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

MSA Buys MICROSCOPY TODAY

The Microscopy Society of America (MSA) is entering a new era in publication that will provide many new and exciting opportunities for our society. On April 1, 2002, MSA finalized the purchase of this magazine, MICROSCOPY TODAY (MT), from Don Grimes. The acquisition of MT now provides MSA with two publications that will complement one another. The journal, "MICROSCOPY AND MICROANALYSIS," is the flagship academic publication of MSA and is edited by Charles Lyman. MT will be published in alternate months with our journal, and will be edited by Ron Anderson.

Why Did MSA Purchase MT?

MSA purchased MT to pursue a number of important goals, namely:

1) MT is well-recognized in the microscopy industry. Our new magazine will become an important vehicle for MSA's name recognition and will provide another means for MSA to carry out its mission of the promotion and advancement of the knowledge of the science and practice of microscopy, imaging, and analysis. MSA membership is not a requirement for receiving MT. We will continue to welcome subscriptions from everyone interested in any form of microscopy.

2) MT will also serve as a means for MSA to distribute valuable information and also the CALL FOR PAPERS for our annual meeting, MICROSCOPY & MICROANALYSIS. The alternating publication of MT with our journal means that the CALL FOR PAPERS, which we will mail with the November issue of MT, will be in the hands of over 11,000 investigators by December of each year. This timely distribution will give those interested in submitting a paper at least two months to prepare and organize their paper prior to electronic submission by February 15.

3) The acquisition of MT provides MSA with an important new vehicle for growth of MSA membership and increased attendance at our annual meeting. Reaching out to interested scientists and microscopists will be greatly enabled through marketing efforts in MT. The potential for growth by adding new members is extremely high when you realize that MT reaches nearly 8,000 workers in microscopy who are not now MSA members.

4) Improvement of our flagship journal, "MICROSCOPY AND MICROANALYSIS," will now be possible. The long term goal will be to provide our journal editor with enough flexibility to improve the quality of the journal in a number of areas over the next several years. Journal departments like the "Meeting and Short Course Calendar," "Net Notes," etc., are already features of MT and properly belong solely there. We anticipate these changes will continue to raise the academic quality of our journal, making it the premiere microscopy publication in the world.

5) The style and composition of MT will change somewhat over the next year or two with new greater emphasis on imaging modalities as well as popular reviews on topics like PhotoShop, and its applications for improving images for publication. Our editor would be delighted to hear from all of you regarding those features of MT that you enjoy, and also to receive suggestions about new features you would like to see in the magazine. That said, we have no intention of making MT into a society newsletter like the MSA Bulletin (now discontinued). MT will remain pretty much the way it is now.

6) Finally, MT is expected to generate a new source of revenue in the future that will enable MSA to build up its reserves, and to help develop important MSA goals.

We hope everyone in the scientific community will continue to enjoy MT and we look forward to your input to our new editor.

Stan Erlandsen, MSA President 2002

JUST FOR FUN MICROGRAPH CONTEST

At the upcoming Microscopy & Microanalysis 2002 Conference in Quebec, (4/9 August 2001), we will repeat the popular "Just For Fun Micrograph Contest."

The concept of the contest is based upon composite images, each made up of two or more other images, at least one of which must be microscopical in nature. Contestants may **enter up to two images each** and do not have to be present at the M&M Conference to win. Tasteful humor is appreciated.

Entries will be displayed in our booth and conference attendees will be invited to judge the entries and vote on the ones they consider to be the most "creative and interesting." First prize will be $300.00 and the second and third prizes, respectively, will be $200.00 and $100.00. Winning entries may be featured as covers on future issues of MICROSCOPY TODAY.

While any reasonable size is acceptable; about 8" x 11" is recommended. Entries should be hard copy, mounted on rather stiff background, suitable for posting. A 3" x 5" card should accompany each entry–with an image description and the contributors name(s) and affiliation.

Entries are welcome from anyone interested in microscopy: users, manufacturers/suppliers, students, kids, etc. Should you decide to enter our contest, it would be helpful if you let us know ahead of time (with the number of your entries) -- just to make certain that we have enough room for everyone. E-mail is fine: (microtoday@attglobal.net) or by fax (845-463-4124).

We hope that you will decide to enter our contest!...
Ron Anderson, Microscopy Today

FRONT COVER IMAGE
Dandelion

Photographed by Dr. Gary Gaugler, MICROTECHNICS, Inc. The dandelion image was recorded using a PIXERA PENGUIN 600CL cooled CCD camera with a 10:1 C-mount macro zoom lens. Exposure was in natural light for 2.5 seconds with an equivalent ISO-100 sensitivity. The image Consists of 5.6MPixels.