estates and temples, as well as on a small scale within individual households. The artistic record has underpinned the traditional approach to baking and brewing. This includes tomb paintings and reliefs, models, and statuettes, mostly of the Old and Middle Kingdoms, with a few examples from the New Kingdom.



*An ancient Egyptian loaf, source unknown. British Museum EA 5345*

Egyptian iconography tended to be standardized, and these scenes are no exception. In tomb after tomb the same "snapshot" actions appear. Accompanying hieroglyphic tags tend to be obscure or not descriptive of the task; often they show workers bickering: "Get on with your work, you laggard" - "Oh, don't listen to him, he's just a big-mouth" - or words to that effect. This is an amusing and no doubt accurate depiction of life in bakery or brewery, but not very informative about what the laggard and big-mouth are actually doing. Standardisation and lack of description make it unlikely that we will get much further in understanding food preparation by studying the art alone. How can we build a picture based on hard evidence rather than speculation and guesswork?

The ancient Egyptian baking and brewing project looks at the subject from a completely different angle, its main strategy to look at the biology and chemistry of bread and beer. Using known information about the biological and chemical changes which occur during

these processes, it is possible to look for traces in ancient loaves and beer dregs. Egypt's extreme aridity halts or reduces decay, and in the best conditions preserves all organic material. Many examples of dessicated loaves from tombs are displayed in museums throughout the world. Thin beer dreg smears clinging to broken pottery sherds, or beer residues in the bottom of pots, have been identified by tiny shreds of chaff and grain tissue.

The most important tool in the search for clues is the scanning electron microscope, known as the SEM, which provides greatly magnified images of surfaces. It can show starch granules in ancient bread crumbs and beer dregs, which come from the cereal grains used to bake the bread and brew the beer. The structure of these granules preserves a record of the processes to which they were exposed during preparation, so it is possible to reconstruct the baking and brewing methods. One unexpected discovery is that some loaves were made from sprouted wheat. Yeast cells in beer dregs can also be seen.

In addition to the SEM, the optical microscope has been used to find out which cereals were used. The starch of barley and emmer wheat, the two cereals of ancient Egypt, are indistinguishable, so the cereals can be identified only by looking at the patterns of cells in the shreds of chaff and bran. Staining ancient crumbs and dregs also provides valuable confirmation of SEM results.

This work has been anticipated by over 60 years. In the late 1920s, a microscopist named Johannes Grüss was sent some residue scraped out of an amphora from the tomb of a person of high rank. He found starch from sprouted grain, cereal bran and yeast cells. Unfortunately, these and other results were published in a German specialist brewing trade magazine, where they were lost from sight and pursued no further. Today Grüss's imaginative work is being extended and continued using much more sophisticated and powerful tools. His studies are important as the first and only attempt to examine Egyptian brewing from the material remains.

Biology also plays a role in interpreting the archaeological evidence. The wheat most commonly used

# Liquid Gold of the Pharaohs

For almost four years, Scottish & Newcastle plc has sponsored research into baking and brewing at Amarna. **Jim Merrington** tells how the project has captured world interest

Support for archaeological investigation into brewing at Amarna by Scottish & Newcastle has been recognised by the business world and the media as one of the most novel and successful sponsorships. It has spread the name of the Edinburgh-based brewery throughout the world: in December it featured on radio in New Zealand, Japan and the United States and in magazines from Asia to Brazil, Australia to Bangkok. The *South China Morning Post* carried a front-page item, and *El Mondo del Biere* in Italy a four-page feature.

All of these news items come from areas to which Scottish & Newcastle export, so it will come as no surprise to hear that it has just become the first UK brewer to export "draught" beers to Egypt for the tourist trade. Using the sponsorship to promote the company's products and reputation for corporate involvement is one thing – but ensuring that the project's objective, to replicate the beer Tutankhamun may have enjoyed, is quite another!

Scottish & Newcastle joined forces with the Society and Barry Kemp's team more than three years ago to provide brewing knowledge and expertise, as well as some financial help, for an investigation into beer-making in ancient Egypt, the cradle of brewing as we know it today. The catalyst for the project was the discovery of remains of a brewery in what is considered by many to be the Sun Temple of Nefertiti, adjoining a Roman camp on Amarna's outskirts.

Excavators have revealed there several brewing rooms and an abundance of small pottery vessels. The probability is that beer from this brewery was a fairly fast fermentation, ready for drinking after only three or four days, and consumed quickly thereafter.

One of the tombs in the cliffs above Amarna carries a representation of Akhenaten and Nefertiti presenting at the Window of Appearance, and a lower register has figures carrying pots similar in shape and size to those found. Perhaps these scenes might relate to a similar ceremony at the Sun Temple, with food and drink being supplied to the adulating crowd, who may have been "only there for the beer"!

The pyramids were said to have been built on a diet of bread and beer, but it is important to realise that in a history of three or four thousand years in Egypt "beer" developed from a sort of alcoholic porridge – solid and nourishing, fit for pyramid builders – into fine and strong ales which were exported far afield. As the process developed, it seems, so dependence on beer grew, and it has been said that at no time in history has beer achieved so much importance to an entire culture as in ancient Egypt.

Beer was consumed by all, kings, queens, courtiers, priests, women, children and workmen. There were beers of varying colours, perhaps indicating various strengths; there was beer for feast days, for the gods as offerings, narcotic beers and beer to help a man sleep. There was medicinal beer, to be taken with celery to heal the gums; and another to be injected as an enema, with equally remarkable effects.

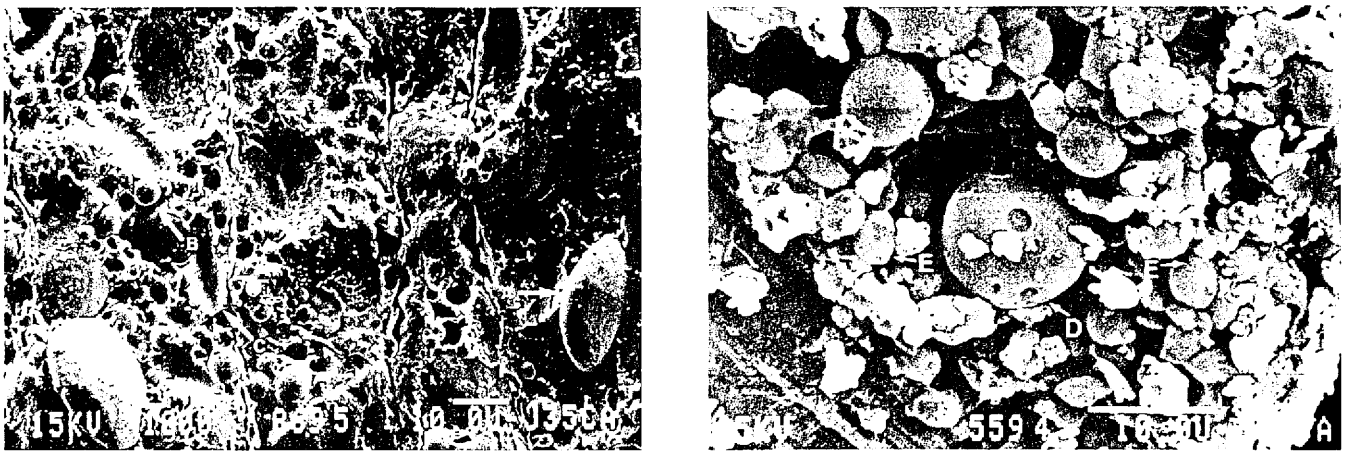
There is ample evidence in the models of breweries and brewing which the Egyptians took with them to their graves from which to piece together the brewing process at the time of Tutankhamun almost 3,500 years ago. It is beer from the Amarna "time slice" that Scottish & Newcastle will try to replicate, using beer pots made to the shape and size of those uncovered at Akhenaten's capital.

The grain used in ancient brewing has been established as emmer wheat, and small crops have been grown at Edinburgh and Cambridge to provide a base ingredient. Scientific examination has shown that the wheat had been malted, and that other additives and flavourings included dates, lupins, coriander, persea fruit and honey.

Advances in science mean that DNA tracking may soon be employed in an attempt to trace the origin of the yeast found in bread and residue samples . . . a far cry from previous investigations in the 1920s using Bunsen burners and litmus paper!

This summer, after another season at Amarna, Scottish & Newcastle will start assembling the jigsaw puzzle and begin brewing samples of the ale already dubbed by the press as "Tutankhamun's tipple" and "Nefertiti's nip". How it will taste is anyone's guess, but clearly the search for the beer of ancient Egypt is nearing completion.

❑ Jim Merrington is director of corporate affairs at Scottish & Newcastle plc.




*Scanning electron microscope images showing (left), the interior of a modern raw emmer wheat grain: A, large starch granule; B, small starch granule; C, protein matrix. Right, beer residue: pitting (D) shows the starch came from sprouted grain; yeast (E) identified by bud scars*

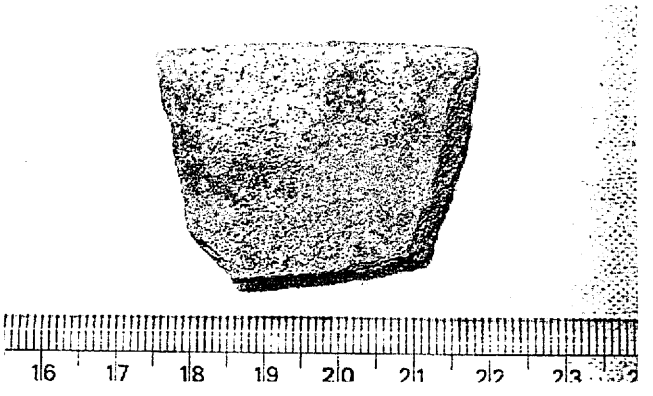
today, bread wheat, behaves very differently from the barley and emmer of ancient Egypt. When these latter cereals are threshed, the grain remains surrounded by a tight coat of chaff, while bread wheat kernels fall cleanly out of the chaff and need only be separated from the loose chaff before grinding. The biological structure of emmer and barley means that they need further processing before the kernels are freed and cleaned of chaff.

The best way to learn how this was done is to watch people today who still use emmer or barley in the traditional manner, to see how the mortars and saddle querns found in ancient Egyptian towns and villages were probably handled. To test this, to find out what other tools may not have survived in the archaeological record, and to get a first-hand understanding of the work required in baking and brewing Egyptian-style, there is no substitute for experiment. The experimental programme uses an ancient limestone mortar, granite saddle quern, and hand stone to recreate the several steps needed to obtain flour from grains tightly enclosed by chaff.

Among the many results, it is clear that mortars were not used for crushing grain into coarse flour, as has often been suggested, but for stripping chaff from the grain. Grinding on the saddle quern has proved conclusively that there is absolutely no need to add sand to the grain to make flour, a claim which has frequently been made. In fact the saddle quern, mounted on a mud-brick pedestal copied from excavated examples, turns out to be an efficient tool for cereal grinding.

In the early stages of this project, I could not help wondering whether ancient Egyptian beer, especially, might have been thoroughly unsavoury to our modern palates. The longer I study Egyptian bread and beer, and the more I discover, the more I believe that both were probably very pleasant. Ambitious plans are in hand to recreate bread and beer, from emmer wheat specially grown for the purpose, using authentic ancient Egyptian methods. It is not often that researchers can look forward to tasting the results of their work!

❑ Delwen Samuel has just completed her PhD thesis at Cambridge, and is a member of the EES team at Amarna.




*Far from being something to wash off, the residue from this Amarna sherd gave rise to the photograph directly above*

*The author grinding emmer wheat on an ancient granite saddle quern set into a replica emplacement. The hand stone is also ancient*