MicroNews

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MicroNews Shorts

SFMS has very low cost dues. At $12 per year for all yearly categories, we are a bargain. With the blessings of our board, life membership is just 12 x $12 or $144.– To make it even more irresistible, if you paid dues in 2006 or 2007 you can deduct the amount you paid from $144 to buy your life membership.

We are pleased to announce that we have several new life members. Thank you for your continuing support: Bill Hill, Mikki McGee, Patrick Schlemmer, Mary Lee Strebl, Judson Smith.

At the invitation of the Biology Department at CSU-East Bay in Hayward, SFMS is offering three two-hour workshops on microscopy to 16 graduate students. The lectures and practical application will help students understand both the theoretical limits and the effective use and care of light microscopes. We hope to bring you a more detailed report after the completion of this first effort to prepare college students to be competent microscopists.

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Editor: The Editorial Board and
Desktop Publisher: Mikki McGee
Contributions: 510-222-8883
or 510-339-9609

To contact the society call 510-339-9609 or write to SFMS, Randall Museum, 199 Museum Way, San Francisco, CA .

Membership is open to all interested individuals. Go to www.sfmicrosoc.org

IMAGING THE CELLULAR UNIVERSE

by Linda Wraxall

On a Monday evening in October, 2006, the Berkeley Lab Friends of Science were invited to attend a lecture for the Advanced Light Source Users Meeting on microscopes and how they have impacted the biological sciences. It was given by Dr. Carolyn Larabell, Professor at the UC ALS, also of Anatomy at UCSF and Director of the National Center for X-Ray Tomography. I arrived to find Bill Heib already seated and was closely followed by Henry Schott so SFMS was well represented in the audience of young science bucks and older, more famous researchers.

Starting with a business degree (!) Ms Larabell worked her way through a second degree in Zoology and a Ph.D in cell biology. In similar manner she gave her audience in the main LBL auditorium an overview of microscopy from its earliest beginnings to as yet unpublished images of today. The birth of cell biology was only made possible by optical microscopes and their 17th century inventors. They allowed us to see for the first time things invisible to the naked eye and, through their increasing ability to resolve images, have revealed not only cells but their internal structures and functions.

Giving a run-down of the important microscopists through the centuries that have impacted her work, Dr. Larabell began with Antoni von Leeuwenhoek, Marcello Malpighi, Robert Hooke and Henry Baker. These men had to draw what they saw (a skill that Dr. L admitted she lacked) and their detailed pictures remain an awesome feature of the legacy they left behind. Antoni von L. was a Dutch draper who became interested in making lenses for his work and used them to look at the world in and about him. He was the first to see bacteria and protozoa in rainwater and wrote to the Royal Society in England about his work. Robert Hooke, an English physicist, among other talents, verified this work and, having made a compound microscope, produced a wonderful book of his drawings in 1665 called "Micrographia". He was the one who coined the word "cell" from the resemblance of the structures he saw in thin cork sections to monks' cells in a monastery! Marcello Malpighi was an Italian physician and the first histologist who identified liver and kidney structures by his microscopical observations. The Englishman Henry Baker is not so well known but wrote a couple of seminal books on preparing and observing specimens under a microscope.

Then there was a gap of two centuries before microscopy once again became popular as the focus of science moved from biology to physics. The resolution of lenses improved, images became recordable through photography and sectioning, fixing and staining materials was developed. In 1930, Fritz Zernike invented the phase contrast technique, which greatly improved the examination of live specimens and unstained tissues, and for which he received the Nobel Prize in 1953. Close on his heels, in 1931, Max Kroll and Ernst Ruska took microscopy into the electromagnetic spectrum with the development of the first

(Continued from page 1)

electron microscope. They were followed by Keith Porter whose contribution to slicing, preserving and staining cells for TEM changed the very nature of biological thought and research. Regarded as the father of modern cell biology, Dr. Porter took the first picture of an intact cell with an electron microscope.

In the 1950s, Georges Nomarski developed differential interference contrast microscopy and then Robert and Nina Day Allen, a husband and wife team, modified it with video so that living and mobile specimens, like neurons, could be observed and imaged. Video microscopy, with or without that system, is now common in labs around the world and enables real-time observation of cells and cell cycles through time lapse imaging. We saw some impressive examples of this work, one example being the chemotaxis effect on the healing process of skin wounds. Neutrophil cells (white blood cells) are attracted to the wound by chemicals released from the damaged cells and start the healing process by mopping up foreign invaders. Fluorescence microscopy, which allows the observation of specific proteins in the cell, was the next upgrade and scanning laser confocal microscopy was developed in 1957 which, by 1987, could store images. In the 1990s, a big impact on the cell biology community was the ability of researchers to look for a specific protein within the cell using a green bioluminescent chemical obtained for the *Aequorea* jellyfish to tag the protein in question. Thus it was discovered that proteins move and change function according to their location on the cell surface or in the nucleus. This allowed bacterial infections (eg. *Listeria*) to be studied and so medical science was once more improved.

Because these different techniques show different aspects of the cell, they require a combination of microscopes but the gap between optical and electron microscopy was finally bridged by imaging with soft X-rays This kind of work, which needs a brighter light, uses a 20ft. synchrotron made possible by nanotechnology and zone-plate optics and was developed by Gunter Schmahl and Janos Kirz in the 1970s and '80s. In 1994, David Attwood (who was sitting next to Henry) was the first scientist in LBL to use soft X-rays and extreme U-V radiation to show the natural construction of whole cells without fixing, staining or using contrast reagents. In effect, the cells were CAT-scanned using a completely quantitative method, a very new method that only takes 3 minutes (not 7 days) and the first cell he examined was the ubiquitous yeast cell. Present and future research will concentrate on looking at genes, whose product is proteins, in order to locate them. FinallyDr Larabell gave them some homework to check out the websites :

www.microscopyu.com www.micro.magnet.fsu.edu
www.cellsalive.com www.olympusmicro.com

So get to it, guys!

MEMBER CONTRIBUTION

USING INEXPENSIVE CENTRIFUGE

Sara Blauman

There is so much to explore in a jar of pond water that one barely knows where to start. After collection and settlement, there are various "zones" one can sample. Take a simple example of a jar with sediment at the bottom, topped by some "clear" pond water which is itself either interspersed with vegetation or topped off by it. We know that for the most part we can sample the bottom and top with results that provide us at least a day's worth of viewing in just one drop. Fishing out strands of algae is yet another gold mine. However, what about the vast in between layer of "clear" water? What does it hold? Anything? Taking a drop via pipet often doesn't yield much.

Is there a way to somehow consolidate the goodies that are present into a single drop? For this I have found that a hand crank centrifuge does the trick. Carolina Biological has one for sale at $66.95. For me, the convenience is well worth the price. This model takes four 15 ml tubes which you can fill with four different samples of water. Or you can do as I do, and place my sample in one tube and fill the others with equal amounts of tap water to keep the device balanced as it spins. Using the centrifuge allows me to spin out the goodies from a whole lot of drops (a tube full) and condense them onto the bottom of the tube. Then I just stick a pipette in all the way to the bottom of the tube and suck up a few drops. More often than not, just one of those drops, transferred to a slide, will yield oodles of subjects to observe and draw. I think the real value to the hand crank over an electric centrifuge is that you control the spinning speed. It allows you to spin quite slowly in order to not squash some of the larger more fragile organisms. On the other hand, if the water looks truly clear, indicating the microbes are very small, one can crank at a more vigorous rate. So, the device is appropriate for separating and condensing many sizes of specimens typically found in pond water.

I have found that spinning for about three – four minutes does an adequate job so it's not like you need to spend any time in the gym to develop your biceps. The other nice thing about the Carolina model is that it has a screw base such that it can be tightened to clamp onto the overhang of a desk top or counter. This provides the necessary stability while spinning.

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President's Corner

August 2006

Ray Wong

Hi, I'm Ray Wong, the society's new president. I've been a member of the society since the mid 70's, and have served as acting Vice-President, and later as Director. I have accepted the nomination and position of president with the idea of promoting microscopy training and outreach -one of the objectives of the society's mission statement. The society has not provided this training since I've been a member, and I believe the society should at least make an effort to provide the service to the community, provided we can find a hosting institution to partner with us.

Currently we have approached the Chabot Space and Science Center in Oakland about doing a microscope workshop and/or outreach. We will also be contacting the Randall Museum in San Francisco, the Math Science Nucleus in Fremont, and perhaps the Academy of Sciences in San Francisco. Oh, by the way, I'm vice president of the board of directors with the Math Science Nucleus, and I'm a volunteer at the Chabot Space and Science Center.

Not that it really matters, I've have a masters degree in Ecology and Systematic Biology with an emphasis in aquatic biology, with a minor in Geology with an emphasis in micropalenology, from San Francisco State University. Essentially, I'm a seasick biological oceanographer. I did my master's dissertation on the "Phytoplanktonic Diatoms of San Francisco Bay". Our past president, Henry Schott, was my genetics professor at Merritt College, Peralta Community College District, in Oakland. Henry was an excellent instructor, and I fondly remember him caring about his students, and I still see this caring and nurturing characteristic here in the San Francisco Microscopy Society. We are most fortunate in having him.

Since being elected into this position in April, I realized how much work is involved, and I would like to express my thanks to the present and past officers of our society for their hard work to keep this society, the oldest scientific organization west of the Mississippi, alive. Though, the fate of the Society depends on its members as a whole, and not just its officers. I am only here as an "interim caretaker president".

(We are pleased that Ray was willing to be reelected to the presidency. We are now confident that there are members who will help steer the Society along a productive and interesting course. Your active participation is the best message you can give to the officers that you value the Society.)

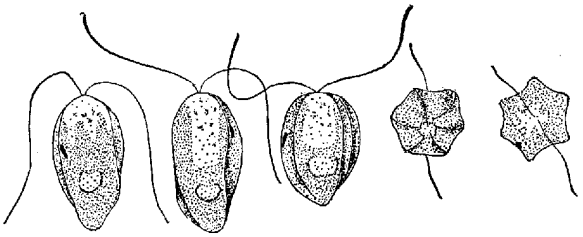


FIG. 12. *Stephanoptera gracilis* (Artari) G. M. Smith. (× 1300.)

FIELD BIOLOGY EXPLORATIONS

Microscopy explorations take many forms and lately, the members of SFMS who have been active in field biology have made two interesting excursions, one to Filoli Gardens in Redwood City and the other to the Tyson Lagoon and the Tule Ponds in Freemont. Collecting specimens was particularly easy at the Tyson Lagoon where a short pier extends into the marsh area among the tule or rushes. Any small sampling device will gather an abundance of water life. Those that are sessile can be harvested by gathering some of the floating debris while those that are active swimmers can be caught with a fine-mesh net or by collecting some of the floating algal mats. Most of the mats are composed of Spirogira and contain populations of protozoa as well as small crustaceans and worms as well as insect larvae.

I like to use a net of some sort that can be used to strain large amounts of water either by pouring water from a bucket that has been dipped into the pond or by dragging the net through the water at the end of a pole. The latest net I have constructed came from the coffee filter-cone that comes with Braun coffee makes. We recently replaced our coffee machine so I salvaged the old filter and glued three small jar caps to the bottom of the filter cone where there is a rather narrow plastic bottom. I used a hot glue gun to secure the caps. Then I drilled through the caps and the plastic bottom of the filter cone. The three small vials were then screwed into the three caps. After filtering water, the contents of the vials can be transferred to any suitable container for viewing under the microscope. If you wonder where to get the vials, ask any older person who has angina and carries nitroglycerin tablets. They come in small vials that have to be replaced every so often since they loose their potency when exposed to oxygen.

At the Filoli Gardens, we collected from a stream near the Red Barn and used the Red Barn, where a horse named Red lived before the barn was converted into a classroom for the children's nature program, as a laboratory to look at our samples. We also collected from a pond that at one time was the source of water for the gardens. It is formed by an earthen dam and is the habitat of a large colony of newts. The water contained a lot of algae as well as protozoa. We could see the newts on the muddy floor and also saw some of the clutches of eggs.

The excursions were a pleasant way to spend Saturday because of the fellowship as well the adventure of finding organisms that for some of us were not familiar. While the Red Barn is not open to the public without the guidance of a docent, the Tyson Lagoon is right next to (east) the Freemont BART station at 1999 Walnut Ave and is open and free for self exploration.. HS

Vaucheria, collected, isolated and photographed by Mikki McGee, April 2007 at Filoli Gardens

Historical Perspective: Annals of Microscopy

What was reported at the SF Microscopical Society *Proceedings of the Meetings*?

September 28, 1887. … read a letter, recently received … from St. Louis, … referring to mountings of *Bacillus anthracis in situ* in lung tissue, made by … stating "that a better preparation never has been made." The letter also cited the verdict of Dr. D. V. Dean, of St. Louis, a thorough microscopist, who pronounced "the slide the best he had ever seen."

October 12, 1887. … His letter prescribed the following as a solution best fitted to preserve specimens of marine life: Water, one part; proof spirits, two parts; glycerine, one part; with one per cent. of carbolic acid added.

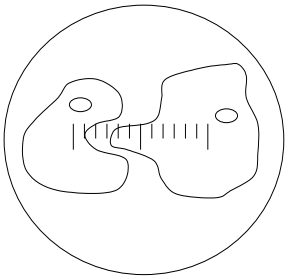
The chief part of the evening was given to an exhibition of high power objectives recently received. … exhibited one -twelfth Zeiss objectives . … Dr. Mouser worked his one-twelfth up to 2,250 diameters with admirable effects. The performance of the Spencer glasses was also very satisfactory.

Dr Ferrer exhibited … a number of low power [Zeiss] objectives and oculars, made of the new apochromatic glass. Among these were projecting eye-pieces, for use with the micro-camera in photography.

(As reported in the ***Journal of the New York Microscopical Society,*** January 1888, Vol. IV, No. 1, page 95-96.)

Floaters

The May 2006 issue of *Microscopy Today* briefly describes "floaters" in the **Netnotes** section and an interesting response by Barbara Foster. Floaters are tiny objects, usually clumps of gel or proteins in the vitreous body. This body fills the eyeball between the lens and the retina. They are harmless and cast a shadow on the retina. Often they are observed as dark bodies that move about when viewed against a neutral, plain and uniformly lit background. Since there is a capillary bed lying on the retina so that light must pass through this bed to reach the retina, it is sometimes possible to see red blood cells passing one by one through a capillary loop. This phenomenon can be observed when you punch a small hole, no larger than 1/8 inch, in a large cardboard sheet such as a file folder, and look at the Northern sky or a well lit surface through the hole. Floaters become particularly apparent when using a microscope or a telescope. We are less aware of them during normal viewing because the image is constantly changing and our brain effectively ignores the small disturbance they produce. H. Schott 12/25/06



Not now. I have a feeling someone is watching.

Light Microscopy and