

A NEW LOOK AT OLD BEER AND BREAD

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We know from the pictographic history that the people in ancient Egypt were fond of beer and bread. Fortunately, they sent samples of these food items along with some of their more esteemed citizens to sustain them in the afterlife. Also, samples were available from rubbish heaps of ancient villages, allowing for the comparison of funerary goods with everyday foods. Additional luck was that the dry conditions have kept some samples from deteriorating even after thousands of years. Whereas they did leave us samples, they didn't leave recipes. There have been many theories about how they brewed and baked in ancient Egypt, but proof was lacking. Recently, Delwen Samuel of Cambridge University used optical and scanning electron microscopy (SEM) to determine how the ancient Egyptians brewed beer and baked bread.² Optical microscopy showed what type of wheat was used (emmer) and some other information, but the SEM proved to be most useful.

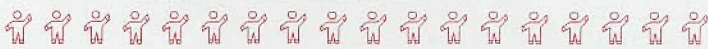
When granules of starch are heated in water they swell, fold, and eventually merge into one another. If the amount of moisture is limited, they do not merge. Dr. Samuel obtained samples of 14 ancient Egyptian loaves and residues of beer from 40 vessels from museums and examined them by SEM. The natural desiccation of the samples made them rather simple to prepare for examination. She found that the microstructure of the bread and beer residues, while thousands of years old, were remarkably similar to that of modern cereal foods. Some starch granules were swollen, folded, and merged, indicating that they had been heated in water. Granules from the bread were not merged completely, suggesting a moist, but not dry, dough. Pockets of granules were unfused, further suggesting that kneading was not extensive. In some loaves a few granules were hollow and others were deeply channeled. These observations are consistent with enzyme action, presumably as a result of malting (deliberately germinated prior to processing). Direct effects of aging, insect damage, and microbial activity were ruled out as having a significant effect on the morphology of the starch granules. A few yeast cells were observed in some loaves, so these loaves were apparently leavened.

Dr. Samuel saw an extreme range of starch morphology in the beer residues. Her observations showed that ancient Egyptian brewers used a two-part process that was distinct from modern methods. A mixture of coarsely ground malt that was heated was mixed with malt that was

uncooked. Sugars, dextrans, and starch were rinsed from the grains, the bulk of the cereal husk was strained out, and fermentation was initiated with yeast. She was able to rule out the technique of crumbling bread into water and then fermenting the mixture, which had been a popular theory. Interestingly, funerary beer was brewed with methods similar to those for beer in common use.

One of the sponsors of Dr. Samuel's research was the Scottish and Newcastle brewery. To put Dr. Samuel's conclusions to the test, they brewed some beer using the suggested methods. The resulting beer was very satisfying, comprising one of the more fulfilling endings to a scientific endeavor. However, the brewers were not optimistic about the commercial potential of the ancient brewing method because consistency of results is more problematic than with modern methods. However, this study does show that it is possible to learn more about the day to day life in ancient civilizations by taking a closer look at their beer and bread. ■

1. The author gratefully acknowledges Delwen Samuel for reviewing this article.
2. Samuel, D., Investigation of ancient Egyptian baking and brewing methods by correlative microscopy, *Science* 273: 488-490, 1996.



For Your Information

In completing their 1996 Microscopy Survey, Microscopy Marketing Education interviewed over 20 % of the scientific attendance at the recent MSA/MAS/ MSC Conference in Minneapolis.

One question asked, under three categories (Light & Scanning Microscopy, Image Processing & Analytical, and Electron Microscopy), was "On which ONE publication do you rely MOST heavily when making decisions about equipment purchases?"

We are advised that *Microscopy Today* was selected first in all categories - over some 10 other publications.

The complete 300 page survey on the microscopy industry is available from Microscopy Marketing Education, 53 Elon Street, Springfield, MA 01108, tel.: (413)746-6931, Fax: (413)746-9311.



Front Page Image

SEM Photograph of a Cat Flea (Ctenocephalides Felis)

Imaged on an ETEC SEM at 5 kV using the SEM Wideband Multi-Detector Color Synthesizer (designed, built and patented by David Scharf). Then acquired digitally at 2,048 X 1,536 pixels directly into a Macintosh Power PC as a TIFF file, using Digital Micrograph software and Digiscan hardware. Then output to a CELCO film recorder, using Ektachrome 100+ film, to produce a 4 x 5 transparency.

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Don Grimes, Editor

Launch Your Field Emission SEM Capabilities To The 4nm At 1kV Level.

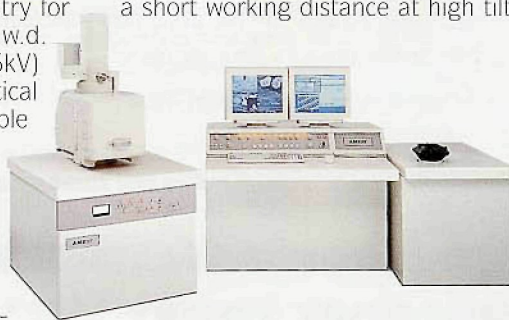
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NEW AND/OR INTERESTING IN MICROSCOPY

NEWS FLASH:

Philips Electron Optics And FEI Company To Combine Global Operations

Philips Electron Optics BV (Eindhoven, The Netherlands) and FEI Company (Hillsboro, Oregon, USA) have today (September 5, 1996) signed a letter of intent to enter into an agreement to integrate their global operations. To accomplish this, FEI will acquire substantially all of the assets of the Philips Electron Optics business. In exchange, Philips will acquire approximately 55% of the common stock of FEI. The balance of the FEI common stock will be held by the present FEI shareholders. FEI will continue to be publicly traded on Nasdaq (Nasdaq symbol: FEIC). Closing is currently expected at end 1996.

The combined company will offer a broad range of products based on charged particle beam technologies across the full spectrum of semiconductor, life science and material science, and components markets. The parties expect that the transaction will result in a better ability to compete in all these markets. The synergies expected to result from the combination will provide customers with superior products and services and faster responses to changing market needs. It is also anticipated that the combined company will be able to deploy its resources more efficiently, including research and development, manufacturing, sales and service.

For a number of years Philips Electron Optics and FEI have had a strong and close relationship, structured around joint projects to develop hardware and software and FEI's use of the Philips XL-series scanning electron microscopes as the platform on which FEI constructs its focused ion beam ("FIB") and combined ion and electron beams ("Dual Beams") systems. The management of both companies believe that the combined company will be a more effective competitor with a better ability to gain market share.

FEI Company is a world leader in field emission based charged particle beam technologies used for FIB and Dual Beam systems as well as a range of sources and focusing columns. The majority of FIB systems are sold into the semiconductor industry for use in design modification, failure analysis, and process analysis. Components are sold into life science and material science as well as semiconductor markets. FEI has approximately 200 employees.

Philips Electron Optics, an operating company within the Industrial Electronics division of Philips Electronics N.V. with approximately 700 employees, is a world leader in innovative electron microscopy, supplying transmission and scanning electron microscopes. These systems are used by research institutes, universities and industrial customers, with a significant representation in the semiconductor industry.

A Final Farewell & Thanks to Minneapolis...

Nestor J. Zaluzec

Well, the Microscopy & Microanalysis '96 meeting is over and a lot of people are happy and rightfully tired.

Allow me to take this opportunity to literally take my hat off to all those of you who have made this meeting a resounding success. A special acknowledgment is due to the Symposium Organizers and, very importantly, to the Local Arrangements Committee, without whom this meeting could not have taken place. You all did a great job!

For those of you that could not attend, this year the scientific registration reached 1530 individuals and is the second highest ever attendance in the meeting history, exceeded only by the mega-meeting which was held in Boston in 1992 - which was also the 50th anniversary meeting of the Microscopy Society of America.

Several other notable "first's" happened this year:

The proceedings appeared on-line and many of you took the opportunity to preview medium resolution copies of all the presentations.

Poster Sessions were distributed throughout the meeting and about 1/4 of each were presented daily. And each poster presenter was given a brief opportunity to say a few words in a topical discussion session.

The experimental TelePresence link, which we established and only announced on the evening prior to the start of the meeting, met with surprising success. This represented the first ever live Internet broadcast to the world from a microscopy meeting. And given the short notice, I'm particularly pleased with the results. In effect, we are now becoming a truly connected community of microscopists and microanalysts.

We recorded TelePresence Access from 18 countries around the world - the farthest were our colleagues in Australia and, the most numerous were various Universities in the USA. For the record, we had "on-line" visits from (in no particular order):

- Australia, Japan, Sweden, Denmark, France, Mexico, Hungary, Germany, Canada, New Zealand, United Kingdom, Brazil, Switzerland, Finland, Belgium, Norway, Slovenia and, of course, many links from the USA in government, universities and commercial organizations.

A total of 1252 logins were recorded to the TelePresence link in the computer workshop area, where we not only broadcast a continuous view of the workshop, but on Tuesday broadcast live the entire TelePresence Microscopy Symposium (another first), with yours truly being the first speaker. Those who had access to a Java Aware WWW browser were able to not only watch but listen to the symposium on-line (with varying degrees of success, depending upon your connection to the Internet).

We also had delayed broadcast on Tuesday of the public policy symposium where presentations were made by Congressman Bill Luther, member of the House Science Committee and by Christopher Roosa, the Assistant Legislative Director of the House Committee on Science. I will be arranging a repeat broadcast of that discussion for those of you who might be interested and will post the details soon.

In addition to the computer workshop we recorded 883 accesses to the Exhibit Floor TelePresence line. Because of our connectivity, a number of Exhibitors were able to have live high speed access (T1) to the Internet, yet another first, and I expect this to grow next year.

Finally, on behalf of the Microscopy Society of America, the Microbeam Analysis Society and the Microscopical Society of Canada, the meeting attendee's and myself, allow me to thank again all those who made the meeting a success. We all hope that if you couldn't make it this year you will be able to join us next year in Cleveland, Ohio (August 10-14, 1997). Just keep checking the society home page (<http://www.msa.microscopy.com>) for details.

More Help, Please

We continue to greatly appreciate article and/or material contributions from our readers - "users" as well as "suppliers". The only criteria being that they should be of interest to a reasonable number of working microscopists.

Likewise, we would appreciate front cover image contributions. Here, the criteria is that the subject should be of professional interest and, secondarily, that it is interesting in a visual sense.

- - - Ed.