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THE BLOOD FLUKES, SCHISTOSOMA

Zane H. Price

Fig. 1 Male and female blood flukes schistosoma in close embrace
SEM photograph by Zane Price. Magnification 200x

The blood flukes Schistosoma, of which there are a number of species, are blood thirsty creatures, and human blood is preferred. Schistosomes are diecious and the two sexes, like their human hosts, differ in appearance. Female worms are long and slender, 1.5 to 2.5 cm in length, while the males vary in length from 0.5 to 2.2 cm. The male body is curved lengthwise to form the gynecophoral canal in which the female is held in close embrace. (Fig. 1)

Upon penetrating the skin of a human host and invading a blood vessel, the immature worms are carried to the lungs, and finally to the liver sinusoids where they mature into adult worms.A couple of weeks or so later, the worms journey against blood flow in the portal system to their final destination in mesenteric or vesicular veins.

Adult Schistosomes are efficiently adapted for residence in small blood vessels.Their shape and size contribute to their ability to move through blood vessels until a suitable location for housekeeping is found. Adult worms are somewhat monogamous.A relationship, once established, is extremely close.The male, with the female in a tight embrace (Fig.1) secures the copulating couple in a capillary with the aid of his spiny skin, and the two proceed to produce eggs — large quantities of them.Two immature Schistosomes are shown in Fig. 2.

The general morphology of the stages in the life-cycle of Schistosomes can be seen with the light microscope, aided by stains with fixed worms or, in the case of whole-mount worms, with optical accessories of Phase or Differential Interference Contrast (DIC). Egg hatching can be observed by tireless patience, or, more comfortably with time-lapse film or video.

The adaptation of the adult Schistosome for life in a blood vessel is visible only with thin sectioning and the Transmission Electron Microscope (TEM), or, in the case of complete organisms, the Scanning Electron Microscope (SEM).The spiny skin or integument, with which they anchor themselves in the lumen of a blood vessel, is dramatic when viewed with the SEM. (Figs. 3,4 and 5)

Schistosomes subsist on ingested red cells.The female S.Mansoni has a voracious appetite when housed in a mouse. She consumes up to 330,000 red cells an hour. The male S. Mansoni has a smaller appetite consuming only 40,000 hourly (Lawrence, J. D., 1973, J. Parasit. 59).

Eggs of Schistosomes, with the exception of S. Haematobium, accumulate in intestinal blood vessels until an egg-mass ruptures the vessel. Eggs then escape into the gut, and they are subsequently shed with

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Publication Correspondence To
Editor Gaylord E. Moss
P.O. Box 9130
Marina del Rey, CA 90295
Tel/FAX (310) 827-3983
e-mail mosss@worldnet.att.net

Other Correspondence To
President George G. Vitt, Jr.
2127 Canyon Drive
Los Angeles, CA 90068
Tel/FAX (213) 464-6503
e-mail gvitt@worldnet.att.net

Dues and Membership Applications To
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11815 Indianapolis Street
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feces. Hopefully, for the continuation of the Schistosoma life-cycle, the egg containing feces are deposited in fresh water, populated by fresh-water snails. Eggs hatch into free-swimming miniature ciliated flat worms called miracidia.

Miracidia have a life of only a few hours, therefore, they must hustle to find a defenseless snail. The cilia are shed upon penetrating the snail, and the miracidia turn into tiny forked-tail flat worms known as cercaria.

Cercaria shed by a snail swim about in search of a susceptable host. Human hosts are preferred by most species of Schistosomes, but non-human primates, insectivores and rodents are infected. Humans become infected by bathing, swimming or wading in contaminated water.

Cercaria infect humans by enzymatic penetration of the skin and enter the blood stream to begin the life-cycle anew.

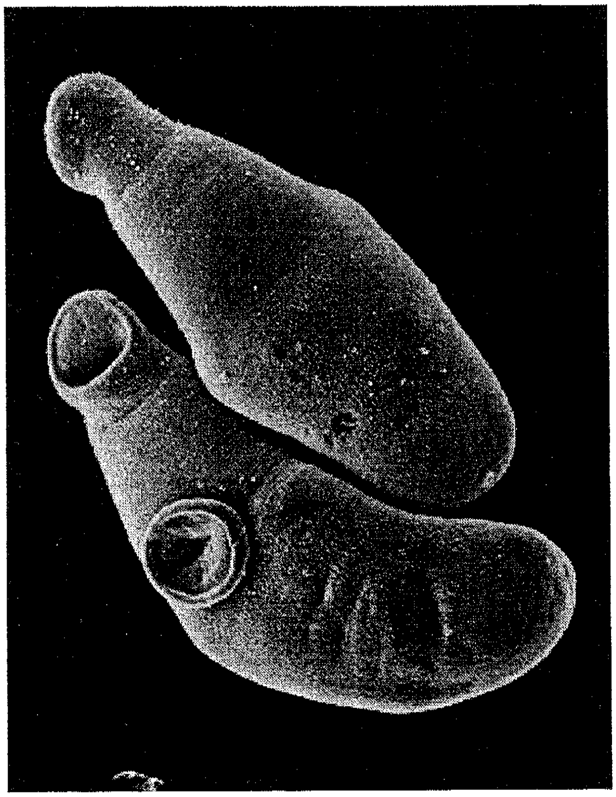

Fig. 2 Immature Schistosomes 300x

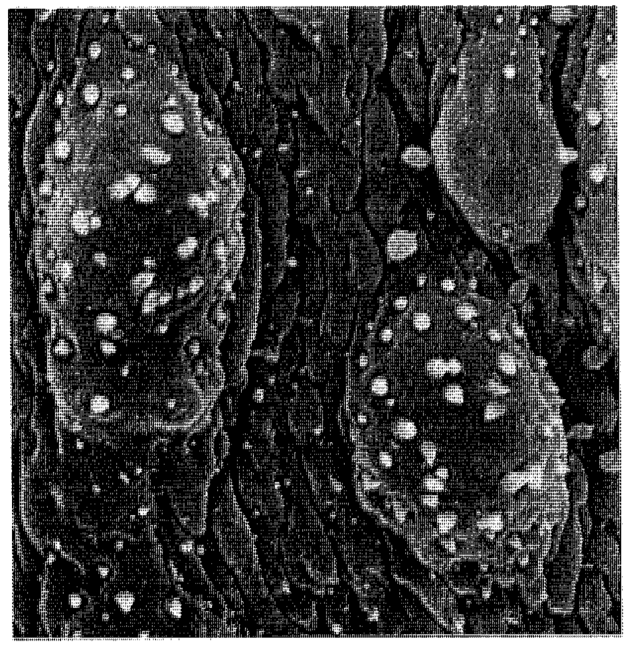

Fig. 4 Spiny tubercles of integument (skin) on dorsum of adult male 4000x

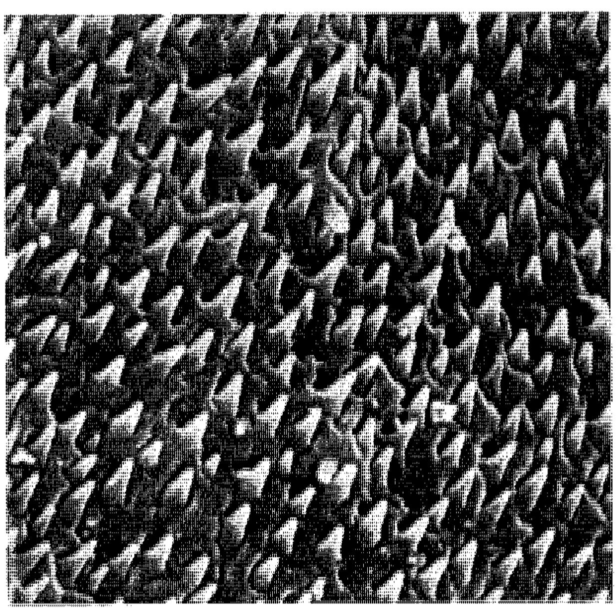

Fig. 3 Ventral surface covered with spines 6800x

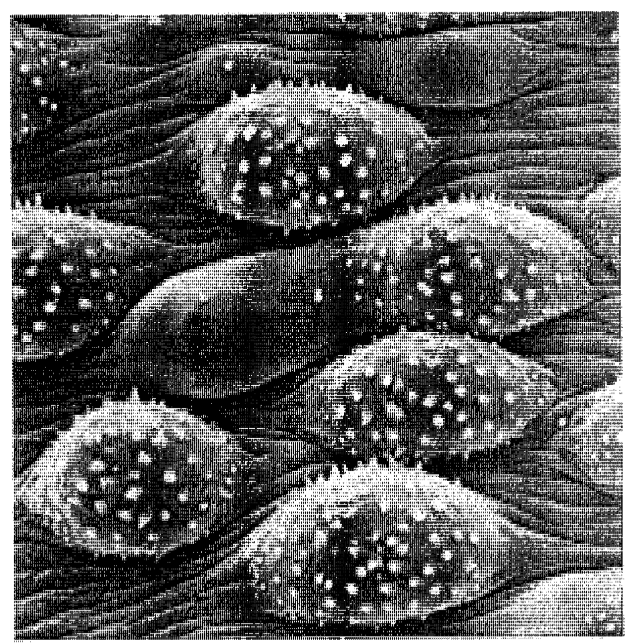

Fig. 5 Spiny tubercles 2000x

THE SCANNING ELECTRON MICROSCOPE

A Basic Treatise on the Theory of Operation

by Ron Morris

With the acquisition of the Cambridge Stereoscan S-240 scanning electron microscope (SEM) by the Crossroads School in Santa Monica, I thought it might be timely to present a basic primer on the theory of the SEM.

It might help to understand how an SEM works by thinking of it as a giant, upside down vacuum tube much like an inverted triode tube. A beam of electrons is produced by heating at the top of the SEM a **metallic filament**, usually tungsten, (See Figure 1) to a temperature of around 3,000 degrees C.

The electrons generated by the heated filament are driven by an accelerating voltage of about 20 KV in a vertical path down through the upright column of the microscope and through **electromagnetic lenses** that shape and focus the electron beam which is then scanned across the specimen in a raster pattern like that in which an electron beam scans a TV screen. A raster pattern is a series of successively scanned lines, with each line displaced slightly in the cross line direction.

The SEM operates on the concept of seeing with these scanned electrons instead of with light as is used in an optical microscope. Since electrons behave as waves, as well as particles, they can be used for microscopy just as light waves are used in an optical light microscope. The wavelength of the electron beam is, however, much shorter than that of visible light which is the reason for the much higher resolution of the electron beam microscope. For an acceleration potential of 100,000 volts, the electron beam wavelength is about 0.04 nanometers as compared to the 400 nanometer wavelength of blue light. A nanometer is 10^{-9} meters, or one millionth of a millimeter.

There are two main types of electron microscopes, transmission and scanning. The design of a transmission electron microscope or TEM is analogous to that of a light microscope in that the whole sample is flooded with electrons which pass through the sample and must be refocused to show an image. This is difficult because the transmitted electrons have differing energies and hence wavelengths, which blurs the focused image much as does chromatic aberration in a light microscope. In order to keep the energy variation of transmitted electrons small, the samples must be made very thin.

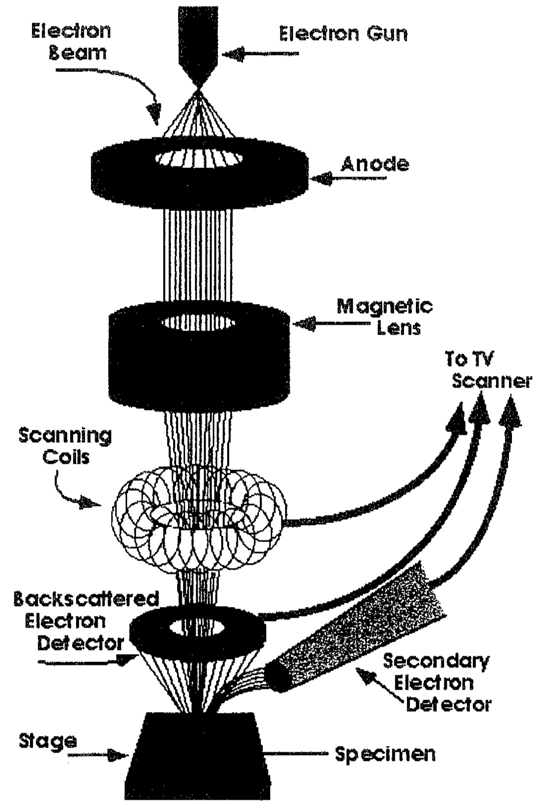

Fig 1 SEM Schematic

This problem is avoided in the scanning electron microscope or SEM because the beam does not have to be focused after striking the sample. By scanning a focused electron beam across the sample and measuring the electrons that are scattered from the surface, a picture can be generated of the surface. The number of electrons emitted at any given position of the scan represent the characteristics of the point being scanned on the sample. The SEM can form different sorts of image by using electrons that are reflected off the surface, or from under the surface of the specimen. There are backscattered incoming electrons that retain high energy and there are secondary electrons of low energy that are knocked loose by the high energy incoming electrons. The secondary electrons scattered near the surface show a topographical view of the sample. The backscattered electrons show characteristics deeper in the sample. Electrons that penetrate deep into the sample cause a chain reaction with other electrons, and more electrons are knocked loose by previously reflected electrons.This effect is more pronounced in samples with atoms of a higher atomic number, as these elements have more electrons.

Higher atomic numbered samples will thus appear brighter on the display, because they produce more electrons.The two detection modes can be used together to show the grain topology of samples along with the relative composition of each grain. In addition some researchers have collected electrons emitted at different angles on different detectors to generate a false color image that adds further information about the surface of the sample.

Once the focused and scanned electron beam hits the sample, **backscattered or secondary electrons** are ejected from the sample specimen. In order to achieve very low noise detection, the low energy secondary electrons are first drawn to an open grid at around 400 volts positive where they impact a **scintillator plate** which converts the electrons to photons. The photons pass through a fiber optic coupler to a **photomultiplier** tube which increases the number of electrons. The amplified output stream of electrons, or current, from the photomultiplier tube which is proportional to the electrons scattered from the sample then drives the screen intensity of a video monitor to generate the magnified picture of the object being observed. Of course, the X-Y scan of the video monitor is synchronized with the scan of the electron beam on the sample. Since the sample must be in a vacuum

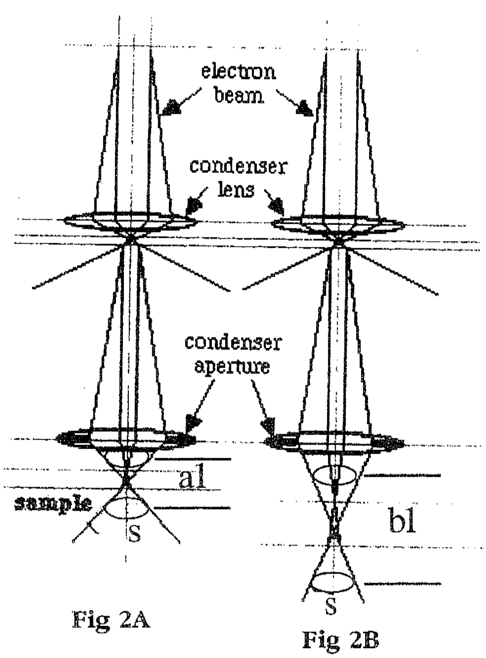

Fig 2 Beams showing depths of field a1 and b1.

chamber to keep the electron gun from burning up, external controls are provided to displace and rotate the specimen in order to view different parts of the sample. Additional digital electronics allow the processing of the signal to increase the image quality and to permit the storage and analysis of the image.

The objective for both a light and TEM microscope is to provide a clear magnified image of the object under study. In the SEM, as previously described, an image is not formed directly by focusing the electrons from the sample. Instead, an image is built up on a screen from information about the electrons scattered from various points of the sample as the beam is scanned across the surface.

An optical microscope uses lenses to bend the light waves to form an image. An SEM uses electromagnetic lenses to bend the electron waves to form a focused point to scan across the sample. The magnification of the SEM is determined by the area of the sample that is scanned and used to build up the image on the screen. The operator can easily change the magnification of the SEM over a range of about 15x to 100,000x just by changing the anglar range over which the electron beam is scanned. This changes the area of the sample that is shown on the full frame picture on the screen . Notice that as the magnification is changed in an SEM, the scanning beam is not changed, only the area over which it is scanned. This leads to the very important effect that the optical depth of field in an SEM does not change with magnification as it does in a light microscope, although there is an effective change caused by the display pixel size as will be discussed.

The SEM allows a greater depth of focus than an optical microscope because the ratio of the focal length of the scanning beam to the beam diameter, or f number, is of the order of 50 to 100. For this reason, the SEM can produce a remarkable representation of a 3-D sample of the surface of solid objects. The SEM in the secondary electron mode has a typical resolving power of 10 nanometers, and in the backscattering mode can resolve to 100 nanometers.

Factors Controlling Resolution and Depth of Field

The shape of the electron beam which is focused on the sample determines the resolution and depth of field of the SEM. Just as in a lens focusing light, the lower f number electron beam in Fig 2-A (that with the widest included angle) can be focused to a finer point and will hence have finer resolution in its scanning of the sample surface as compared to the higher f number beam in Fig. 2-B. However, just as in the optical case, the higher f number beam of Fig 2-B will have the greater depth of field. This can be seen by assuming that the depth of field is defined by a scanning beam that is smaller than diameter "s" in Fig 2. It is clear that the higher f number beam of 2-B has a greater depth of field "b1" than the depth "a1" of Fig. 2-A.

In the SEM, the **condenser coils**, the **stigmator**, and the high voltage on the grid determine the sharpness of the point of the beam. The objective lens electromagnetic coil determines the point in the vertical beam where the converging point is formed, moving the focus point, up and down, just like moving the objective lens up and down in an optical light microscope to achieve perfect focus.

The actual depth of field is also dependent on the size of the picture element, or **pixel** in the final image. The spot size irradiated by the electron beam does not have to be any smaller than the size of a pixel in the image. Focusing to a point smaller than a single pixel in the image does not gain any further resolution. Since the number of pixels is constant for a given display system, each pixel represents a larger portion of the sample at lower magnification settings. The effective depth of field thus increases as magnification is decreased because the focused spot size can increase until it reaches the new increased pixel size. If all of this has you thoroughly confused by now, then quite simply, the depth of field of an SEM is determined by only two factors-the angle of the cone of electrons hitting the specimen, and the size of the pixel, determined by the magnification.

Factors Controlling Image Distortion in an SEM.

Image distortions in a light microscope include spherical and chromatic aberrations. SEMs have these distortions and others as well. One of these other important kinds of distortion is due to the scanning movement of the electron beam. At low magnifications there is a distortion near the outer edges of the sample because the electron scan angle is far from perpindicular to the sample. However, as the magnification is increased, the field of view decreases and the extreme scan angle deviates less from perpindicular to the sample and is closer to the optical axis of the system. Therefore this distortion is reduced for higher magnifications.

Surface tilt and surface irregularities also cause image distortion because the electrons, which come from a distance inside the specimen travel different distances depending on how much the sample is tilted or how rough the surface is.

Surface irregularity can also cause distortion if an overhanging part of the specimen blocks the return of scattered electrons to the detector, re-absorbing them in the specimen sample itself. Some surface tilt can be compensated for by the SEM. It is not perfect compensation, however, and the act of compensating for a distortion in the X axis can cause a distortion in the Y or Z axis direction. Because of this, 3 dimensional objects will generally be distorted in a least one dimension when viewed with an SEM.

Life in a Vacuum

One of the major differences between optical and scanning electron microscopes is that in an SEM the specimen and electron path must be in a vacuum. This means that most of the air molecules must be been removed from the inside of the microscope. Pressure is measured in a unit called a Torr. The typical pressure of earth's atmosphere is 760 Torr. The moon's atmosphere is 1x 10^{-15} Torr. The SEM's typical operating chamber atmosphere is 1 x 10^{-6} Torr, which is equivalent to a barometer reading of 0.0000039 inches of mercury.

The SEM column and specimen must be in a vacuum because in air the metallic cathode filament would quickly oxidize and burn out, just like the filament in a broken light bulb. Also, the electrons in the beam would collide with the air molecules, and never reach the specimen sample. Gas molecules could form around the filament and detectors, and cause the image quality to be greatly diminished. A vacuum environment is also required as part of the sample preparation in the sputter coater, where water vapor and solvents are removed.

The Sputter Coater Process

Since an SEM uses electrons to produce an image, most SEM's require the specimen sample to be electrically conductive so that a charge does not build up on the sample. All metals are already conductive, and require no preparation. Organic and non-conductive samples such as ceramic and plastics, have to be covered by a thin layer of conductive material . This is done in a **sputter coater.**

The metallic layer has to be thin enough as to not obscure the fine details of the specimen, but thick enough to survive damage by the high energy electron beam. It must be a continuous, electrically conductive layer of metallization that will not oxidize, and it must also have a very fine grain structure that will not be objectionable at higher magnifications.

The sputter coater uses argon gas and a small electric field inside a small vacuum chamber, in which the sample is placed. The lid of the chamber is the anode which is positively charged and houses the metallic foil, usually gold.The chamber is brought under vacuum by a built-in vacuum pump. Argon gas is then introduced into the chamber and an electric field is used to cause one electron to be removed from the argon atoms to make positively charged ions. The rarified Argon gas ions are then attracted to a negatively charged piece of gold foil, which they strike at high velocity.

The Argon ions act like sand in a sandblaster, knocking gold atoms from the surface of the gold foil.These gold atoms now settle onto the surface of the sample, producing a thin gold sputtered coating.A layer that is about 15 to 30 nanometers thick is adequate.A 60% gold/ 40 % Palladium compound, or even chromium can also be deposited on the sample in the same way, producing a less costly coating. Carbon and graphite paint or tape can also be used.This method is often used in preparing semiconductor samples.

Preparing and Mounting Specimen Samples

Material that is to be viewed in a SEM has to be completely dry, free from oil and grease, and mechanically rigid, stable in a vacuum and electrically conductive. Since few samples naturally meet these requirements,most must be prepared and mounted.

Specimens are attached to the specimen support, or **stub** before viewing in the SEM. Special adhesives are used to attach the specimen to the stub. Normally, the specimen is mounted to the stub first, then inserted into the vacuum chamber of the sputter coater, where a vacuum is drawn on the specimen prior to coating. This increases the conductivity of the specimen, and makes for a better image.

Prior to coating, all water and solvents that could possibly vaporize in the SEM column should be removed from the specimen. Biological specimens need to be prepared as for light microscopy with fixation, preserving, dehydration, clearing, staining, dissection, softening, and mounting. Much more care has to be taken to insure that the specimen will survive the harsh dynamic SEM environment of very low pressure and bombardment with a beam of high energy electrons. Fixation and thorough dehydration of all moisture is imperative to avoid the destruction of the sample while in the SEM.

Dehydration is often accomplished by freeze drying with liquid nitrogen, or Critical-Point Drying using successive steps of increasing concentration ethanol baths, finished with liquid CO2.

As mentioned previously, non-metallic samples, such as insects, botanical samples, histological samples, and ceramics should be coated in the sputter coater. Metallic samples normally can be placed directly in the SEM since they are already electrically conductive.

Some sample specimens can be conveniently mounted on a substrate such as glass or plastic coverslips, metallic or crystal disks, plastic, wax, and other types of membrane filters that are in turn mounted on the stub.

The next page shows five photomicrographs made on the Cambridge S240 SEM that was formerly at Silicon Systems Inc., and which is now at the Crossroads School.

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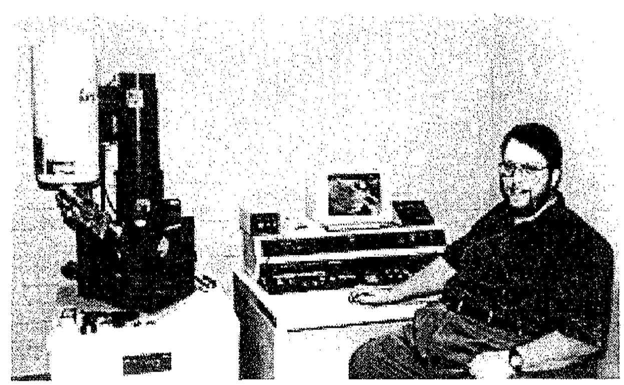
Also, the author would like to thank Joe Patterson and Margot DePetris of the Failure Analysis and Reliability Engineering Dept. at Silicon Systems, A Texas Instruments Company , Tustin CA for their kind help and advice.

About the author:

Ron Morris is a member of the technical staff at Silicon Systems, Inc., a Texas Instruments Company. He is currently involved in product development of mixed-signal integrated circuits for the computer storage products industry.The use of the SEM is an important tool in diagnosing manufacturing defects and engineering design flaws in integrated circuits.



Ron Morris at the Crossroads SEM

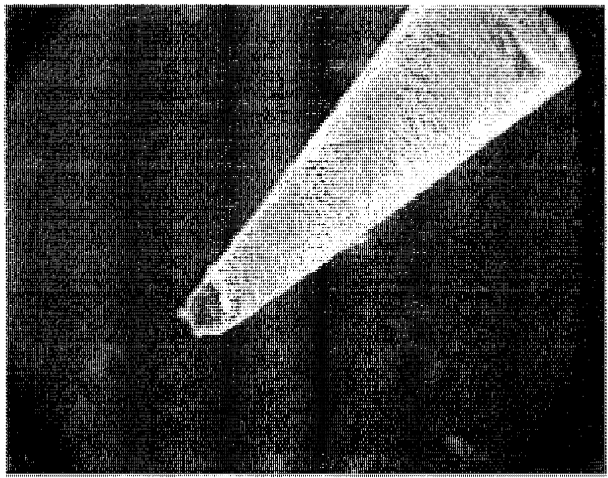


Photo 1 This is the end of a probe needle that is used for sub-micron probing of silicon wafers. The tip diameter is 0.5 micron. Magnification 840X.

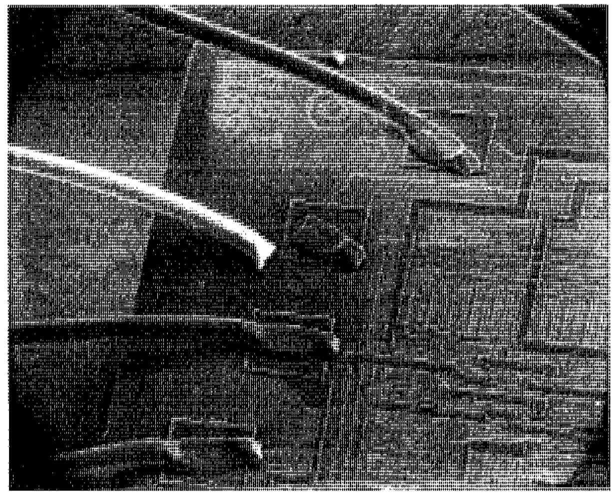


Photo 2 This shows a broken bond wire on the corner of an integrated circuit die. This can be a failure mode in ICs that have been physically stressed or subjected to excess shock or vibration.

Photo 3 Laser 'zap' hole created by a frequency doubled Nd-YAG laser beam hitting a metallized line in an integrated circuit. Magnification 3,500X.

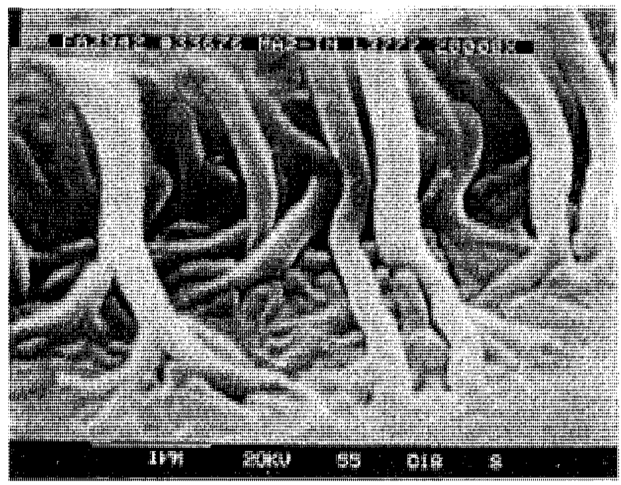
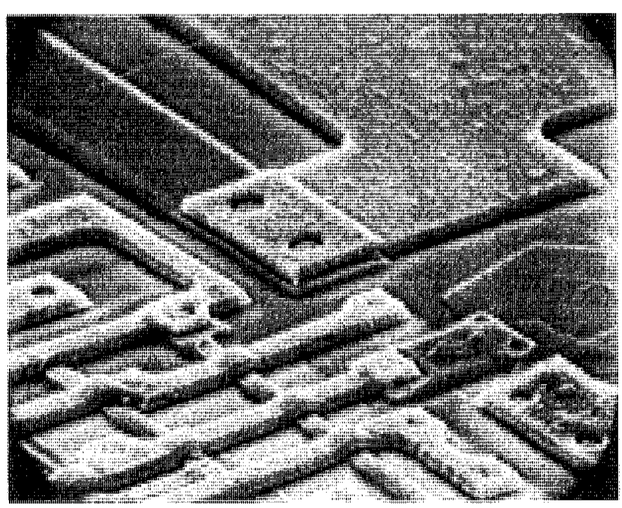


Photo4 Polysilicon fingers that 'grow' with electrostatic discharge damage. It is much the same effect as when lightning hits sand and melts it instantaneously. Magnification is 20,000X.

Photo 5 The processed layers of vapor deposited metal lines on a silicon substrate. The top metal layers are insulated from the lower metal layers that they overlap by glass insulation (polysilicon and silicon nitride). Magnification 16,000X.



WORKSHOP of the Microscopical Society of Southern California

by: **George G. Vitt, Jr.**
Date: **Saturday, 2 August 1997**
Location: **Steve Craig's Lab,** 25 persons attended.

Gaylord Moss had purchased a batch of comfortable, stackable white plastic chairs to solve the problem of seating (not to mention the trouble to Steve, our host, in having to use his living-room furniture) - and these chairs got their christening at this workshop. We all wish to thank Gaylord for this considerate and timely act.

1. **George Vitt** circulated a recently received letter from **Dr. James B. McCormick** who congratulated us on our progress during the past year and also expressed the real possibility of his coming again to L.A. in order to conduct a talk and demonstration of the type he has given us some 2 years ago. George then circulated some photomicrographs he had taken through an Olympus trinocular mic. equipped with a Leitz Micro-Ibso to which had been added a bayonet adapter to take the Nikon F3-HP. He reported that the camera film plane, the Micro-Ibso eyepiece, and the mic's binocular eyepieces were parfocal, enabling the use of only the Micro-Ibso eyepiece to be used for focusing and framing. He also described, with great enthusiasm, his beginning adventures and revelations in the use of Photoshop and the new PowerPro computer, stating that he has been getting very little sleep, as a result.

2. **Richard Jefts** showed the several types of slide labels he had prepared for use on multi-specimen slides.

3. **Jim Solliday** reported that member **Lynn Harding** of Ojai, CA has the book *The Natural History of British Diatomaceae*, 3 vol., c.1860, by Arthur Duncan. This set is available for $95. Jim then displayed a Chevalier pocket mic. with a square "U" beam support, c.1881. Its mirror can be in either of 2 positions and the base unscrews for storage in its 6"x1.5"x3" box.

4. **Dave Hirsch** displayed a microscope from the collection of Arthur Frank (Glasgow). The base of the mic. is attached to the top of its case, and the legs form a triangular support. The accessories include a fish plate, bullseye, and forceps. Dave also told of his correspondence with Mr.Frank, and that part of his collection had been auctioned at Christies and part is at the Science Museum in London.

5. **Stuart Warter** showed an unusual spirit lamp with the ID "Buffalo Dental Mfg." on the bottom of the glass. The lamp has the usual thumb-wheel adjustment for wick height, a glass tank and a glass cup-shaped top. Stuart then displayed a "Junior" self cased pocket microscope with integral folding tripod support. The whole mic. fits into a cylindrical case which fits in the pocket. Jim told of a phone call he received from Toronto from the g.g.g. grandson of Henry Crouch, who wanted to know all he could about his illustrious ancestor, and Jim obliged with all the necessary details. A general discussion followed on the prices realized on Crouch mics. at Christies, and George Vitt recounted his coup at this auction house coup when, in 1961, at their sale of Japanese arms & armor, all of which came from the Metropolitan Museum in NY. It was the largest such sale of this century!

6. **Ken Gregory** displayed a transit by Atlas Instruments, Tokyo in its original mahogany case (refinished), c.1935. It is 10.5" high, has a 2.25" compass, a 7.5" telescope with attached 3.5" spirit level, a 4.5" horizontal circle with vernier, 2 plate vials, a 4" vertical circle with vernier, on a 4-screw leveling base \. The transit is with black matte finish in fine condition, and was quite a find.

7. **Don Battle** circulated a directory of photo equipment manufacturers.

8. **Jim Clark** brought for sale ($75) what looked like an aircraft sextant c.1920, in its steel case, by K&E. Jim then showed an adjustable angle plate for use with the miniature Sherline milling machine. Jim also brought for sale a Nippon Kogaku petrographic mic., complete with all accessories in its fine fitted wood case. It Features 3 centerable objectives, focusing and XY adjustable Bertrand lens with iris, 1/4 and 1/2 wave plates integral to the body tube, polaroids, rotating graduated stage with vernier and detachable XY stage, and several eyepieces with crosshairs and micrometers.

9. **Ernie Meadows** showed how he adapted an XY stage to the Russian stereo mic. MBS-10. It was a superb job, and the stage looked like it were made for that mic.

10. **Barry Sobel** showed his Rudolph Wasserlein "No.3 A1 Microscope" c.1890, German made for the English market. Signed on the main tube "R Wasserlein, Berlin" and the description in the case lid verifies the maker and the enclosed accessories. A very firm stand which can be fixed at any angle, draw tube, eyepiece micrometer, stage, substage with concentric movement and 2 dark stops; 3 eyepieces, 5 objectives Nos. 2,5,7,9 about equal to an English 1.5, 1/4, 1/6, 1/10 inch and a No.11 <u>immersion</u> lens about equal to an English 1/16". This is a remarkable instrument and from the great ease with which thehigh powers can be used, their clear definition and flat field, it can be very confidently recommended as altogether unapproached by the microscopes of other makers at the same price. At the time, the price in mahogany case was £15. All the accessories are present except the eyepiece micrometer and one of the two darkstops. The substage mirror can swing from side to side and can be moved up and down. There is a fine adjustment for positioning the substage. Other unique features include the rotatable stage-limb assembly. The immersion objective is in a brass can. There was also a live box and a table of magnifications written in German. In addition, an English translation and a copy of a paper attesting to the quality of the instrument was also enclosed - and the claims were NOT exaggerated. It is easy to see why the continental makers soon put many English manufacturers out of business.

Larry also exhibited his Arthur Chevalier "Grand Model" mic. c.1885, French. This was the largest and most elaborate model offered by Dr. Arthur Chevalier. This firm was famous for its high quality achromatic objectives developed by Vincent Chevalier, followed by his son Charles, and finally Dr.Arthur took over when his father, Charles, died. The catalog describes the microscope as: "large model with rotatable mechanical stage extension tube, stage covered with black glass, plano-concave mirror with double articulation and rotation allowing oblique illumination from the front or side... gearing to the variable diaphragm and condenser; a series of tubular diaphragms, ocular micrometer..." It was supplied with 4 oculars and 6 objectives (1,3,5,8,9), and one corrected oil immersion objective, camera lucida, micrometer objective, Nicol prism polarizers, Lieberkuhn, bench condenser, and a "Dujardin" condenser. It was claimed to have a maximum magnification of 2000x (!) and sold for about 1350 Fr in 1885. This example has one ocular and the original "9" objective. It lacks the case and all the other oculars and objectives. It has a large Y-shaped lead-filled foot, and the iris diaphragm substage assembly rides on a rack-and-pinion and has an additional forward-backward rack & pinion adjustment. The mechanical stage is in working order. The coarse focus is through a cam-lever arrangement on the optical tube and fine focus is lever-screw through the limb. It weighs over 16 lbs. and is 15" high. The entire assembly, from the stage up, rotates.

11. **Myron Lynd** showed an extraordinary 19 century mahogany slide case with glazed door with 21 shallow flat drawers, with ivory pull-knobs, each holding 16 slides in the horizontal position. This case was literally filled with first quality slides of some of the top makers of the period, such as Topping, Norman, Watson, E.Wheeler (1860-70). Enoch's 1/8" thick entomological slide of a whole mount was stupendous! This was indeed a treasure trove and Myron's piece created quite a sensation!

12. **Bill Hudson**, our Curator of Chemistry, reported that he had expanded the MSSC List of Reagents due to the gift of materials generously donated by **Alan de Haas.**

13. **Pete Teti** announced that on 9 August there would be a slide mounting workshop and that those attending should bring the requisite equipment. 19 persons signed up for the 'extra' workshop.

14. **Izzy Lieberman** recounted some fallacious claims made by a company which made 'blue deionizer balls' for use in washing machines, stating that the ions were too small to see, and that they could be seen only with one type of microscope. Izzy then showed a German pocket microscope.

15. **Phil Lohman** reported that he is interested in telescope and camera lens testing techniques, and uses a method that does not require any special equipment, and which is easy to implement. All those interested should contact Phil for this information. Phil is the **Curator of Photography** at the Palos Verdes Art Center. He related that the Art Center will put on a show in about 4 months, and needs some exceptional photomicrographic art for this exhibit, and that MSSC members, of the Society as a whole, could (and should) consider submitting these photo images, which the

Art Center will gallery mount. The minimum allowable print size is 8"x10". This will be a **6 week long show.** **Jim Solliday** stressed that the membership has about 4 months during which time, at a regular meeting, members' work should be shown and selections made to send to the exhibit - the submittal being in the name of MSSC. An excellent idea! This could well be a major and very worthwhile MSSC activity, so dust off your lenses, load the cameras, and get to making some great photos!

BREAK: There was now a 30min. break during which there was the usual mini-Internet where the members were Web-browsing each other, discussing all manner of subjects, and looking at the many goodies that had been brought for exhibition, sale, or as freebies. Of course the coffee and tasty edibles (thanks to **Steve and Millie Craig)** were far from being ignored. The meeting then resumed.

Discussions: There ensued a general discussion on various subjects: Different ways of making a polarization compensator (as a substitute for the now almost unavailable, and very expensive quartz wedge); birefringent plastics; **George Vitt** described the making of 1/4 and 1/2 wave plates from Muscovite mica, and **Chris Brunt** recommended the use of mica heat-sink material used for power semiconductors. (Note: **Larry Albright** very thoughtfully brought to the following monthly meeting a **century's supply** of such mica!); thin sections (with Mr.J.McCormick possibly presenting a talk on the subject); the fracturing of Balsam Cement when a lens is drastically cooled. **Jim Solliday** recounted how an entire shipment of Zeiss objectives, meant for a dealer, had been thus damaged during the coldness of an air shipment! It was the loss of a small fortune! Zeiss has since re-formulated their cement mounting media, and ships by surface only!; the cementing of lenses, where **Jim Solliday** pointed out that Spencer 'neutralized' their balsam so that it would not be temperature sensitive nor decay with time. **John de Haas** pointed out that a 30 micron thickness is standard for mineral thin sections (for a calibrated thickness) and that a 30 micron quartz will give 1/4 wavelength retardation (yellow).

17. **Gaylord Moss** reported that Santa Monica College is giving 4-session classes in **Photoshop**, with a CD with 9-hours of instruction. Version No.3 of Photoshop is now available for 1/4 its original price, since it has been superseded by Version 4.0.1, and that it is being sold by a surplus outlet in Oregon. There was a general discussion on Photoshop. **Larry McDavid** recommended that we can first get version 3 and then update to version 4 at a considerable saving.

18. **Stuart Ziff** brought a fascinating volume from the large size, multi-volume edition set of "Physics Demonstration Experiments", the Ronald Press Co., New York, c.1970 - meant as a teaching guide at High School level. There ensued a discussion on Physics Courses in High School.

19. **Larry McDavid** showed a rare "Deck Prism", a multi-faceted, pyramidal shaped piece of cast clear glass, with a relatively flat top. It was used to provide daylight in the otherwise dark interior, below-deck, of a sailing ship - by being mounted in an aperture and flush with the deck surface. Larry described a 'correction prism' he had fashioned for the head of his Nikon Binocular mic. This adds a small amount of convergence for those persons who have difficulty in looking through binocular tubes which are mounted parallel to each other.

20. **Gary Legel** brought a rare, recent, pristine find: a cased Leitz Dialux mic. with 4 sets of eyepieces, complete light source by Leitz, phase contrast turret and objectives, and a monoscope for photography. This was a lucky find and we all owe thanks to **Norm Blitch** and **Maurice Greeson** for discovering this fine instrument. (Gary now wishes to sell his pristine Ortholux!)

21. **Tom McCormick** said, "I guess we have now fixed most of the problems I had created with the SEM!" He added that his charming wife, Nancy, has been especially enjoying using his Wild stereo microscope. (We must all thank **Ron Morris and Tom,** for their tireless work on the SEM.)

22. **Jim Clark,** who is a Professor of Physics, described how he collected the 'Amateur Scientist' articles in Scientific American magazine and, using this material, putting students 'to work'. He noted that **Bill Davies** has available many OLD (c.1910 or so) complete issues of Sci.Amer. which, in those days was a publication of much larger (page dimensions) format than currently.

23. **Alan de Haas** had lent **Ernie Meadows** a Spencer automatic microtome blade sharpener, which Ernie - with his infinite expertise and precision - fixed and put back into operation! They brought the unit to show. This device performs the job completely automatically: The blade is put in the holder, a slurry is applied to the glass plate, and the timer is set. The machine slowly moves the blade (sinusoidally?) over the glass plate

HANDS ON WORKSHOP OF AUGUST 9, 1997

Pete Teti

The Microscopical Society of Southern California has again started hands-on workshops which were regular activities in the earlier years of this Society. Many members felt that an additional meeting was needed because of the increase in attendance at meetings and the show of a wide range of interests. These workshops will take place on the second Saturday of each month.

In these sessions, the emphasis will be on learning and gaining more skills in microscopy by working directly with the microscope and personally making slides. Each meeting will be led by one of our more experienced members or possibly by outside guests who will share with us unique skills in the use of the microscope.

These work sessions may include: field trips, collecting and preparing specimens with a microtome, dyes, mounting and illumination techniques, photomicrography, crystallography and many other subjects.

Our first workshop was led by John deHaas. He explained and demonstrated dark-field illumination using various kinds of condensers including oil immersion which he demonstrated with a uranium glass cube. The scatter and fluorescence in the uranium cube dramatically and clearly showed the cones of the light paths. He also demonstrated oblique and Rheinberg illumination.

Jim Solliday concluded the session by projecting some of his excellent 35 mm photomicrographs of bright-field, dark-field and Rheinberg images of a variety of insects and diatoms.

The workshop was a great success and we thank John deHaas and Jim Solliday for a very stimulating and informative program. We also thank Steve Craig for hosting and providing his lab to make it all possible.

Our next workshop will be on the preparation, mounting and illumination of mineral specimens. John deHaas will bring samples for everyone, or people can bring their own.

The workshop will be at Steve Craig's lab on Saturday, September 13th at 9 AM. Come for another enthusiastic and informative session of microscopy.

WORKSHOP of the Microscopical Society of Southern California - continued

while the plate vibrates at 60Hz, moving parallel to the direction of the cutting edge. After a given time, the blade is lifted, rotated to the other side, and gently lowered for working the other side of the edge facet. This process is repeated until the timer shuts off. The plate and its aluminum frame are mounted atop a parallelogram arrangement of two flat steel springs - and the whole is factory adjusted to be resonant to the AC magnetic field produced by the driving solid-core solenoid. The reason the writer knows all this, is that he has the identical sharpener which, by the way, needs a new solenoid (it was originally wound with something like #40 wire and worked directly off 110 VAC!. Naturally, this wire was the first to go. Have you ever handled #40 wire? If you give it a hard look, it breaks! Perhaps a new low-voltage solenoid, with a step-down transformer would be the best way to fix this problem. Any ideas?? Otherwise, the unit is A1.

Alan then expounded, to the benefit of all, on the merits of attending the various swap meets regularly held in this immediate area, giving some examples of bargains he had gleaned from these expeditions. Seek, and ye shall find!

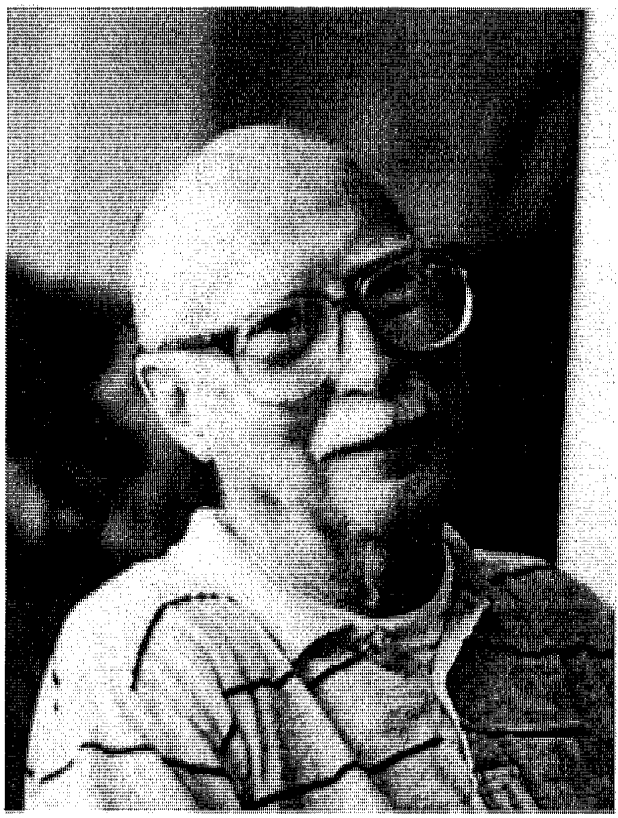
24. **Steve Craig,** who is a multi-disciplined professional scientific photographer and microscopist par-excellence (besides other things), exhibited his "Work Horse Microscope" - a Leitz Labolux with Zeiss Binocular head and 6.3x, 4x, Zeiss 63x, and 25x Luminars!

25. **John de Haas** reminded everyone of the Workshop to take place on 9 Aug at Steve's.

Please note: 25 attended, and there were 25 inputs. Not bad.

MEMBER PROFILE

BILL HUDSON



Bill Hudson - 1997

Bill and Anne Hudson with sons Robert and Brian - 1965

Although my parents came from the midwest, I am that rarity, an older native Californian, born in Pasadena. I grew up in the pre-depression days when children were to be seen and not heard. My early atmosphere was very rigid, almost hostile. In a strict fundamental religion, any kind of independent thinking was strictly discouraged. One was to think what one was told without question. I was born left handed and after suffering a constant painful and battered left hand which was slapped whenever I used it to reach for anything, I gradually managed to switch over to the right. This probably affected my outlook.

I was saved from the constriction of my environment when my elementary school teacher took my class to the Public Library where I met a kind and sympathetic librarian who encouraged me to read and opened up the world for me. She got me into the wonderful world of books which I read avidly. I discovered philosophy and science. I was in big trouble at home and in school, however, when I found Darwin and evolution. But I could not buy the fundamentalist view that I had been taught. Although I was a rebel, I learned not to voice my thoughts when it would cause trouble. The kind librarian was a good listener who continued to take an interest in me and arranged for me to meet other interesting people, scientists and professors who also helped me. I was a good reader, years ahead of my grade level and read and read rather than playing with other children. The librarian saw to it that I got to local geology meetings, becoming a registered attendee at an annual meeting at Cal Tech when I was just into my teens. I was the only youngster there, but had read enough to be able to follow the technical discussions. I remember that meeting as a high point of those years. Around this time, I met an old-time assayer who showed me my first microscope. The assayer taught me about material analysis which started my lifelong interest in chemistry, microscopy and spectroscopy.

I joined the National Guard while in high school, later transferring to the Army Air Corps, deciding on a military career. When WW II had ended, I was sent to Northern China near Peking. The war between the Nationalists and the Communist Chinese was in full swing.

In Dicken's words, "it was the best of times and the worst of times." I was close enough to drive into Peking where I found a street market with a little stall that had several pristine Zeiss microscopes and spectroscopes. I had frugally saved my meager army pay and so had enough to buy out the complete Zeiss instrument stock of this vendor. I stored the resulting full packing crate in a locked storage room back in my barracks. This was the best of times. A few days later, I awoke to loud explosions and the barracks on fire. I just had time to pull on my pants and boots, grab my sidearms and leap out the window with the rest of the men. We watched the building burn to the ground. The best guess was that we were hit with Communist mortars.The next day I poked around in the ashes and found the worthless bits and pieces of my beautiful Zeiss treasures.This was the worst of times.

Not long after, I was transferred to Nanking to work with the Nationalists.While there, I found an Olympus and a Tiyoda research microscope. The Tiyoda is an exact copy of a pre-war Zeiss and was a premiere Japanese microscope of the time. I still have and use both of these.

Sometime later, an event occurred that was to profoundly change my life. I was with a civilian friend in a restaurant in Shanghai. We had already ordered, when I had a strange feeling that made me suggest that we go to a nearby Russian restaurant instead.We left some money to avoid hard feelings and went to the other restaurant. As we sat there, a young woman came in the door. Our eyes met and made contact. My friend knew her from her home in Northern China and introduced her to me. I invited her to have dinner with us which she did. It happened that her uncle owned the restaurant and she was visiting from Tiensien. After dinner, I invited her to go to a movie with me - it was a comedy with Eddy Bracken and some cannibals. We had a nice evening and the next day I went back to Nanking.A couple of weeks later, I was back in Shanghai and I left a note in the restaurant asking if she would like to see me again. She did and we saw each other a couple of times and then I went back to Nanking. We corresponded until I had to return to the U.S. Before going home, I visited Shanghai again and delayed my return a couple of weeks as we became more serious about our relationship, but still not too much. Then after I returned to the states, we continued to correspond and had a long distance romance by mail.

Then in 1949, the communists were taking over all of China and marching on Shanghai. Our letters crossed in the mail, I telling Anne, who is Jewish, to get out of Shanghai now and to go to Israel where I would find her and she writing me that she had decided to go to Israel and that I could see her there if I wished. Her travels to Israel were complicated; she came to San Francisco, but could not get off the ship, then she traveled by train to Los Angeles, then to Ellis Island, then by ship to Italy and finally to Israel in the middle of 1949. We had decided to marry and I resigned from the military, feeling it would not be compatible with family life. I decided to adopt the Jewish faith so that our eventual children would have parents of the same religion. I studied with a rabbi in the US and converted to Judaism before going to Israel for an orthodox wedding.

Previously, I had studied Buddhism and feel that my beliefs mix the two religions. From Buddhism I hopefully am gaining tolerance, compassion and love; and from Judaism I have order, law, a sense of history, a moral code and a sense of belonging to a people.

We lived in Israel until the end of 1950 when my wife got her U.S. entry papers. Our trip home on the Israeli freighter SS Meirdizengoff was very eventful. It was expected to take 2-3 weeks but took over 2 months. The crew and officers were of mixed nationalities who surprisingly communicated quite well. We got on the ship at Haifa after it had run aground at Jaffa. We went from there to Turkey to load chrome ore, but the ship ran aground again due to misunderstanding between the bridge and the engine room. In the confusion, while running full ahead, the anchor was dropped, parting the chain. It took 1 1/2 weeks in port to repair the ship and recover the anchor and chain. From there we went to Lisbon to take on a load of cork. My wife was not allowed off the ship in Lisbon because the right wing government thought that anyone from China was a dangerous communist. There is considerable irony in this as Anne's parents had fled from Communism. She was born in Harbin, Manchuria, the same city as was our esteemed MSSC President George Vitt, and I think two more anti-Communist people would be hard to find!

Finally, we started for New York. In mid-Atlantic, we ran into a terrible storm. The ship took on so much water that the captain was afraid that we would founder and put all six passengers on standby to abandon ship. Everyone worked to jettison the deck cargo of big bales of cork which left a long bobbing trail behind the ship. Suddenly, there was a big explosion in the forward paint locker.Then someone noticed that water hitting the steel deck was turning to steam. There was a fire belowdecks.Abandoning ship seemed even more likely as a British frigate stood nearby to help. The passengers were told to get their valuables and to stand by the lifeboats. I still joke with my wife about her valuables sack which contained two bottles of perfume.The fire below deck continued to smolder as the forward deck buckled. Finally, the storm eased and the captain decided to make a run for Bermuda, the nearest port. We made it and when the waiting fire brigade opened the hatches, the flames must have shot 100 feet in the air. Noise below decks revealed a group of stowaways who had been in a cavity in the cork cargo, fortunately away from the fire.At this point, the frazzled captain said he did not need any more complications and told everyone to just forget about the stowaways. Anne and I are in a newspaper photograph of the stricken ship's arrival in Bermuda. After more weeks of repair, the jinxed ship finally got to Baltimore and we took the train to Pasadena.

In my life as a civilian, I attended LA City College, Cal

State and UCLA taking numerous classes in mathematics and science, especially chemistry, geology, metallurgy and materials. I wanted to be a science teacher, but several things changed my mind.

A favorite teacher discouraged me asking why I should want to teach.Then I saw a vice principal whom I had known as a strong and assertive man, now beaten down and shrunken by the job. I also went to a trial teaching program and was horrified by the attitude of the students. Then the clinchers, there were no immediate teaching jobs and my wife was pregnant with our first child.

I dropped everything to get a job. I worked in aerospace engineering until I retired in 1990. I enjoyed the work with North American Aviation, Honeywell, Lockheed, Ampex, Litton and Librascope. This was a time of intense aerospace activity and I followed the contracts as they were won by the various companies. My wife worked as a bookkeeper and an office manager as she took care of our two boys. She eventually got a teaching credential and taught until retiring in 1992.

At one time, I had a lab supply business, but I found that I could not compete with the big companies. I was more successful with lab work that I did on the side. Remembering what I had learned from my early assayer friend, I did and still do some lab work for small mining companies.

I have always been interested in scientific instruments and, over the years, have built a number of spectroscopes, spectrographs and other instruments. I have no particular interest in collecting old microscopes but have several modern ones that I use.

I long ago adapted the Tiyoda microscope that I got in China to petrographic work by adding an ocular protractor, improvised retardation plates and polarizers. I always wanted a good specialized petrographic scope to make the work easier. At a recent MSSC workshop I was able to acquire from Jim Clark a splendid Nippon Kogaku petrographic scope, circa 1950, with accessories. 1950 was about the time that Nippon Kogaku, which was to become Nikon, established its worldwide reputation for superior optics. With this microscope I can now do easily what was difficult in the past with my makeshift equipment.

My microscope lab is in a spare bedroom and I have a garage area set aside for chemical work. For vibration isolation during photomicrography, the microscopes are set on a concrete slab which is supported on small inner tubes. I do 4x5 and 35 mm photomicrography. My 35 mm is an Olympus OM-1 which I like because I can lock up the mirror before exposure. Generally, I eliminate all vibration by using a light block card to shut off the illumination to the microscope, using the card to expose the film rather than the camera shutter. I make rock thin sections and some of those in Bill Sokols slides may be those that I gave him after analysis. I hope to make a video sometime showing thin sectioning techniques.

In the early 1980's, I found the MSSC through a meeting of the local mineralogical society at which Jim Solliday gave a slide program.

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GOODS, GEAR, AND GADGETS

Richard M. Jefts

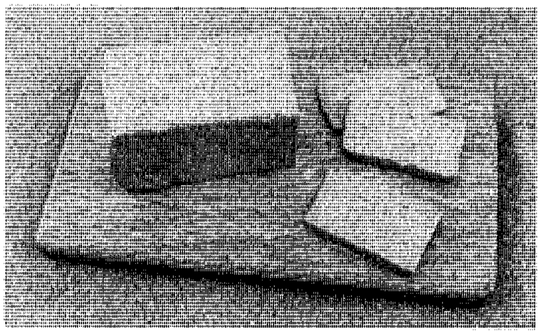

Fig. 1 Three pound clay block and slices.

The usefulness of this material is pretty much inversely proportional to its good looks - we're talking here about lumps of clay. However, when used as suggested, it is a piece of goods, a gadget of sorts and of value to the working microscopist. Small opaque specimens for viewing with incident light, are not always easily held rigidly in the best oriented position, especially for any long term examination. The specimen is often irregular in shape and simply will not hold itself steady at the best possible viewing angle. If, however, on a smooth plate or slide, the specimen is lightly imbedded in a small piece of pliable clay or plasticine, the whole can be squeezed and manipulated with the fingers, while viewing down the tube, and so catch that exact angle showing the structure or particular detail wanted ... at which point we back off, and the sample is held firmly in place. We can examine it or take its picture, all at our leisure, and all without fear of its toppling over as soon as our back is turned. Small mineral 'thumbnail' or 'micromount' specimens have, for many years, been so mounted (amongst many other ways) - here we adopt the technique to a wider range of microscopical materials, for both temporary and permanent mounting. There are, in general, two types of clay or plasticine: one that stays more or less pliable under most ambient conditions, and a slow drying type that must be kept moist. The former is convenient as it is easily molded for over longer periods of time. The latter may be a little easier to come by (childrens toy shops, etc.), and, if kept damp, works well for more short term use. This drying out feature, however, can actually be used to our advantage to make a permanent mount: mold a small piece of clay, with the specimen imbedded, to the desired angle and let dry. Remove the specimen, apply glue (Carpenters or White glue works nicely), reset the specimen in place, then glue the whole to a glass slide and allow to dry. If it will not damage the sample, the drying can be speeded up with moderate heat, under a shaded lamp bulb. Fig. 1 shows both over-kill (three pounds of the stuff) and

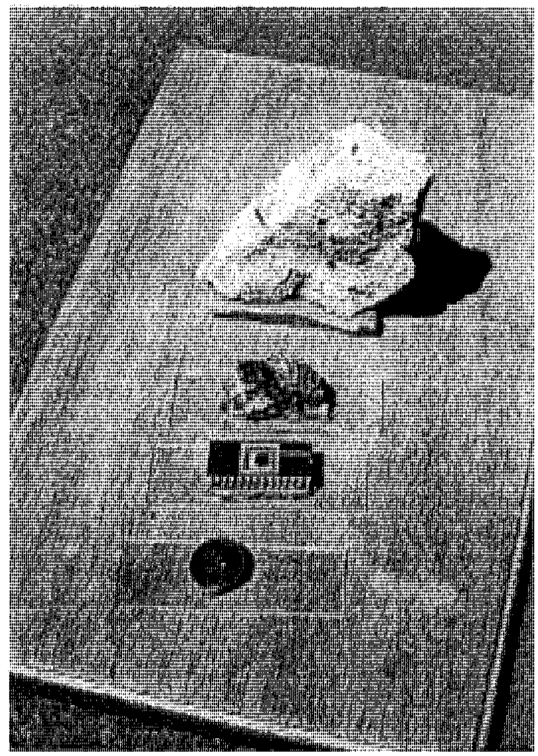

Fig. 2 Four example uses for clay.

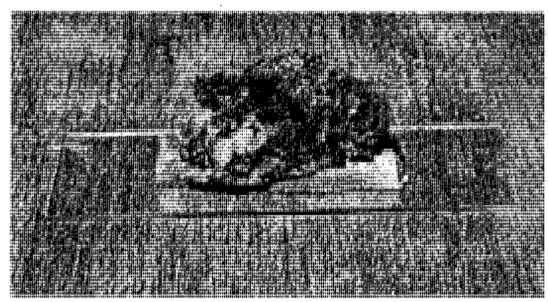

Fig. 3 Mineral specimen in clay support

the loaf partially sliced. Fig. 2 shows four possible uses - a coin, tilted at a convenient angle to check for a possible altered mint mark, an older computer 'chip' and a colorful crystalline mineral. The larger sandstone rock with fossil shells, shows how the method can work equally well with larger specimens that must also be held steady and at a critical angle for display or photographing - simply use a thicker slab of clay. Fig. 3 shows the imbedded mineral in closer detail. The clays are non-toxic, not messy to use, and if you should end up with a surplus, you can always make bud-vases, ashtrays or animal figurines. Just don't get so carried away that you end up short with not enough material to mount those samples and specimens for convenient microscopic viewing.

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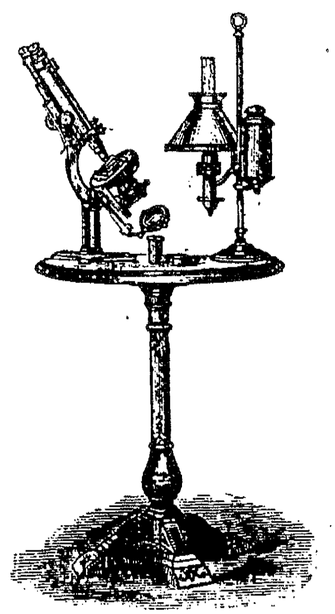
The top is of wood, of different styles, as described in price-list below, and is so made that warping is impossible. The available diameter of the top is 20 inches, unless a larger one is desired.

The bearings are carefully fitted, consequently the table is always firm, and when desired may be clamped in any position.



The cut is a faithful representation of the table known as No. 1, with a microscope standing 18 inches high, and study lamp, and is calculated to show the abundance of space allowed for working.

The value of such a table is at once apparent to those who have occasion to exhibit the microscope to friends, as it does away with the constant changing of seats, which is always annoying. It is used by the undersigned as a working table.

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Advertisement from the American Journal of Microscopy July 1876 Courtesy of Richard M. Jefts

MINUTES FOR MSSC MEETING OF 20 AUGUST, 1997

David L. Hirsch

OPENERS. The regular meeting opened at 7:55 PM, with 35 members and guests in attendance. People entering the meeting hall were greeted by two tables loaded with an assortment of microscopes, books and various accessories. KEN GREGORY AND STUART WARTER assisted in setting up the display and in developing a sales procedure. The goods shown, represented a part of the estate of the late Corresponding Member John Ewert who, with his wife and three others, died so tragically in a plane crash on Sunday night, May 11, 1997 at the Truckee-Tahoe airport. (See MSSC Journal, June, 1997).

ROLL CALL. As of the week ending 30 August, 1997, MSSC membership stands at 62 and rising! Of these, 17 are Corresponding members, including members from Alaska and England. As noted earlier, the Associate Membership formerly offered to spouses has been eliminated and they are welcome to attend MSSC regular meetings and workshops.

ALL NEW MEMBERS PLEASE NOTE; Regardless of when you join MSSC during our fiscal year (July 1 through 30 June), you will receive all Journals for that period prior to the month in which you joined, in addition to the monthly journals through the end of that year.

THE MAN WITH TWO HATS: LEO MILAN wore two hats as our guest speaker for the evening. First, this talented slidemaker, photomicrographer, and grower of prize winning World Class Orchids, showed transparencies of slides made by himself and the late savants BILL SOKOL and ED LOWE. Leo used both cross polarization and first order red illumination, along with natural daylight in making the photomicrographs. The pictures were taken at various magnifications ranging from 10X through 400X.

Various materials were used as subjects for crystalline configurations, including garnet, gypsum (calcium sulfate), and other minerals. In addition, resorcinol, other organic substances, and inorganic salts such as copper sulfate were crystallized from solids or solutions. Leo explained how the slides were made, and their significance. We now look forward to a MSSC member giving a lecture on the mechanics of crystallization.

Donning his other hat as a modern day Marco Polo, Leo displayed several mini-albums of panoramic photographs in color that Doris and he took on their China trek. Leon's panoramic photographs became more meaningful after watching the documentary on PBS titled:"Trans-Siberian Rail Journeys", about a seven day rail journey from Moscow to Beijing. I wonder if there are any Chinese microscopical societies? Perhaps Leo will check this out on his next trip to China.

PETE TETI gave a progress report on workshop activities. Pete reminds us that the second Saturday of each month is designated as Microtechnique Day. A meeting place is being sought to carry on this activity.

PRESIDENT, GEORGE VITT discussed his new Nikon Scanner and the reproducability of this device which is limited only by the fidelity of the photographic print being scanned.

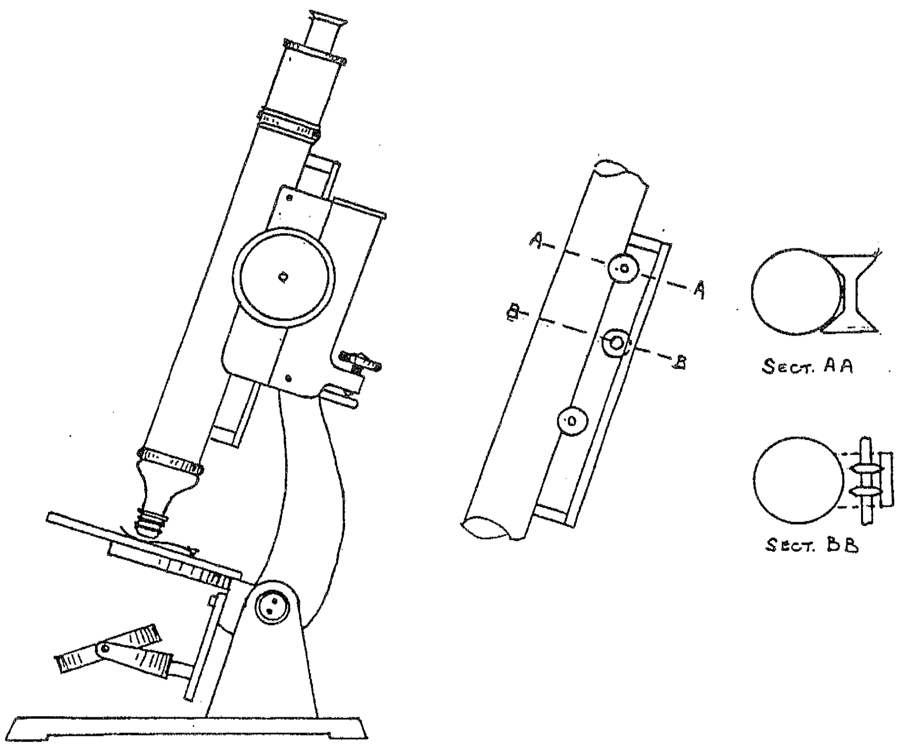
SHOW AND TELL was overshadowed by the estate sale, but BARRY SOBEL came through with an Ellis Aquatic-type microscope, which he described as:"Signed:"Cary London," on the stage. Identical to the classic type used by Brown and contemporaries, except for a square stage rather than round; Case size is 7.25 x 6 x 2 inches. With 2 Lieberkuhns. 4 additional oculars; plush lined original case, 100% complete. The Ellis-type of aquatic microscope was the mainstay of serious microscopists for high power work until the 1820's because compound microscopes had more severe aberrations. The word 'Aquatic' came to mean the use of a swivel arm which could follow a moving organism; initially this was a friction joint but later was replaced by an arm which also swiveled, but had a rack and pinion control for fore and aft motion rather than the friction fitting. Barry's microscope was an example of the latter.

KEEP 'EM COMING! As Chancellor of the Exchecquer, I am the first person to see the arrival of membership checks. Members usually include notes which have been 100% complimentary, and mainly in praise of the MSSC Journal and the rebirth of our Society. Two vital ingredients make the MSSC Journal far outshine any of the offerings of our previous life. First, we have the outstanding capability of our Editor in breathing life into the Journal. Second, MSSC members, motivated as never before, prepare and submit meaningful microscopically oriented articles for publication. Look for the dynamic, fascinating, intriguing, erudite articles which add zest to each issue, and while you are at it, join the expanding group of published MSSC authors. Write-up your topic, and forward it to Gaylord for inclusion in a future issue of the MSSC Journal.

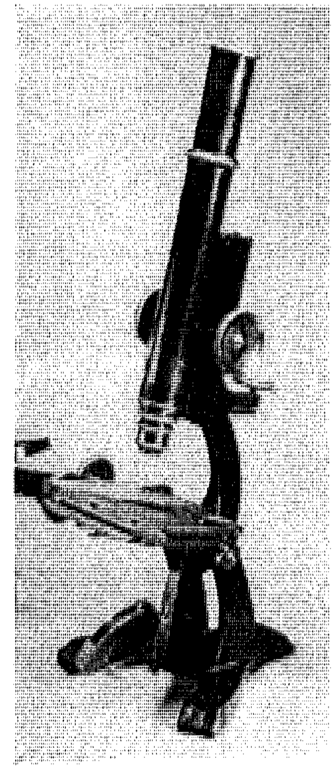
"The goldenrod is yellow, the corn is turning brown, etc., etc." I vaguely recall a kid in knickers, press-ganged by doting parents into reciting that poem to the 'grown-ups' way back in the golden age of crystal sets. As we well know, MSSC boasts many technically gifted members from whom we have not heard, as yet. Have no fear; you will not be called upon to belt out Hamlet's Soliloquy or Casey At the Bat. Take a cue from members who shared their knowledge with us in the past. Select a microscopically germane topic and 'run with it'! Go forth and delineate! Check with Program Chairman, LARRY ALBRIGHT to set up a speaking date.

A MYSTERY SOLVED

Bert Loro's Microscope Identified as by J.& W. Grunow



Bert Loro's sketch of his Christmas 1934 microscope



J. & W. Grunow microscope from Skinner sale catalog

On page 44 of the November 1996 MSSC Bulletin, Bert Loro, our member from Victoria BC, wrote about and showed a drawing of a microscope that his father had bought him for Christmas in 1934. When he returned from WW II and long after he had lost this, his first microscope, he realized that it was an instrument of unusual design. He had a longing to know more about the origin and maker of this microscope and in the article asked if anyone could identify it from his sketch.

Recently Stuart Warter recognized Bert's microscope in the catalog of the Skinner Science and Technology sale #1790 held in Bolton, Massachusetts on July 10, 1997. It was shown on page 47 of the sale catalog where it was listed as item # 307 Rare J. and W. Grunow, NY circa 1866. Serial No. 471.

The estimated value was given as $3000-$3500 which means that the bid would have opened at $1500. It was not sold.

Stuart sent this information to Bert who confirmed that this was indeed the same model microscope that he remembered from his youth.

The similarity of the drawing above that Bert made from memories of fifty or more years before to the photo from the Skinner catalog shows that Bert Loro has a remarkably detailed memory, as does Stuart Warter to have recognized the microscope in the catalog as that of the one described eight months earlier.

Very Special
September Meeting

Inner Space

by James Solliday

Wednesday, September 17 at 7 PM
Crossroads School
1714 21st Street
Santa Monica, CA

By 1610, the telescope and microscope had begun to have a major impact on Society.The telescope changed the way we thought about our universe but the microscope opened up mysteries closer to home.In 1661, Henry Power (1632-1668) wrote that, *"the least Bodies we are able to see with our naked eyes, are but middle proportionals 'twixt the greatest and smallest Bodies in nature, which two Extremes lye equally beyond the reach of humane sensation"* Wednesday night's program will take us from the rings of Saturn to the Inner Space of our microscopes.We will travel into a drop of water discovering the wonders of a dimension beyond our vision.The microscope not only opens our eyes to the world of biology but also to chemistry and the beauty of crystal formation. polarized illumination will be used to reveal the interference colors produced by nature.The idea of this presentation is to introduce the viewer to the infinite possibilities of images found under the microscope. The slide program will be accompanied by music and two dissolve projectors. It is hoped that our members will be inspired to pursue their own photography through the microscope.This program was originally put together in 1980 and was the first effort by the author. Most of the photomicrographs where taken with my first generation of equipment and illustrate the possibilities of determined effort.At the end of the slides, a discussion of photomicrography techniques will be welcomed.

As most of you know, the Microscopical Society of Southern California has been invited to put on a photomicrography art exhibition and we all need to begin working with our cameras and microscopes.The program will not have any great revelations like Galileo's 1610 discovery of mountains on the Moon but I do hope you will discover the wonders of the microscopical universe. See all of you at the Wednesday meeting.

James D. Solliday

Editor's Notes

We have two upcoming spectacular events. The first occurs this Wednesday evening at our regular meeting when Jim Solliday presents his beautiful and awesome "Innerspace." Anyone who has seen one of Jim Solliday's slide presentations knows that he has the rare talent to make every picture a work of art. This art is magnified greatly in his sound and dual projector presentations. In these, his ability to smoothly fade from one image to another while choosing the appropriate music to flow and change to match the mood of each type of image is magical and moving. This is the evening to bring wives and girl friends and anyone else who would enjoy seeing a fine artist entertain the senses with the beauty of the microscopic world. This special meeting will be held in the Crossroads music auditorium to provide a quiet setting.

The second event occurs next month when our October meeting speaker will be Brian J. Ford, the noted English author of *The Single Lens*, as well as several general books, textbooks and numerous scientific journal publications. He is well known as a lively and entertaining speaker with a great depth of knowledge on a variety of subjects.That meeting will be on Tuesday, October 21 to match Brian Ford's travel schedule.

I would like to thank those members who in sending in their dues mentioned that they enjoyed the MSSC Journal. Especially, I would like to express my gratitude to those who have sent articles to be published. Please, if you have not, consider writing up something of your own thoughts or activities so that we can have a lively publication that represents the diverse interests of all the members, thereby broadening the knowledge and interests of us all.

Gaylord E. Moss