



MicroNews

San Francisco Microscopical Society

Volume 9, #1 January 2014



Aloha 2014!

Friendly reminder: if you have yet to pay your annual membership dues, please do so.

Featured Image

Mosquito Larva

By Jo Podvin

40x, Leica DM500

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'Discovery Days' are here to stay

On November 2nd, AT&T Park hosted "Discovery Days," an annual event celebrating creative exploration and advancements in the areas of science, technology and engineering. Part of the Bay Area Science Festival, "Discovery Days" called for industry, academia and non-profits to come together to educate the public and inspire youth through hands-on activities and demonstra-

tions. The San Francisco Microscopical Society answered the call.

Partnered with the Merritt Microscopy Club, SFMS tabled on the club level of AT&T Park and enjoyed an exceptional amount of foot traffic. SFMS' Peter Werner, Henry Schott, Sara Sandhu and Merritt Microscopy Club members manned Leica dissecting microscopes and

Zeiss Primo Stars, explaining the fundamentals of fluorescence microscopy, polarized light microscopy and darkfield illumination to young microscopists. With pond scum, diatoms, and tartaric acid crystals provided by Werner, Schott and MMC member Giana Cirolia, visitors walked away with lessons in biology and a taste of a microscope's potential.

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Ready, Set, Sync!

A look at the emergent relationship between the cell phone and the microscope.

Calendars, phone books, photo albums, bank accounts, weather updates, *The New York Times*, local restaurant reviews, radio stations, inboxes, street navigation—everything is readily available, courtesy of the smartphone. After all, this is the mobile age.

According to a *New York Times* article published in March of 2013, there are five billion mobile phones buzzing around the world. In South Africa alone, SIM cards outnumber the country's population—52 million SIM cards to 47 million people. So how does this impact the world of microscopy?

The spring semester of 2013, I enrolled in microbiology at Merritt College. During lab we performed several staining techniques and learned to identify various microorganisms under the microscope. Instead of drawing the results by hand, I aligned my cell phone's camera lens with the ocular of the microscope, and imaged. Eventually, I was introduced to the *Skylight*, a unique device invented by Andy Miller, an accomplished engineer and a Bay Area resident. The *Skylight* attaches to the ocular of a microscope and secures smartphones into place, allowing users to align and image sans the use of shaky hands.

My cell phone, coupled with Miller's device, proved to be an effective educational tool for my microbiology class. Now, the relationship between the smartphone and the microscope has reached a new level—more specifically—a new size.

In 2009, a team of scientists and bioengineers from UC Berkeley and UCSF collaborated to develop a new microscope attachment for camera-enabled cell phones. Using a Nokia N73 camera phone, a 60x 0.85 NA Achromat objective, a 20x widefield microscope

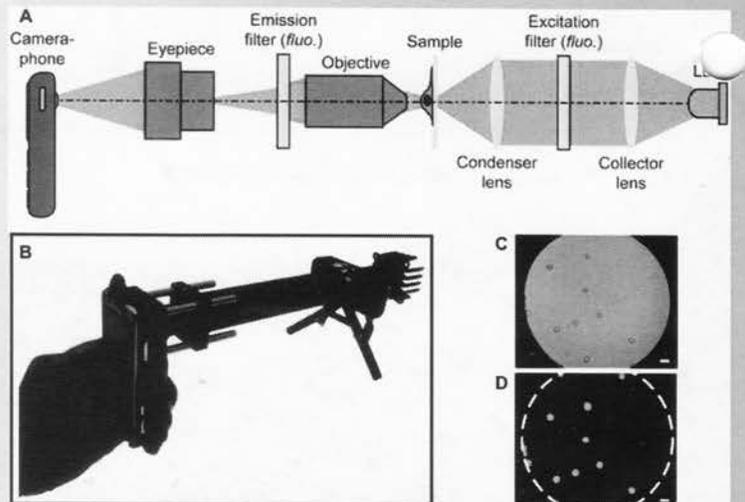


Fig 1.1 A) diagram of the mobile phone microscopy system, B) current prototype, C) & D) brightfield and fluorescent images captured by the device

Image courtesy of the Public Library of Science.

eyepiece and inexpensive filters, the team successfully integrated a microscopy system into the mobile phone and demonstrated the phone's ability to capture brightfield and fluorescent images (Fig. 1.1). Red blood cells infected with *P. falciparum* were imaged in brightfield, and sputum samples containing *M. tuberculosis* were analyzed in fluorescence using the device. Ultimately, the high-resolution images of the blood smears and sputum samples served their diagnostic purposes.

The team published their results in an article entitled *Mobile Phone Based Clinical Microscopy for Global Health Applications*, made accessible by the Public Library of Science (PLOS ONE). The role of the mobile phone microscopy unit in public health is tremendous, and still evolving.

Dr. Aydogan Ozcan, a professor of electrical engineering and bioengineering at UCLA, recognizes the role of fluorescence microscopy in biomedical research and clinical diagnosis. In 2013, his lab developed a fluorescent microscope device that attaches directly to the camera on a smartphone (Fig. 1.2). With the attachment, Ozcan and his team successfully detected human cytomegalovirus

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The Future of SFMS—Take Action

Would I want to read what I have written?

This is most likely the best test for a report, particularly one of a Board meeting. It is not easy to make the governance of an organization sound interesting and exciting yet there are members who want to know and who may want to react. The Board would benefit from your reactions and involvement so take a moment and consider the following high points of the December 13 SFMS Board meeting.

The agenda starts with the approval of the previous meeting's minutes that were distributed the day before.

A number of improvements were agreed upon in the wording but not in the sub-

stance of the minutes. Peter recited the President's report reflecting on the recent activities of the Society: participation in the Fungus Fair, Discovery Days at AT&T Park, and the talk by Dave Armitage at the No-

SFMS' OFFICERS & VACANCIES

President: Vacant

Vice President: Peter Werner

Treasurer: Myron Chan

Recording Secretary: Mary Ann Scott

Communications Secretary: Bill Hill

member general meeting; Dave was the recipient of the 2012 Grant from the

Society. The reports from other board members followed. Treasurer Myron Chan pointed out that three dissecting scopes were delivered to the Mission Science Workshop at a total of \$221. Myron and Dr. Neil

Straus spent most of the day repairing and reconditioning microscopes at MSW. While no definite plans for the Wednesday, January 8, 2014 General Meeting were developed, it was agreed upon to hold the required election. The March 12, 2014 General Meeting will also need more planning although a speaker is under consideration. More news will follow, so set aside that date.

The rest of the evening was devoted to setting aside funds (creating a budget) for the 2014 fiscal year. Improvements of the web site was limited to \$1,000; Publica-



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There is something to be said for the microscope's ability to engage the

public. Exclamations like, "this is beyond awesome!" and "hey, I can see my eyelashes in here!" filled the air, creating an ever-lasting

sense of excitement. Werner and MMC members stepped into the role of science educators, sporting white lab coats and asking

questions while visitors peered through the oculars. Dissecting micro-

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Fig 1.2. Ozcan's fluorescent microscope attached to a Sony Ericsson mobile phone.

(HCMV) particles—a single particle measures about 150-300 nanometers.

The featured attachments are low in cost, and most importantly, portable. Being able to analyze water supplies, food, bodily fluids and other specimen samples in resource-limited areas

could lead to the timely development of effective treatment plans. Mobile networks are constantly expanding, and merging microscopy with these technologies can potentially support public health efforts all around the globe.

-Sara Sandhu

help wanted:

Hail Fellow Microscopists!

I'm a new member of the San Francisco Microscopical Society and a beginning microscopist—I'm currently a student in the Merritt Microscopy Program. I've gotten a bunch of rock samples from a friend up on the Salmon River in Siskiyou County. He mines the rocks and makes objects from them, from pendants to headstones to fountains. They are mostly types of 'California Jade'—jadeite, nephrite, tremolite—and range in color from white to pink to green to black. A couple of years ago he discovered a rock that fluoresces amazingly under black light—he calls it 'nebulite' because it looks like Hubble Space Telescope pictures of nebulae. I thought it would be interesting to image his rocks, so he sent me samples, consisting primarily of little chips. I immediately discovered my limitations in imaging minerals. As the professors in my program are skilled in imaging cells, tissues, and biological specimens, they are of limited assistance in this endeavor. Therefore, I'm reaching out to the SFMS with a cry—HELP! If anyone has any ideas/assistance for me, I'd love it. Contact me at jopodvin@gmail.com.

-Jo Podvin

sfms makes annual appearance at fungus fair

SFMS recently participated in the 2013 Mycological Society of San Francisco Fungus Fair, an annual event our society has been participating in for the last several years. It's been excellent exposure for our group, as the Fungus Fair is one of the more popular public science events in the SF Bay Area, particularly

given the increased popularity of foraging over the

where the fair was held for many years, up through the

we typically share neighboring tables.

SFMS will participate at the Point Reyes Fungus Fair
Sunday, January 5, 10am-4pm.
Contact germpore@sonic.net for more details.

last few years. This year, the Fungus Fair was held at the Hall of Flowers in Golden Gate Park, a homecoming of sorts, as this

90s. SFMS was represented by myself, Henry Schott, and Bill Hill, who also represented the California Lichen Society, with which

We presented a display of fungal curiosities, featuring mushrooms with interesting microscopic features, but also molds, decidedly less charismatic members of the fungal kingdom, but often amazing-looking under the microscope. (continued on pg. 7)

What Can We Learn? by Henry Schott

What I bring to you are some observations made when I attended a meeting of the *Other* microscopical society in the Bay Area, the Northern California Society for Microscopists, (NCSM). The meeting was at the Berkeley Arts Festival Center at 2133 University, just a block from the west entrance of the University.

2133 University had the characteristics of an old store-front church. Step through the door and you find yourself in a large room with rows of folding chairs occupied by about thirty people intensely listening to the presenter. The projector set well in front of the

first row was focused on a much-too-small screen making any of the text illegible even from the front row that was totally empty until I sat there. The presentation entitled *A Micro/Macro Texture Analysis of Anatase Films with Preferred Orientation of (001) Facets* was foreign to me. It did seem to deal with crystal structure but since I missed most of the presentation, I am unable to suggest its significance.

The second presenter, professor Ida Llewellyn-Smith very quickly won my interest since she promised to focus on technique as she discussed *Immuno Elec-*

tron Microscopy in Neuroscience Studies. She was visiting the University from Australia and for the sake of half the audience who were not from biological-related fields, she gave a brief overview of immunology. She described how antibodies contribute to making specific proteins visible in electron micrographs by labeling them with gold particles that in themselves are too small to be visible but that can attract silver forming a heavy coating that more than doubles their size. She also emphasized that all such studies of brain or spinal cord tissue need to be done with antibodies that are both pure

and diluted to the proper titer. Failure to use relatively pure antibodies or properly prepare the tissues results in specimens that are black.

The first step in tissue preparation is fixation, a chemical process that stops all biological processes including deterioration and tends to harden the tissue. Fixatives are designed to preserve the antigens (proteins, peptides or polypeptides) of interest. Various fixatives are available including formaldehyde, gluteraldehyde, acroline, and picric acid. Acroline is fatal if absorbed through the skin and picric acid crystals are explosive and very unstable unless dissolved in water. Methanol and ethanol are also preservatives but will dissolve neural cell membranes to a lesser or greater degree depending on concentration and time.

The next problem facing the investigator is to ensure that the anti-

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tion costs for four issues of *Micro News* received \$810; the purchase of Publisher software received \$155; the purchase of microscope slides to begin a lending library received \$350; Development of the History of SFMS was budgeted at \$600; The processing and promotion of the 2014 Call

for Proposals to receive a \$5,000 Grant received up to \$500; The purchase of one or two banners for use at fairs and exhibits received \$250.

The next meeting of the SFMS Board is scheduled for Sunday, February 16, 2014 at 1649 Magellan Dr. in Alameda. Call 510-523-4132 if you wish to attend the lunch at noon or only the

meeting from 1:00 to 3:00. All members are welcome.

-Henry Schott

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What Can We Learn? by Henry Schott, **cont.**

bodies have a chance to reach their target inside the cell in sufficient quantity to detect. The fixed cell membrane effectively forms a barrier to the antibody molecules. Detergents can dissolve membranes or create holes in them. Sudden freezing of the tissue causes crystals of water in the cell that puncture the cell membrane. Both these methods have drawbacks but can be used to allow gold-particle carrying antibodies to enter the cell and find the specific peptides for which the antibodies have been designed. One of the more important aspects in neuromicro-anatomy for the researcher requires knowing precisely where you are in the brain or spinal cord, and what cells you are observing. Coordinating light microscope studies with those of EM are essential to solving the complex issues of nervous system activities. She received hearty applause at the conclusion of the presentation.

The third presentation of the afternoon was made by a representative from Carl Zeiss who was invited to speak about the new instruments that employ x-ray technology to create micro-images. Starting in 2000, XRadia in which Zeiss had invested, began to develop microscopes that used the soft x-ray bandwidth to image specimens. Zeiss recently bought the company and now produces two models, named Versa and Ultra. Since x-rays can penetrate opaque objects, it is possible to identify three-dimensional data points that permit the tomographic reconstruction of the image in a computer. An interesting example was the image of a coin-shaped battery (used in watches and hearing aids) where all the metal casing was removed electronically from the image leaving only the lithium battery core. A second video showed a zebra fish embryo that had been x-ray imaged. Though tomographic reconstruction the zebra fish could be viewed in any of the anatomical planes, frontal (coronal), sagittal or transverse. While the title of the presentation promised *3D Correlative Microscopy Employ-*

ing Light, X-Ray and Electron Instruments, the emphasis was on the x-ray. What I found particularly interesting was that magnification of x-ray images occurs by placing the object closer to the x-ray source and capturing the projected image at a receptor placed some distance behind the object. The diverging rays cause the magnification. Further magnification of the image captured by the receptor is then possible with ordinary lenses. The presentation was also well received.

Let me now mention some observations that may have relevance to the SF Microscopical Society meetings. Because there was diversity of subject matter, the audience attracted people from different disciplines. This helped to swell the number of attendees. When the NCSM has night meetings, the audience is more than twice as large since the evening meetings attract Delta College students and faculty. Participation by representatives from industry not only helps to strengthen the coffers of NCSM but they also provided refreshments and even catered food for evening gatherings. By holding only two local meetings per year, NCSM does not invest in excessive planning. The third meeting is held at the MSA convention of which NCSM is a member. Just like all small organizations that I know, NCSM has a hard time finding anyone who wants to serve as an officer. For three years, the society has managed only because three people have served in a voluntary capacity as unelected officers. At the meeting, two members volunteered to be a nominating committee. It will be interesting to see if they can find candidates for office. I enjoyed the meeting but realized that the only activity in which I could participate besides listening, was talking to others during the 20 minute break. At SFMS meetings, we often have a chance to see microscopic demonstrations and learn about microscopy related items that a member has recently purchased. These show and tell moments are both fun and interesting. They make our meetings unique.

A Message From Peter Werner

As 2013 draws to a close, SFMS looks forward to proposing a new board for approval by our membership at the January 2014 meeting. Notably, I plan on stepping down as President this year – I have held this position for the last 3 years, but additional responsibilities in my life make it difficult to devote the time necessary to properly carry out the responsibilities of this position, and I also feel it's time to give somebody else a chance to step up to the plate. As of late December, we are still searching for someone to replace me as President, and I'm hoping that someone reading this article will come forward.

I will still remain on the board and Vice-President and Program Chair, and hope

to bring together an interesting set of speakers and events for the remainder of this year and 2014-2015 as well. In addition, if no one comes forward by the January meeting, I will continue in the position of Acting President until such time as the office of President is filled.

As to other board positions, Myron Chan and Mary Ann Scott will continue with their excellent work as our Treasurer and Secretary, respectively, and Bill Hill will switch positions from Vice President to Communicating Secretary. Henry Schott will be leaving the position of Communicating Secretary and, therefore, the SFMS Board after many years as an officer, and will also be stepping down as edi-

tor of *Micro News*. I want to personally thank him for his many years of outstanding service to our Society and for basically being the main force keeping our society in existence for many of those years.

Several non-board offices will also be changing – Henry Schott will now take on the role of SFMS Historian, and will be organizing and digitizing newly rediscovered documentation from the early years of the modern manifestation of SFMS. And a big welcome to Sara Sandhu as editor of *Micro News* – her enthusiasm for and knowledge of this task will insure that this publication carries into the future on as the voice of our Society.

I wanted to thank the general membership and

board of SFMS for entrusting me over the last several years with the responsibility of leading our group. My time on the board has seen our society expand its participation in local naturalist and scientific events, and our recent participation in the Bay Area Science Festival Discovery Days and the MSSF Fungus Fair were great successes in public outreach. We have also had some exceptional presentations – in particular, Steve Ruzin's presentation of the Golub Collection at the San Francisco Airport and Brian Ford's talk at Merritt College drew large, enthusiastic crowds.

And, notably, we were granted a generous bequest by the Robert D. Hancock Trust, which has turned us into a small but well-to-do group. This has greatly enhanced the ability of SFMS to expand the scope of our activities and outreach, but it has also made the responsibilities of the board more complex, as we now must deal with the challenges of using our assets to maximum public benefit and investing the assets in such a way that is not eroded away by inflation. I look forward to working with our membership and our newly reconfigured board on meeting the challenges and opportunities that have been presented to us.

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The displays included the "fungal jungle", a stereoscope display of a moldy piece of bread featuring competing colonies of *Penicillium*, *Rhizopus*, and *Neurospora*; a *Rhizopus* sporangium beautifully illuminated by yellow-on-blue Rheinberg illumination; rhizoid hyphae of *Stropharia ambigua* set up under cross-polarized illumination

to bring out the crystalline oxalate acanthocytes unique to *Stropharia*; the gill edge of *Hypholoma fasciculare* set up under near-ultraviolet fluorescence to show the strong green fluorescence of the hymenium tissue in this species; and a brightfield oil immersion mount showing the fine features of warty *Gymnopilus* spores. The mycology students from SFSU also had some brightfield microscopes

set up at the fair, showing additional representative micromorphological features of various kinds of mushrooms.

The microscope display was very popular, with people of all ages often taking time to linger over the microscopes. We look forward to returning to the Fungus Fair and other MSSF events in future years and help to provide a unique perspective on mycology.

-Peter Werner



Stamp

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FROM: Micro News

San Francisco Microscopical Society
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Oakland, CA 94611-2613

MEMBERSHIP INFORMATION

To join the Society:
fill in the form available on our web site at

www.sfmicrosoc.org

Mail it to : SFMS Treasurer
435 Melrose Ave
San Francisco, CA 94127

Make check out to SFMS.

Dues are \$12. per calendar year. Pay now for 2014

Life membership is \$144.00

TO:

We are on the Web

WWW.SFMICROSOC.ORG

scopes were linked to donated laptops which gave young microscopists the chance to capture images of their own.

The field level of AT&T Park was flooded with young scientists and enthusiasts. A graduate group from UCSF was of particular interest, attracting hundreds of spectators from the moment the grounds opened up to the public. Using inexpensive optics, 3-D printed Lego optic adaptors and a Lego-constructed microscope body, the team demonstrated their Legoscope and invited participants to create their own. The innovators behind Legoscope make no attempt to hide their recipe for success and are eager to share their discovery with schools and organizations. Interested parties can find more information at <http://designscience.ucsf.edu/lego/home.html>.

As the event came to a close, passersby crowded the microscopy tables for one last look. The combined efforts of SFMS and MMC left participants curious and excited about the world unseen.

-Sara Sandhu



SFMS and MMC members spent much of their time explaining fluorescence microscopy to parents and children.