MICROSCOPY TODAY

MAY/JUNE 2002

ISSUE #02-3

The Microscopy Society of America Buys Microscopy Today!

Details on page 5

Break Through the Barriers

FEI COMPANY™

As technology advances, so does the number of barriers you face in analyzing and controlling deep submicron structures and processes. Today's samples are more complex and require a broad range of analytical techniques for thorough characterization. You need high resolution. Compromised results are not an option. You need to do and see more in less time.

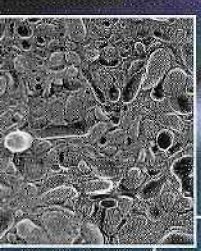
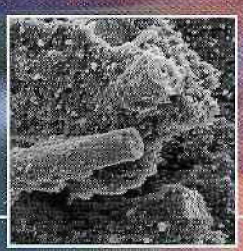
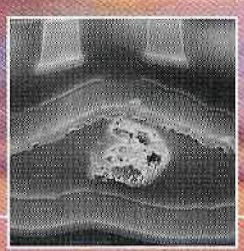
FEI's unrivaled suite of 3D Structural Process Managment™ solutions gives you total control and a winning edge for improving your time to results, increasing your efficiency, and improving your operation's bottom line—it's why the world's technology leaders come to us to help them through the technology shifts they face each and every day.

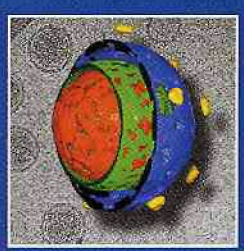
Advanced FIB, SEM, TEM, and DualBeam™ tools are at the heart of Structural Process Management solutions from FEI.

Structural Diagnostics™
Structural Modification™
Structural NanoFabrication™
Structural Biology

Talk to us and discover how 3D Structural Process Management™ solutions from FEI can help you break through today's deep submicron and technology barriers.

Life Science
Material Science
Microelectronics



Take Control with 3D Structural Process Management™

www.feicompany.com
sales@feico.com

Food Under The Microscope

Stephen W. Carmichael,[1] Mayo Clinic
Carmichael.stephen@mayo.edu

We're all interested in food. Food is the sustenance of life. And you're interested in microscopy, or else you would not be reading this column. So here's a web site that will appeal to both of your interests.[2] Miloš Kaláb is the author of the web site, and he's enlisted a host of food scientists to assist him. There's no lack of expertise here!

The home page can send you to many locations, but let's begin with the site that deals with microscopy. It is said that the earliest microscopists trained their simple instruments on food, mainly to look for contaminants. We are then treated to a primer on microscopy, beginning with light microscopy, then advancing to electron microscopy. The basic principles of transmission and scanning electron microscopy are explained, with several links to other sites for more details. The environmental scanning electron microscope, that allows the examination of hydrated specimens, is introduced as an instrument for the future in food science. Preparatory techniques, from the routine to the laborious (freeze-fracturing, encapsulation in agar, immunolocalization, etc.), are explained.

Most of the site is dedicated to specific foods, with an apparent emphasis on milk products. Why is milk white? The small (100 nm) particles of casein and larger fat globules scatter all wavelengths of visible light equally, making milk opaque and white. Higher fat concentrations and dietary intake (food high in carotene for example) can give milk a yellowish tint. You can learn more about the whey proteins α-lactalbumin and β-lactoglobulin than you thought possible. Fresh milk contains lactic acid bacteria and other contaminants, so a discussion of sterilization (pasteurization) is included.

Cheese is made from curdled milk. Details of cheese making are given, along with the microscopic appearance of the product during the various steps. Since each of the parameters used during the manufacture of cheese has an effect on the final product, a great variety of cheeses are available. On the other hand, the manufacturer of a certain type of cheese (for example, sharp cheddar) needs to keep all of the steps constant, and examination of the microstructure at various steps apparently can be informative. Structural differences are shown in cottage cheese, unripened cheese (such as ricotta), cream cheese, and low-fat and fat-free cheeses. You can not only learn about curd granule junctions, which influence the texture of cheese, but detailed instructions are given so that you can observe these junctions yourself. An interesting history of the relatively new processed cheese is also given, along with the structural consequences.

Grittiness of food is another point of discussion. Products containing particles around 1 μm in diameter are perceived as creamy, particles 3 to 8 μm are powdery, and particles larger than 8 μm impart a gritty feeling. An interesting point is made as to how seemingly academic studies of food structure may help food technologists avoid problems when they develop new foods to give us a greater variety of products. Also, it is pointed out that the human tongue can distinguish between the presence or absence of fat globules 1-3 μm in diameter, which gives whole milk a "creamy" texture and skin milk an "empty" feel. This also emphasizes what a discriminating organ our tongue is!

Yogurt, milk powder, soya foods, starch, and microorganisms are also discussed in detail. Overall, I found this interesting resource to be enlightening. We all use microscopes in our scientific endeavors, but this web site combines our interest in microscopy with the universal interest in food. ■

1. The author gratefully acknowledges Dr. Miloš Kaláb for reviewing this article.
2. The original web site is http://anka.livstek.lth.se:2080 /microscopy /intro.htm, with alternate URLs of http://www. magma. ca/ ~scimat/, or http://distans.livstek.lth.se:2080/foodmi.htm, or http:// anka. livstek.lth.se:2080/foodmi.htm. The original site has become so busy that alternate servers were needed.

Index Of Articles