MicroNews

San Francisco Microscopical Society Volume 3, #3 June 2008

WHAT MY MICROSCOPE **REVEALED**

I recently purchased a used Wild M5 stereoscopic microscope and used it to look at the underside of a leaf of Fremontodendron californica, tdshe flannel bush. The underside of the leaf is described as "densely stellate pubescent below". Pubescence suggests hair but what I saw were strange multi-fingered structures, quite firmly attached and forming a dense jungle over which small insect larvae crawled. At 50x these star-like units are quite beautiful and form a unique surface that I have not observed in other plants. HS

Please send me HSchott@aol.com short accounts of what you have observed through your microscopes.

Inside this issue:

Microscopy Education: An Example of Success

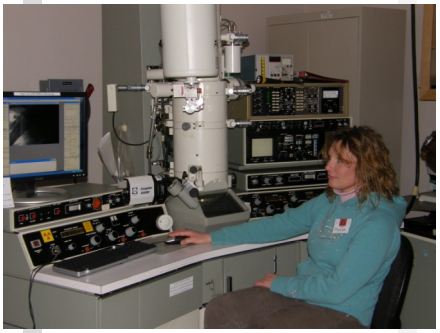
San Joaquin Delta Community College Microscopy Program

Community colleges in California fulfill a variety of functions and represent one of the largest educational systems in the world. Traditionally considered the third tier of public higher education, their main purpose is to provide students with undergraduate studies that can be transferred to state universities or the UC System or prepare students for a vocation such as nursing or auto mechanic. There are hundreds of vocations for which students can take courses at community colleges and earn a certificate or an associate of arts (AA) two year degree. For a college to offer a vocational degree there must be a market for those students' skills.

Stockton has a large, comfortable campus for its community college. In the south-east corner is a one story building devoted entirely to microscopy and the vocational instruction of future technicians. I recently visited the 7.5 million dollar facility and was given an extensive tour by several of the instructors and staff members.

Planned from the ground up, an effort was made to isolate the building from ground vibrations and to insure that the delicate electron microscopes would function at their highest resolution. One of the last rooms I visited was a large lecture room where every student could connect to the network and also see the digital images projected behind the podium. Every other room contained the instruments on which students are trained. One room was devoted to microtomes, another to light microscopy and each electron microscope was situated in an independent room.

San Joaquin student at an EM training station



The program dates back about fifty years and has produced technicians that work in the biological sphere and the better-paying materials testing laboratories.

One of our SFMS members is currently enrolled in the program and I hope that we will eventually receive a report of the effectiveness and scope of the curriculum. I was impressed with the students I met and with the many fine instruments that the staff has acquired. It is a mix of new and older models, just what students will encounter on the job. HS

My Life (Not) in the C.S.I. Laboratory

As I sit relaxed in my easy chair, watching Network Television's version of my life's work, I can't help but think, *"I don't remember it being at all like that."* I drew my first pay check in fiscal year 1965-66 as a criminalist, a civil servant in a major metropolitan police department.

The early years drew heavily on my expertise in the fields of chemistry and criminalistics, the application of the scientific method and technology to law enforcement matters, usually to the enforcement of criminal law.

During all these years, until 2003, the microscope was my buddy. It (or they, since I became friends with several versions of this useful tool) allowed me to miniaturize my procedures. I was able to perform chemical reactions on single crystals of poisonous substances, extract identifiable chemicals from natural materials, visually compare detailed morphologies of natural substances with similar known materials, type or determine species origin on bloodstains, and identify or eliminate a confiscated tool as the source of a tool mark.

Within this last-named process lies the bulk of my career in forensic sciences which, if illustrated, would show me bent over the vertical tube of the comparison microscope. In later years, thankfully for my

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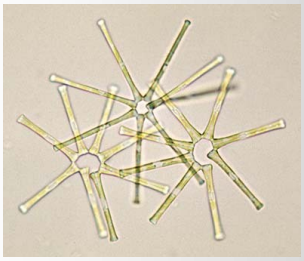
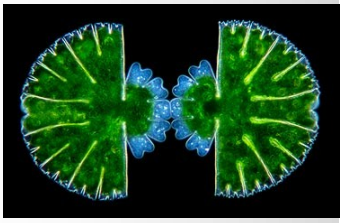
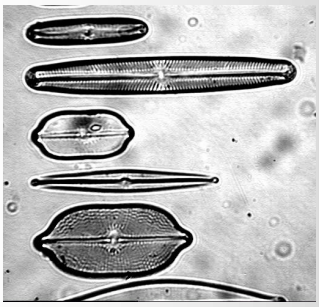


Asterionella, a pinnate diatom



Micrasterias thomasiana shortly after cell division. Photos by Wim van Egmond



Diatoms from ImageJ

Terry Coddington, author of "My Life (Not) in the C.I.S. Lab" and Life Member of SFMS.

Photo by Schott, May 2008

THE STUDY OF DIATOMS by S. H. Meakin

The possessor of a microscope who treats its use as a spare-time hobby usually acquires a number of varied slides prepared and sold by opticians, and generally these slides are used as one uses a picture book. In time he becomes satiated with viewing his slides, and this is the stage at which these notes may prove useful.

To make the hobby continuously useful, the owner of a microscope needs to have new interests, and one of the most prolific is the minute life, animal and vegetable, to be found in water marine, brackish and fresh. Animals in the live state are, of course, the most interesting, but one cannot make permanent slides of the animals alive, and when dead these subjects soon retreat to the "Picture book" state. The vegetable inhabitants of water, algae, desmids, and diatoms are perhaps the easiest objects to handle.

The study of diatoms is one of the most exciting and far reaching hobbies one can adopt, for one never gets to the end. Diatoms are always easy to procure, as almost every clean pond, ditch, swamp, marsh, river, as well as sea contain unbelievable quantities and varieties of these tiny plants. The cost of obtaining quantities is nil and the collecting of them lends interest to any excursion.

Requirements for collecting

All that is needed to collect diatoms are a few corked tubes 2 1/2 ins. long and 3/4 in. diameter, an old tablespoon, and a walking stick, some means of fixing the spoon to the end of the walking stick being required. A pocket field microscope which is easy to construct is a great advantage, but not absolutely necessary. …

Examination in the field

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My Life (Not) in the C.S.I. Laboratory (continued from page 1)

neck and back, the eyepiece tubes became inclined. My eyes were focused on two bullets, usually, or two cartridge cases; the tool marks were on the bullet (or cartridge case) and the tool was a firearm. I might use the same methodology to match tire irons or screw drivers to a crime scene mark, but firearms identification, in the spirit of the Wild West, took up most of my time.

Hollywood's CSI's seem to have missed the back-breaking, eye-straining hours of my career by twirling two bullets side by side to pronounce a caliber and make of weapon, then by watching a computer screen to declare a match. If one of the two bullets was from a test firing, then our heroes would have their murder weapon. A quick check of the registration would identify the perpetrator before the ink was dry on the incident report.

My bullet twirling was done by two mechanical bullet-holding stages on the right and left sides of the base of the comparison microscope, respectively. If the left-hand stage held a test-fired bullet from a confiscated weapon I would be trying to include or eliminate this weapon from the weapons involved in the incident under investigation.

If a bullet from a shooting incident was submit-

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DIC or Normarski Microscopy

Differential interference contrast microscopy (**DIC**), also known as **Nomarski Interference Contrast** (**NIC**) or **Nomarski microscopy**, is an optical microscopy illumination technique used to enhance the contrast in unstained, transparent samples. DIC works on the principle of interferometry to gain information about the optical density of the sample, to see otherwise invisible features. A relatively complex lighting scheme produces an image with the object appearing black to white on a grey background. This image is similar to that obtained by phase contrast microscopy but without the bright diffraction halo.

DIC works by separating a polarised light source into two beams which take slightly different paths through the sample. Where the length of each optical path (i.e. the product of refractive index and geometric path length) differs, the beams interfere when they are recombined. This gives the appearance of a three-dimensional physical relief corresponding to the variation of optical density of the sample, emphasising lines and edges though not providing a topographically accurate image.

DIATOMS, continued

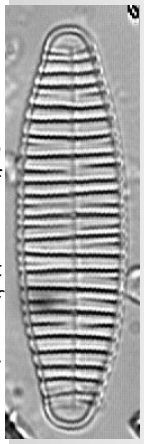
(Continued from page 2)

prevents rubbish from being gathered and brought home, but with little experience one soon finds out what is likely to be good even if the field microscope is not used. So it is by no means necessary to go to the expense of a field microscope if one is prepared to take a sporting chance of the contents of some tubes not being as good as might otherwise be the case. There will always be plenty of diatoms of some kind, as soon as necessary knowledge of what to look for is acquired. Generally speaking, any brownish-green or yellowish-green patches on stone, mud, roots of trees, and on stems and leaves of water plants will prove to be rich in diatoms.

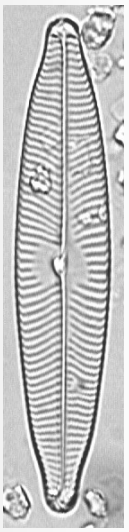
Having arrived home, take a 3 x 1 inch microscope slide and with a eye dropper or forceps take up a spot of the brownish material and place it on the slide with one drop of water. Just loosely lay on this drop a cover glass and inspect under the microscope. If the gathering happens to be of Naviculas or Pleurosigmas it will be difficult to convince the novice that he is looking at plants and not animals. The whole field of view will be alive with moving diatoms, pushing and jostling each other all over the place.

Now the microscopist is up against his first diatom problem, which is: *by what means do these plants move about so vigorously?* If he solves this problem, he can call himself a genius. The next problem will probably be: *how is it that there are so many thousands of these plants and by what means do they grow and multiply so enormously*? That is another very difficult and controversial subject.

This article is excerpted from the original published in THE MICROSCOPE Vol.III 1939, London.



Diatoma vulgare



Navicula viridula

My Life (Not) in the C.S.I. Laboratory

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ted without reference to a confiscated or found weapon, the empty microscope stage would be equipped with measuring devices. The number and dimensions of the gross rifling impressions on the bullet could lead to a weapon make and model, or group of same, as the source of the bullet, information that could be added to a search warrant.

The forensic comparison microscope provides less magnification than typical research microscopes that provide the graphic pond-water images of amoeba and paramecia that excited me as a 10-grader. Because of the subject matter, the forensic comparison microscope is also designed to render images of opaque objects and work with reflected light.

Bouncing an incandescent beam off a shiny metal surface for photography was a test of the microscopist's ingenuity to get an image on film that showed tool mark detail without highlight burnout and shadow blackness. Light tents, diffusers, fluorescent sources and colored filters were all usable tricks in my early career to get the details of rifling on a bullet onto a 4"x5" sheet of black and white film. These film sheets could produce graphic images of microscopic detail when done well, and the only preparation needed for court

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SFMS Activities — Participate and be active

June 21, 2008 Saturday. The Board meets to discuss the Fall Programs and hear the reports from the officers. We start with a lunch at 12 noon, to which all attending members are invited provided they notify in advance hschott@aol.com. This is grass-roots democracy so come and help with the discussion and planning.

July 3, 2008 Saturday. Brian Ford dinner. You have received a flyer for this event held with the CAC group. Brian always is stimulating and presents challenging information. Go on line (Google) and find out more about his work.

July 19, 2008 Saturday. ***Sun, Wind and Water Day*** at the Randall Museum will be our contribution to the educational work of the museum. The microscopes have been enormously valuable for the event in the past, and we have come to count on the Microscopical Society as an important presence during our educational events. We man the microscope table and demonstrate aspects of what is transported by wind and water which is almost everything.

WE NEED SOMEONE TO TAKE CHARGE. PLEASE CONTACT LINDA WRAXALL at: lindaw5601@aol.com,

The First ***Ultraphot***

Training Sessions were held on Saturday, April 19 from 10 to 2 . Helmut Will demonstrated the components of the Zeiss Ultraphot and led the four 'students' through the various configurations of the instrument.

If you are interested in receiving this training, please contact Helmut Will at werdorf@aol.com to register you interest. The instrument is available for use only to trained members of SFMS who are willing to comply with the rules of the laboratory where it is located in Richmond.

Interested in SFMS organization? Help revise our constitution.

We are working with an old and outdated constitution and need to revise and reorganize this important organizational document. Several people (at least two) are needed to volunteer for this important effort. Contact our acting president, Linda Wraxall if you are interested in participating in this project. Lindaw5601@aol.com

Micro News

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MEMBERSHIP INFORMATION

To join the Society, fill in the form available at www. sfmicrosoc.org and mail it to the above address with your annual 2008 dues of $12.– made out to SFMS.

Life membership is $144.00

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presentation was a contact print.

Polaroid film was a help when it became available, but the direct positive image still required lighting and contrast control by the examiner.

Digital recording was a further help in instant feedback and contrast control, but all these technological advances still required the examiner to find a set of rifling minutiae on two different bullets and bring them into side-by side registration in the image field in sufficient clarity that hopefully even the most reticent of observers would agree to their sameness, and subsequently a common origin of the two bullets.

Similar, but more random placement of weapon impressions on a fired cartridge case could lead to a common origin opinion on a pair of these, also. Cartridge cases, by virtue of brighter metal surfaces and a more random assortment of surface contours, had their own problems with the capturing of a quality image, but could similarly be useful in identifying a weapon of origin or the elimination of a suspect weapon from consideration in an investigation.

When digital image capture and computerized searching became functional late in my career, I like the CSI's, would watch the search results on the screen. But I would not see a large red banner bearing the words, "MATCH CONFIRMED" blaze across the screen. I would see two highly-correlated images of rifling or firing pin or breech impressions appear, and that was my signal to collect the sources of those images, that is the actual bullets or cartridge cases, and start twirling the bullet holders on either side of my microscope until I found sets of striae that confirmed an apparent match, or allowed me to conclude that a match was not possible.

Conclusive matches might not be made on bullets (or cartridge cases) from the same firearm for various reasons, but commonly because the "evidence" bullet (or cartridge case) suffered from damage at the crime scene. Bullets are commonly involved in high-speed collisions with hard surfaces before, during or after striking a victim, and cartridge cases commonly get caught in compressions between a gravelly road and a shoe sole or automobile tire.

I can't blame Hollywood for leaving out all the drudgery, but I can't help wishing that many times during a lengthy career I could have twirled bullets for a match like the CSI's do.

(Terry Coddington, the author of this account, is a Life member of the San Francisco Microscopical Society.)

Below: NCIS actors, one of several TV shows that made CIS famous/