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A "Cuff-Type" Microscope Compendium or "Optical Cabinet"

Barry J. Sobel

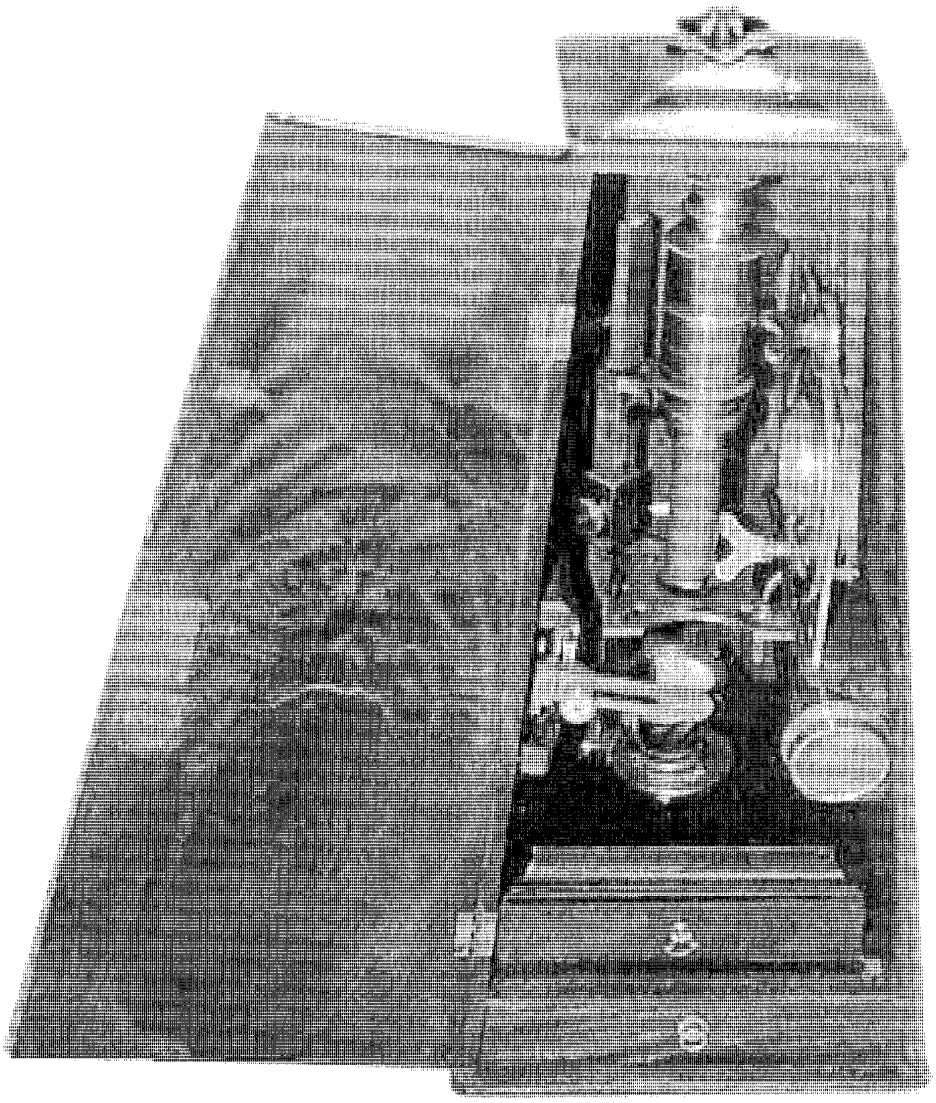

Fig. 1 Cole "Cuff Type" microscope with its accessories and case.

The Compendium

From the 1740's to the late eighteenth century, the "Cuff Type" all brass, side pillar microscope was the standard compound instrument. Also, during the eighteenth century, projecting microscopic objects during a "Solar Microscope Exhibition" was a popular pastime and patrons would purchase tickets and attend such events much like a play or concert. On some occasions, a compendium or "optical cabinet" was supplied to allow the owner to both use the microscope and also to project the images using a solar microscope.

These compendia were expensive and are uncommon today. The author was fortunate to acquire one of these recently.

The instrument is English, and dates to between 1780 and 1782. It is signed by Benjamin Cole (II). Microscopes by Cole are rare and Cuff compendia by any maker are also scarce. The Coles were famous as orrery makers and the father invented and made an advanced reflecting quadrant. Their microscopes are known, but the author is not aware of signed examples in public collections. Clay and Court referred to seeing one, an inclining type of Cuff, and their list of instrument makers states of Benjamin Cole (I): "he was a maker of the Cuff Microscope and other optical instruments"[1]. This compendium includes not only a Cuff-type compound microscope but also a Solar microscope made entirely of brass, of a type also first made by Cuff and later by Dudley Adams as well as Edward Nairne. The solar microscope is essentially identical to the one Nairne made which he claimed to have "improved"[2]

History of the "Cuff-type" Microscope

The "Cuff-type" of instrument which has the body tube supported on an upright (non-inclining) limb with calibrated-slide coarse focus and fine-screw fine focusing was the idea of Henry Baker. He was a famous speech therapist and popularizer of science during the eighteenth century when he found the Culpeper microscope cumbersome, and difficult to focus; its three supports making examination of mineral specimens difficult. Baker and John Cuff designed this instrument as an improvement over the Culpeper type during the 1740's. The new feature of a single limb support allowed greater access to the stage and allowed fine focus by a tightly threaded screw. The design was published in Baker's Employment for the Microscope in 1753. It was then copied by the leading makers of the century. Dollond sold examples nearly identical to the original design of Cuff. Cole's instrument is slightly different in several details to be described. Culpeper microscopes continued to be manufactured, however, because they were still popular and were cheaper to make.

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The Solar Microscope

The Solar microscope is a projection device allowing an audience to view the images projected on a wall or screen. According to Bradbury[3], the idea might be traced back to the Camera Obscura of sixteenth century origin, but that might not be such a good analogy. The idea of projection of the sun itself via a "scioptric ball" probably led to the first projections of slides. The ball was originally intended to project the image of the sun to view sunspots. It may have been Fahrenheit, or another continental maker, who first had the idea of attaching a screw-barrel microscope to the scioptric ball to project the image. This had a major disadvantage of limiting the location to which the image was projected. In any case, it seems it was Lieberkuhn who introduced this device to London around 1740,[4] but that device did not have a mirror attached to the outside which severely limited the direction the image could be projected and the time of day at which projection could occur[5].

Benjamin Martin mentioned in 1740 in his System of Optics that he had improved the design by attaching an external mirror to the scioptric ball thus allowing a more horizontal projection. This still limited the viewing, however, as the adjustment was still via the ball and therefore the image moved as the location of the sun in the sky changed.

It was John Cuff, the maker of the first all-brass side-pillar type microscope, who first constructed a solar microscope in which the mirror was moved by controls inside the room.The earliest model, with a wooden panel and pasteboard optical tubes, used a cord and pulley to rotate the mirror and a push-pull rod to raise and lower it, thus providing two-dimensional movement, allowing the image to remain projected in the same place and doing away with the need for a scioptric ball (see illustration in Baker, H 5th ed). Shortly thereafter, the instrument was made entirely of brass (also a Cuff innovation) and gearing replaced both the push-pull movement and the cord and pulley rotational movements. (Nairne claimed credit for the gearing). This system only allowed the viewing of transparent objects however.

The next development was an arrangement to view opaque objects. This invention can be attributed to Benjamin Martin in 1774 in his Description and Use of an Opake Solar Microscope.

Edward Nairne, inventor of the Chest Microscope, in which a Cuff-type microscope swivels up out of a neat little chest, claimed to have improved Cuff's Solar Microscope. The engraving of his improvement shown in Figure 2 is identical to the instrument supplied with this Cole compendium.

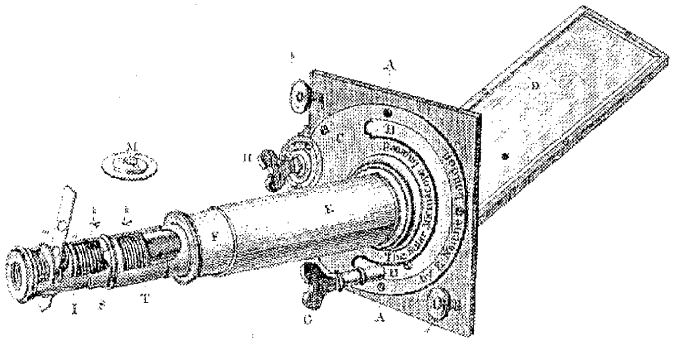

Fig. 2 Cole "Improved" Cuff's Solar Microscope.

These instruments produced impressively large images on the wall, but resolution was always quite poor. While tickets were sold to "Solar Microscope Shows" it remained a source of entertainment and not scientific discovery. It is for this reason its use did not persist. Soon Lucernal microscopes were developed as well, having a ground glass screen for viewing and tracing the enlarged images. They did not survive into the later nineteenth century as projection using a magic lantern, initially with microscope attachments, and then simply slides of microscope images became popular.

Benjamin Cole

Benjamin Cole was a famous instrument maker and was for a time associated with Thomas Wright; an orrery at the Musees Royaux de Art et d'Histoire in Brussels bears both names. Wright, interestingly, also made microscopes. The younger Cole took over when his father died in 1766; he was succeeded by John Troughton about 1781 or 1782. Both Coles were famous instrument makers and both were well known orrery makers. According to Clay and Court, Cole was known for making the Cuff-type microscope. The address of 136 Fleet Street was used for only a short time before it was taken over by Troughton, although apparently after retiring from this business, the younger Cole went on to live to age 88.

Details of the Cole "Cuff-type" Microscope Compendium

The Cuff-type microscope body tube is supported on an upright (non-inclining) limb with calibrated-slide coarse focus and fine-screw fine focusing. It is signed on the cruciform stage: "Cole Maker at No. 136 Fleet Street LONDON."The mahogany base with drawer and accessories includes 8 bone sliders, stage-mounting bulls eye condenser, stage forceps, Bonani sprung stage, cylinder Lieberkuhn (with separate can to hold the silvered reflector), talc box, six numbered objectives, fish plate, and understage mirror. The tapered original mahogany case has an additional drawer containing three numbered large wooden sliders, one with three large oval openings and two with six round openings. Both the smaller ivory sliders and the larger wooden

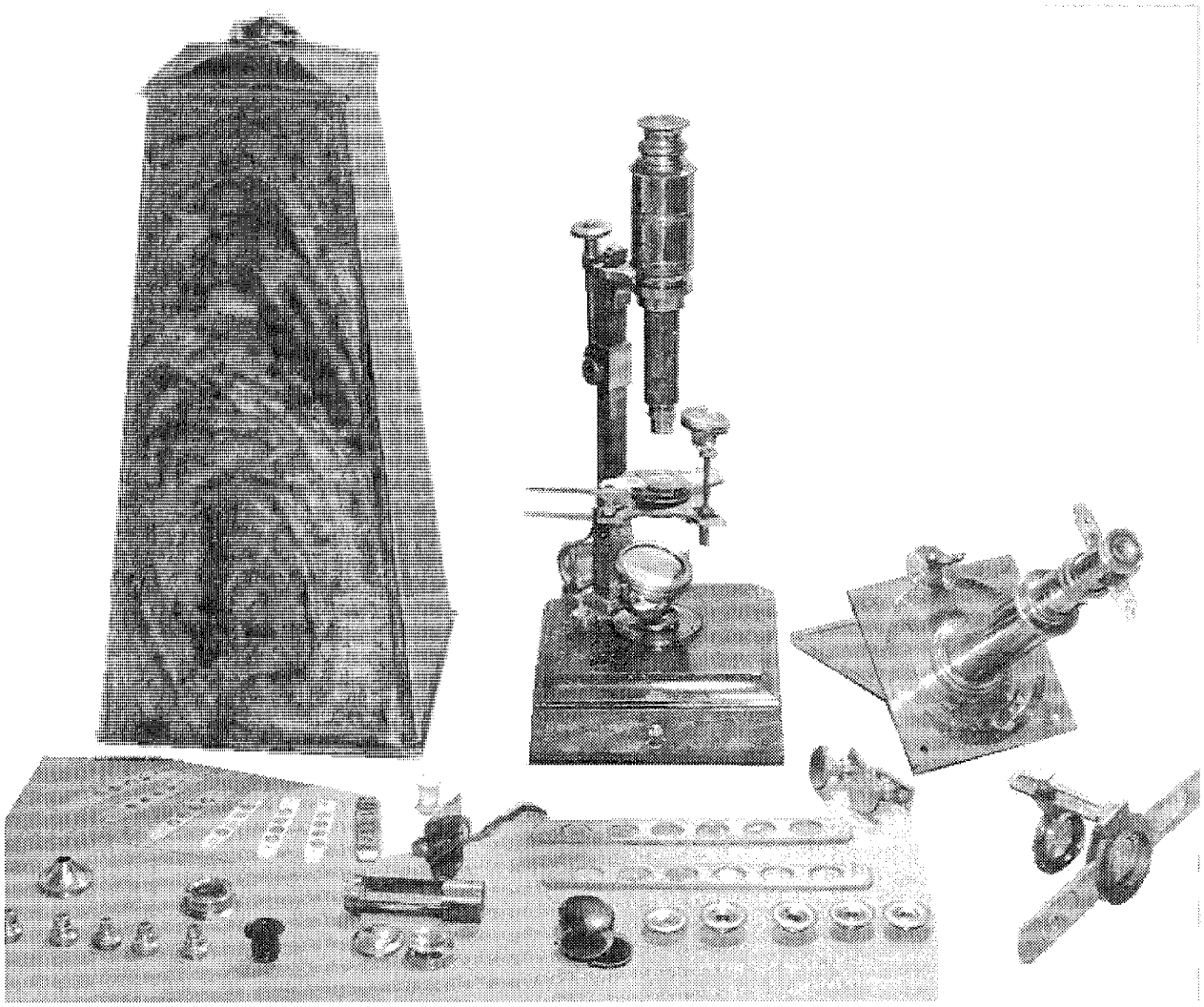

Fig. 3 Cole microscope with accessories.

sliders are labeled in the same handwriting and all specimens are present. Additionally, the large wooden sliders fit diagonally into the drawer in which a cutout to accommodate them is provided. There is also a brass livebox, a substage cone-shaped aperture reducer, the screw barrel device which would accept a vial for viewing the circulation in a small fish or eel, six associated objectives with covers, a brass slider, a tortoise-shell solar filter set, a hand lens in ivory (painted black), and the two sets of retaining screws to hold the solar instrument in the window or wall. Also in the case is a low-power projection device with a simple lens and rack and pinion focusing, and the body tube with condensing lens for the solar. When using the screw-barrel, a cone-shaped fitting is used on the inner end of the extension tube from the solar body; when the low power

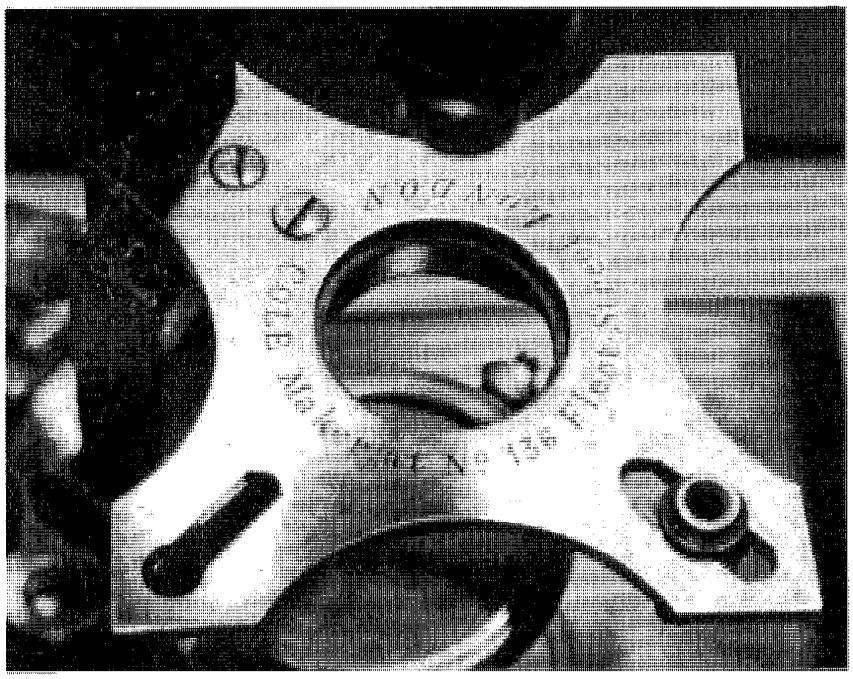

Fig. 4 Cole signature on cruciform stage.

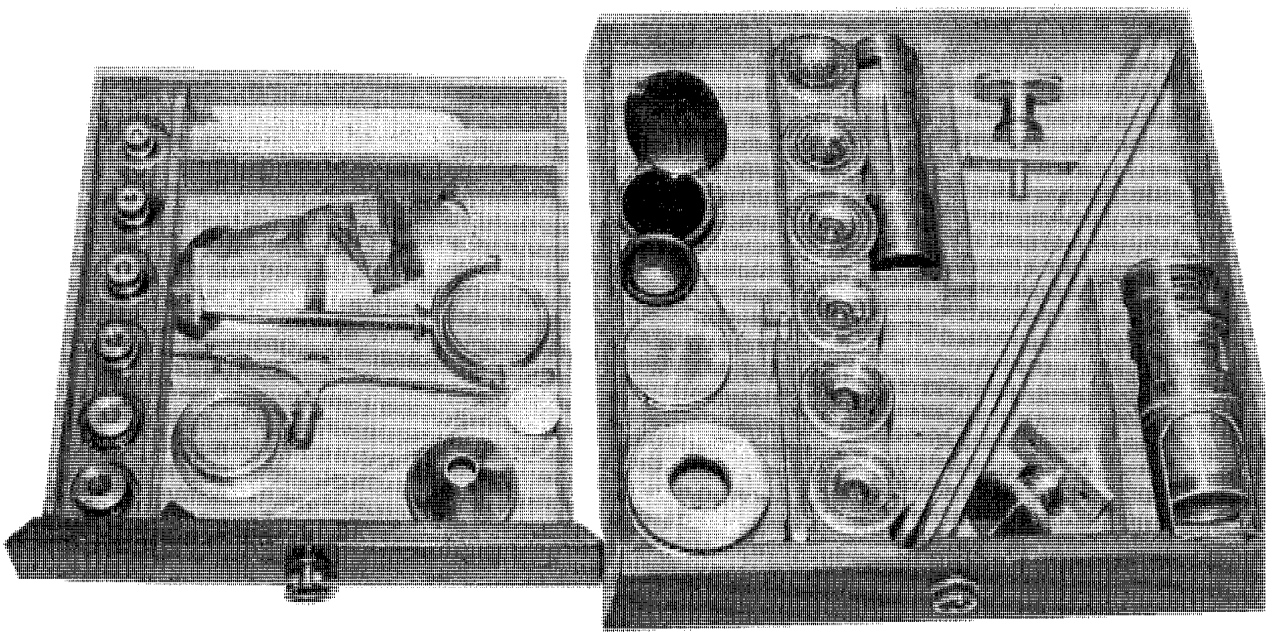

Fig. 5 Accessories stored in drawers of Cole microscope

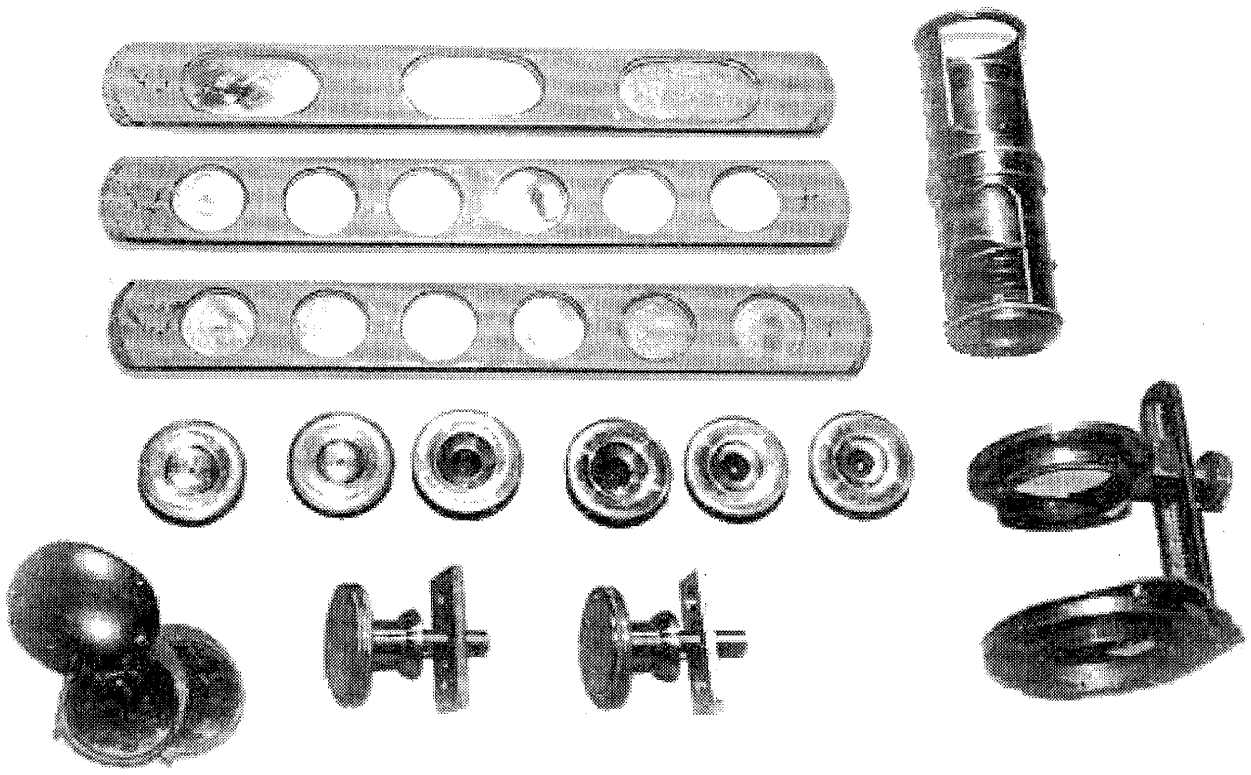

Fig. 6 Solar accessories of Cole microscope.

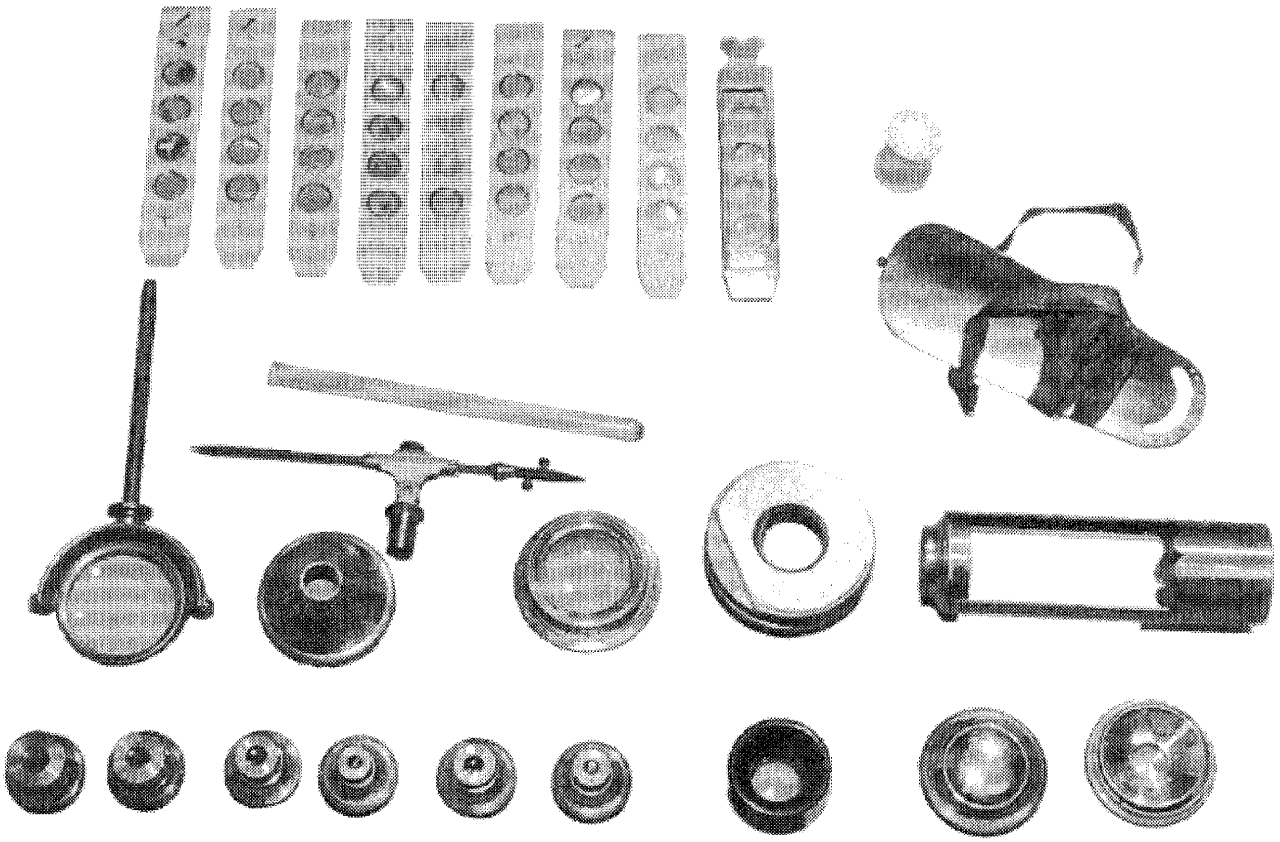

Fig. 7 Nonsolar accessories of Cole microscope.

projection system is used this cone is removed, the low power projector screwing directly into the end of the tube.

The compendium which forms the basis of this article is pictured in the accompanying photographs. Figure 1 shows the instruments in the original pyramidal case, Figure 2 shows Nairne's "improved" version of the solar microscope which is identical to the example in this Cole compendium; Figure 3 shows the instruments outside the case and with all the accessories. Figure 4 shows the signature on the cruciform stage. Figure 5 shows how the accessories store in the drawers, the accessories shown to better advantage in Figure 6 (solar accessories) and Figure 7 (other accessories).

Comparison of the Cole and Dollond Instruments

Because of the fact that the author is fortunate to have at his disposal an instrument signed by Dollond, which is nearly identical to the original Cuff design, it is interesting to compare the Cole and Dollond instruments. Figure 8 shows that even the two cases are slightly different; the case on the left is that of the Cole and the one on the right is that of the Dollond instrument. Note that not only are the tops different, but the doors are hinged on opposite sides. Figure 9

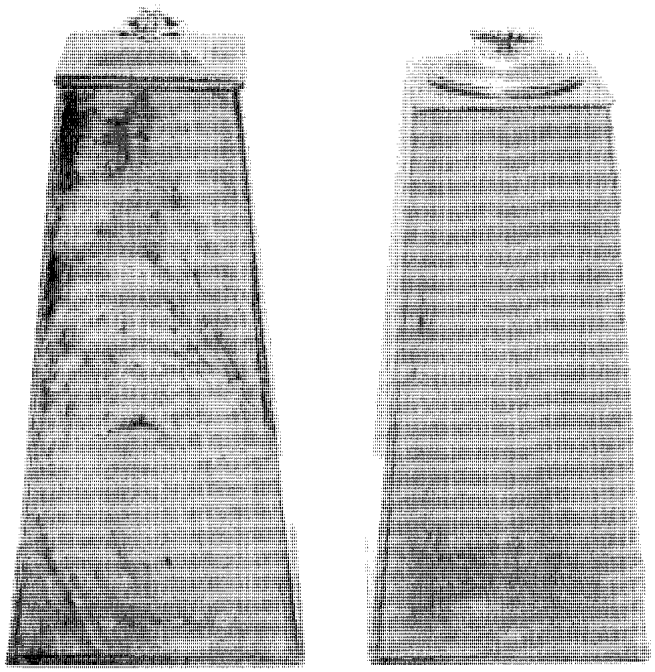

Fig. 8 Cole case on left, Dollond on the right.

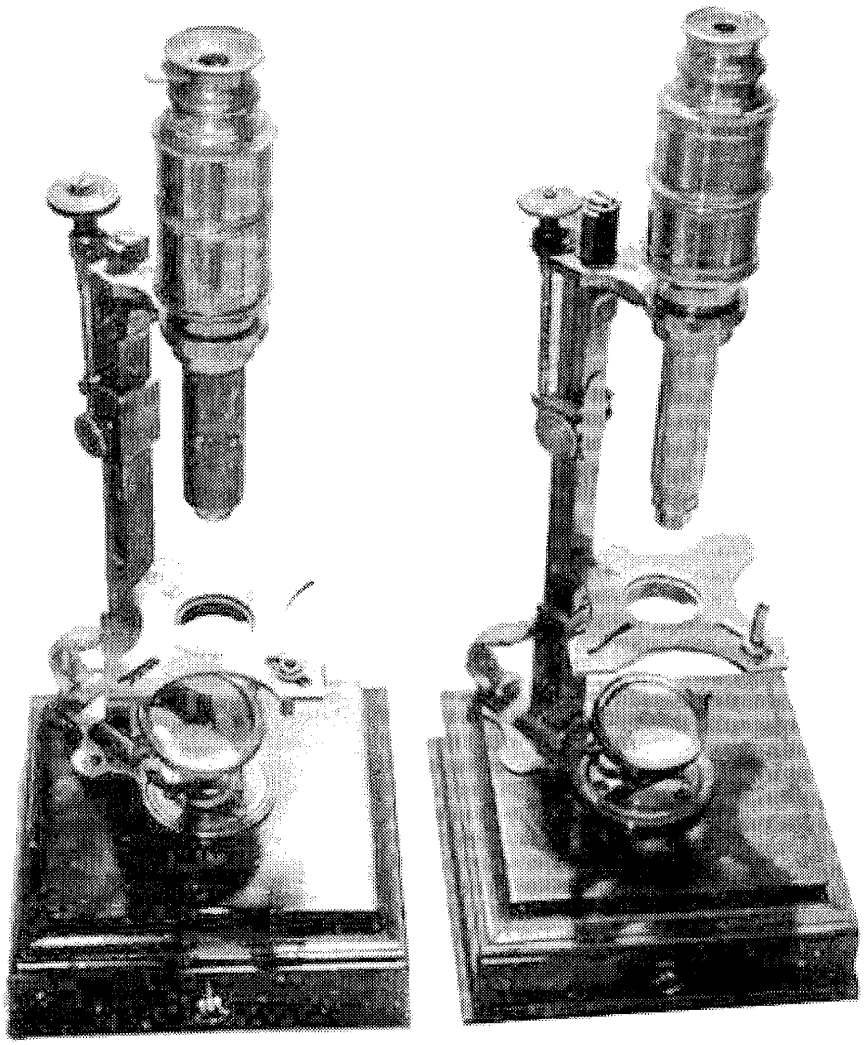

Fig. 9 Cuff type microscopes. Cole on the left, Dollond on the right.

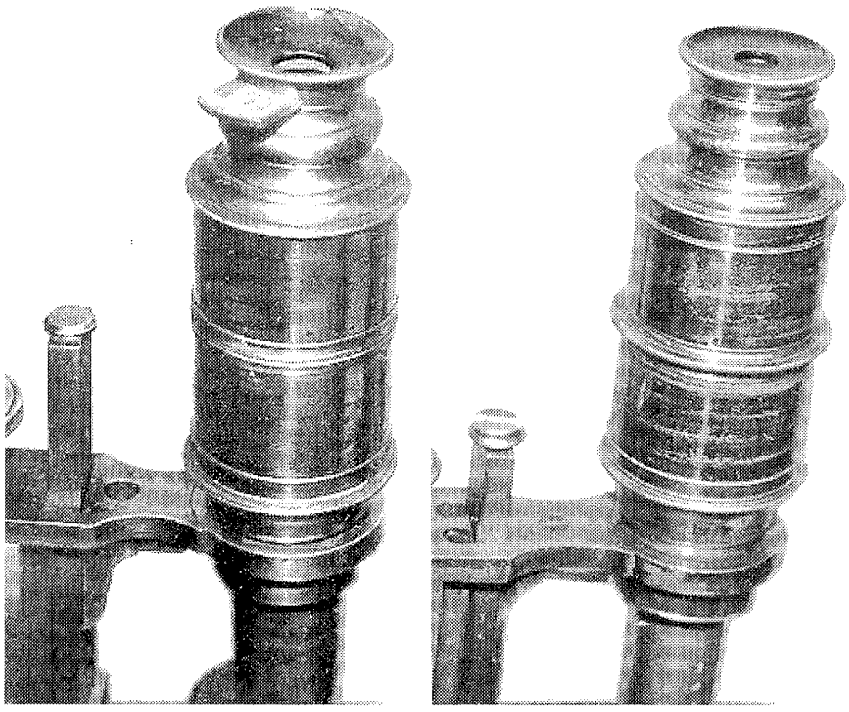

Fig. 10 Upper tubes. Cole left, Dollond right.

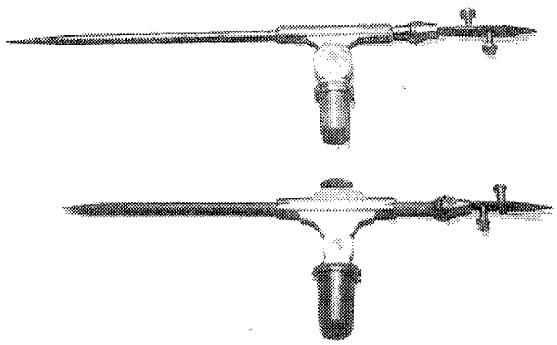

Fig. 11 Stage forceps. Cole bottom, Dollond top.

shows the two Cuff-type instruments side by side. Note the superficial resemblance but in this view, the difference in dimensions of the lower portion of the optical tube is obvious, the Cole tube is shorter and of greater diameter. Also, in the figure, note that the outer pillar, which slides against the inner one is held on it by a hollow square. This is a single piece of metal in the Cole model but in the Dollond uses two pieces of metal, the main piece being U-shaped, attached to the rear (sliding) pillar with a plate screwed on to the inside completing the fourth side. Figure 10 shows the upper tubes side by side. Note that the decoration in the middle of the upper tube is different in the two; the Cole, on the left has flat, nearly concave tooling whereas the Dollond has a convex decoration[6]. Figure 11 shows that even the two stage forceps are different. Figure 12 shows the two focusing arrangements next to each other. The screw on the Cole model at left is of larger diameter, and made of brass while the screw on the Dollond is thinner and of steel. The author has confirmed with the Whipple Museum staff that the screw is the same on their Dollond example. Also, in Figure 12, we note that the knobs are quite different. The Cole model has a double knurl pattern and the Dollond single. In Figure 13, one can see that the flat plate into which the mirrors fit is decorated differently in the two examples.

Although all of these differences are interesting, and they probably point to the fact that the two instruments were made by different makers, it should be noted that the two might date from different years. Indeed they may be twenty years or more apart, and the designs certainly could have changed.

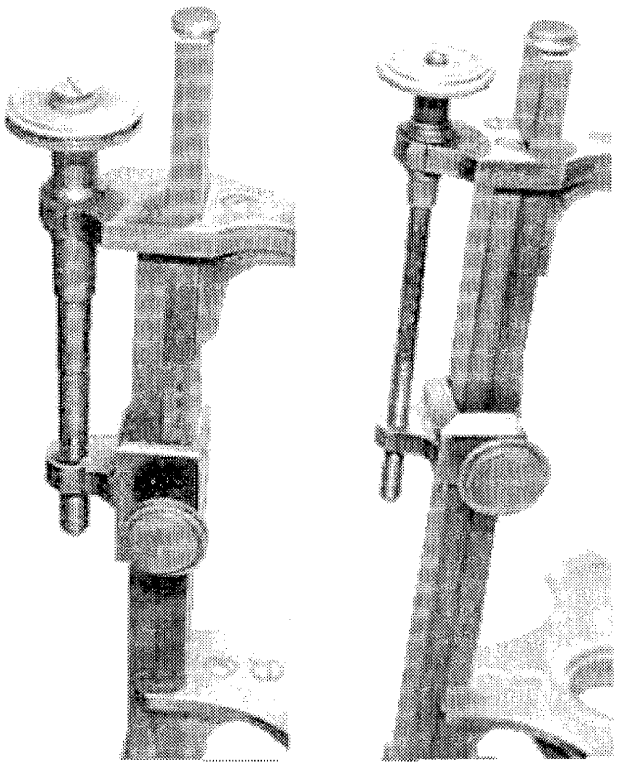

Fig. 12 Cole knob left, Dollond right.

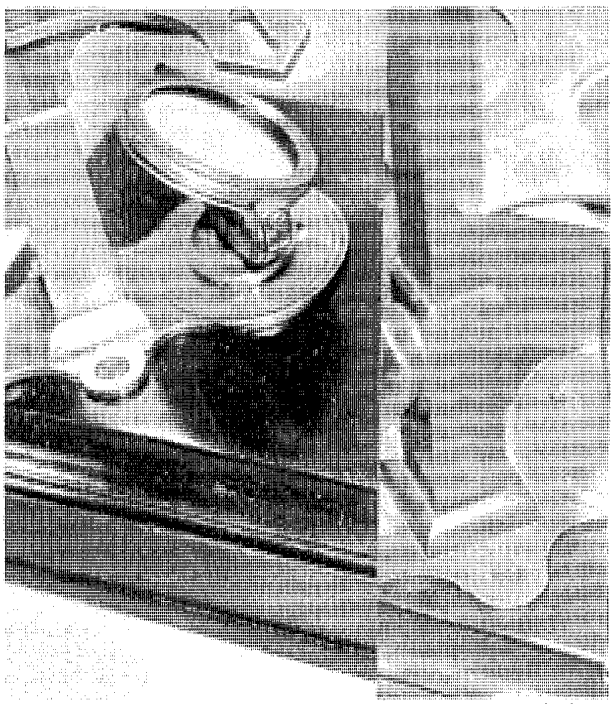

Fig. 13 Flat plates for fitting mirrors. Cole left, Dollond right.

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2 Nairne, E: The Description of a Single Microscope; and an Apparatus Applicable to the same, in order to make it a Solar Microscope.

3 Bradbury S: *The Evolution of the Microscope.* Pergamon Press. Oxford, London, New York, Sidney etc. 1967.

4 Baker, H: *The Microscope Made Easy* (London 1742) pp21-6.

5 Baker, H: *The Microscope Made Easy.* 5th ed. London 1769. Pp.22-26

6 The reader may note that the eye cups are different, but the eye cup in the Dollond, although old is not the original.

WORKSHOP of the Microscopical Society of Southern California

George G. Vitt, Jr.

Date: Saturday, 2 October 1998
Location: Steve Craig's Lab.

1. **Steve Craig** announced that a student from Mongolia will be arriving the following day and will be staying at his home while attending a local University. He then passed around photos showing our photo gallery exhibit at the Palos Verdes Art Center.

2. **George Vitt** introduced guest **Ken Rogers**, who brought for sale a cased Siebert microscope with objectives and eyepieces, c.1870. George brought a box full of a large assortment of dyes (some quite rare) that had been donated some time ago by member **Kevin Bennet** of MN. **Bill Hudson**, our Curator of Chemistry, will add these to the catalog listing that he has compiled. George then announced that an anonymous person had most generously made a donation to the MSSC treasury. There was a round of applause. He then asked Phil Lohmann to call the Palos Verdes Art Center and determine how many of our exhibition photos had been sold. George then described some experiments he had performed on x-ray images, where the shades of grey were represented in false color by the use of a flat bed scanner used in transparency mode, and Photoshop software.

3. **Richard Jefts** announced that **Gary Legel** has had major surgery, and is recuperating. (A week later, George Vitt spoke with Gary on the phone and Gary reported that he is at home, mending well and steadily and that he will most probably attend the November workshop! This simply proves that "You can't keep a good man down!" Keep it up, Gary.) Richard brought for sale the books *Animal Micrology* and *Practical Histology*.

4. **Dave Hirsch** reported that membership application forms are being received and that 23 persons still owe dues. He then showed a two lens "bulls-eye" type of condenser that he had made, consisting of two water filled glass globes (200mm boiling flasks) which act as lenses, one of which was tinted with methylene blue to act as a color filter. These were mounted on a sturdy, fully adjustable stand. Dave also showed an accompanying light source, of his design and construction, to be used with these globes - a candle holder with brass reflector on an adjustable stand. Dave announced that he would be going to England in November to attend the Science Fair.

5. **Stuart Warter** displayed five drum microscopes, all of which are equipped with stages: 1) by Georges Oberhaeuser, Paris, 1849; 2) by Edmund Hartnack (Oberhaeuser's nephew) Paris, 1863-4; 3) A microscope sold in 1856 by Gorham Co. & Brown (Importer, Providence RI). This microscope looks much like a Hartnack but has other features which raises the question as to who made it; 4) An unsigned microscope of unknown manufacture, c.1860; 5) A small microscope, signed by Wasserlein, Germany, c.1880-90. The first four microscopes are equipped with diaphragms. Stuart also showed the rare Trichina (meat inspection) microscope that had been used in the German army during WWII.

6. **Barry Sobel** showed two microscopes: OBERHAUSER TYPE MICROSCOPE: French, c.1866; lacquered brass with oxidized brass stage. An Oberhaeuser type pillar on drum microscope with draw tube coarse and screw fine focusing, understage wheel of apertures and understage pivoting concave mirror, two oculars and two objectives in original mahogany case signed in script on the draw tube: "E. Hartnack suc de G. Oberhaeuser, Place Dauphine, 21 Paris;" lead weighted base with number "4842," written on the protective leather bottom. This type of microscope was invented by Oberhaeuser as an improvement over the "Martin type" of drum microscope. A beautiful instrument with most original lacquer intact except for one of the objectives. Approx. 11" high with tube extended. #M-116.

SIGNED COMPOUND MICROSCOPE: French c.1865. Signed in script on the barrel:" E. Hartnack suet de G. Oberhaeuser Place Dauphme 21 Paris" About 11 inches high, with heavy 4.25 x 2.5 inch black-painted rectangular cast iron base supporting twin tapering columns supporting the 2 3/4 x 2 ~ inch stage, with wheel of 4 apertures beneath, and sliding casing on pillar with attached slide support, 2.5 inch arm attached to the pillar by knurled knob; two knob rack and pinion focus, with good optics but no case. Lower section of pillar with 1 3/16-inch concave mirror on a gimbal and pin. Georges Oberhaeuser was the inventor (about 1835) of the type of drum microscope which has a pillar separating the upper from the lower sections of the instrument. His nephew, E. Hartnack joined his business in 1857 and, in 1860, Hartnack assumed control under his name alone. The business operated at this address until about 1870 when Hartnack moved to Germany. Oberhaeuser died in 1868 and Hartnack in 1891. # M-88.

7. **Ken Gregory** showed a cased student microscope with 4 objectives and substage stops for condenser.

Workshop - continued on page 229

Dietary Diatoms

Richard M. Jefts

To the active microscopist, diatoms can have a way of becoming an active and, all-be-it insidious, pleasant way of life.

It is true that one has to generally make some concerted effort, sampling a sea or ocean, or even puddle, pond or ditch, to acquire material for an evenings browsing for these siliceous, unicellular algae. It is all the more insidious, then, when one has to go no further than the bathroom medicine cabinet (see Diatoms and Dentifrices, MSSC Journal, Vol II, No. 10, Oct. 1997), and now possibly no further than the kitchen cabinet or pantry shelf where our daily supply of pills and tablets, and vitamins and minerals are stored.

At a recent Workshop meeting, through the courtesy of a fellow Society member, I was given samples of a dietary supplement tablet with the suggestion to note the printed label with special care. It was a happy moment, then, upon reading the fine print, to find that the Trace Metals Research organization, in Roy, Utah, has compounded a vegetable cellulose-coated tablet with not only the advantages of alfalfa, but with also an added host of dietary oriented minerals. Amongst these, to supply a source of silica, is a 'Diatom Silica Complex.'

To explore further, one half of a slightly less than two gram tablet was thoroughly digested in 25mls of distilled water, with frequent and gentle agitation at room temperature. When the mass was totally dissociated, the whole was resuspended by shaking. While allowing the suspension to settle out slowly, various levels were sampled, not only to get a feel for what the tablet had to offer, but to attempt to find a stratum with a minimum of extraneous and a maximum of diatomaceous material.

Against a background of smaller and heavier refractile-like particles, and a veritable jungle of amorphous vegetable-like shreds and pieces, there were scattered broken shards of diatoms and an occasional complete and whole diatom shell or frustule. Selective decantations eliminated most of the refractile-like bits and thinned down much of the heavier shreds of vegetation. Semi-permanent wet mounts were then made by sealing a large drop of material under a 22 x 30mm No. 1 coverslip, the edges of which had first been rimmed with a thin bead of Vaseline. The areas of each mount were swept out methodically at 150-200x, swinging to 625x high dry for more detailed examination.

No attempt was made to isolate or clean up the individual diatoms, for there were simply too few available to reclaim in any practical numbers, or for them to survive the rigors of cleanings, washings, multiple mechanical transfers, etc. It should be stressed, then, that all of the frustules, whole or in part, have not only not been cleaned, but that they are often poorly placed and oriented - half hidden and tipped at awkward angles and seldom showing a surface area level enough to allow an extensive plane of uniformly fine focused details. While the illustrations shown here are a pretty fair cross section of the conditions and forms seen in this one half tablet sample preparation, it is these very same conditions that make it risky to attempt to classify too closely the individual diatoms themselves. Less risky, perhaps, are a few comments, of a more general nature on each of the eight photomicrographs.

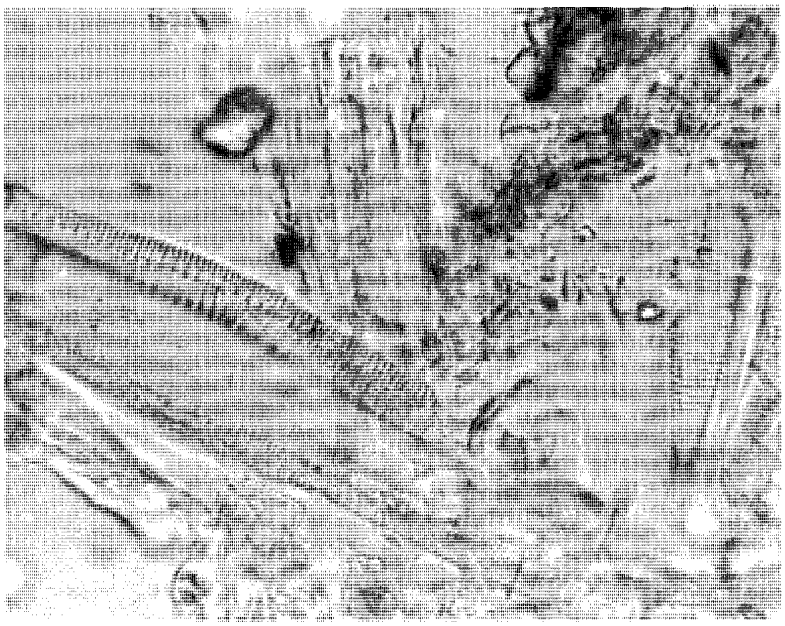


Fig. 1 What appears to be a 'side' or girdle view and extending well out of the field, even on the original negative, this was the longest frustule found. Directly above, in soft focus, is a shred of vegetable matter typical of what was seen throughout these samplings, with 'bark'-like surface detail. A broken diatom shard, showing a valve face, and similar to those seen in figs. 7 and 8, is at the right.

Fig.2 This valve view of a complete and undamaged centric or radially symmetrical diatom was a real find and seldom seen in these mountings. To the left is a typical angular piece of the heavier, colorless, refractile-like material, initially largely eliminated. Like the vegetable shred in Fig.1, fine details are slightly blurred, as the interest and the focus is on the diatom.

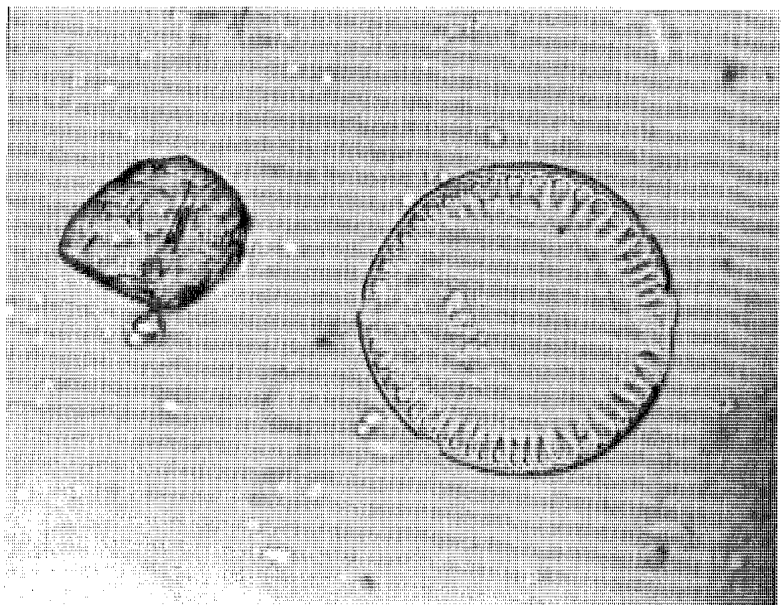


Fig.3 Tipped at an intermediate angle, and slightly on edge, this complete and whole frustule is almost three-dimensional. The general pattern and the costae, or transverse bands, on the predominately 'top' or valve facing view, are very distinctive and are easily resolved into separate dots or beads.

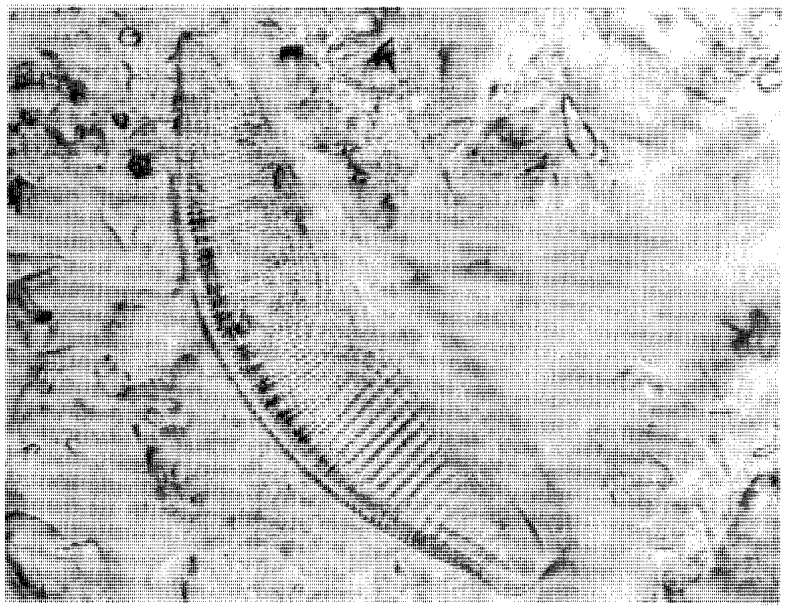


Fig.4 Neither of these are well oriented for the best showing of fine details, but it was hard to pass up the fortuitous side by side alignment and in an unusually uncluttered field. Of two different sizes, the one on the right, as in Fig. 3, offers another almost three-dimensional and slightly angled valve view, with a hint of girdle details. One wishes it had flopped more to the right for the former, or settled over more to the left for the latter. The wide 'ribs' and open structures are distinctive. The smaller valve viewed diatom is slightly below the chosen focal plane. Both are complete and whole.

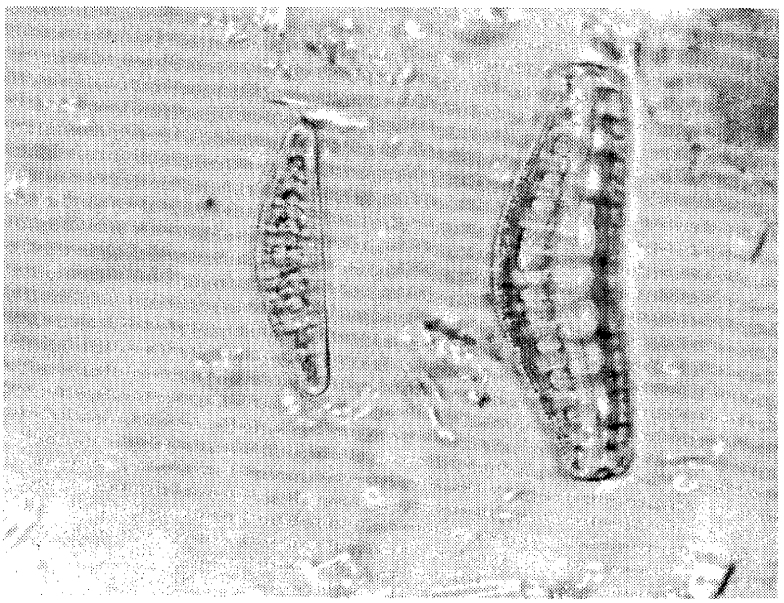


Fig.5 Another undamaged specimen, clean, nicely oriented and showing a sharp and distinctive girdle face, allowed highly detailed oil immersion viewing at up to 1562x.

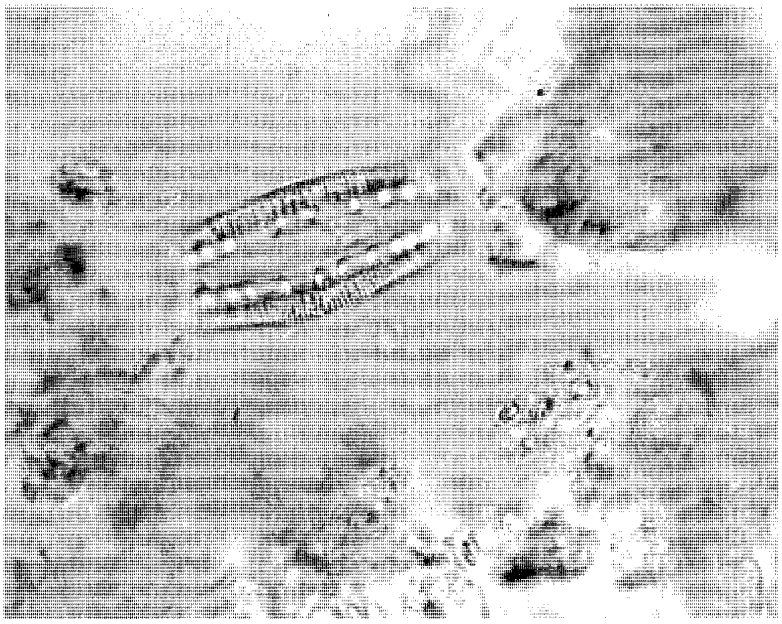


Fig.6 Partially buried under coarse and fine debris, but with its valve face mostly exposed, details here are also similar to those in Fig.3. Puncta, or beads, are resolvable in five or six of the transverse bands at this very shallow focal plane setting. This is an example of trying to make the most of what is available, the result being less than ideal. To make up for all this, however, in the lower right corner area, a fish head with a large black eye and part of its upper body appears to be poking out from the mass of material.

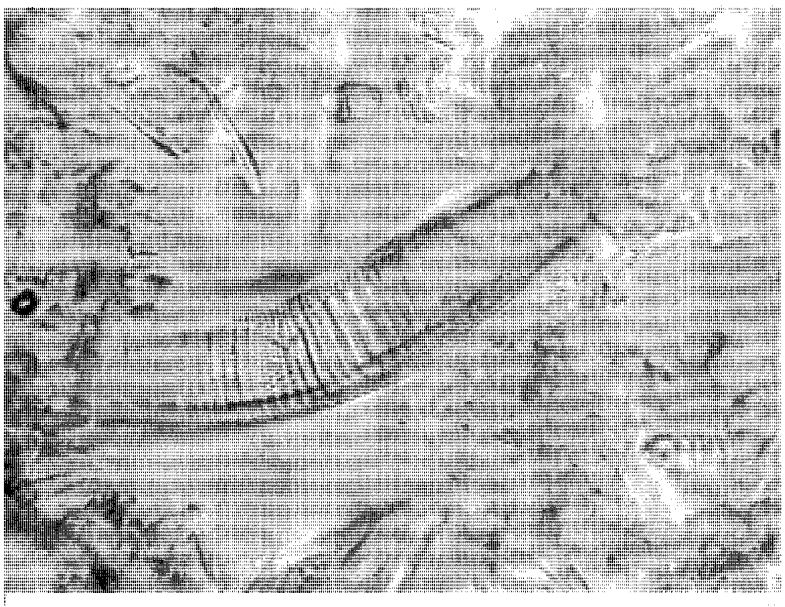
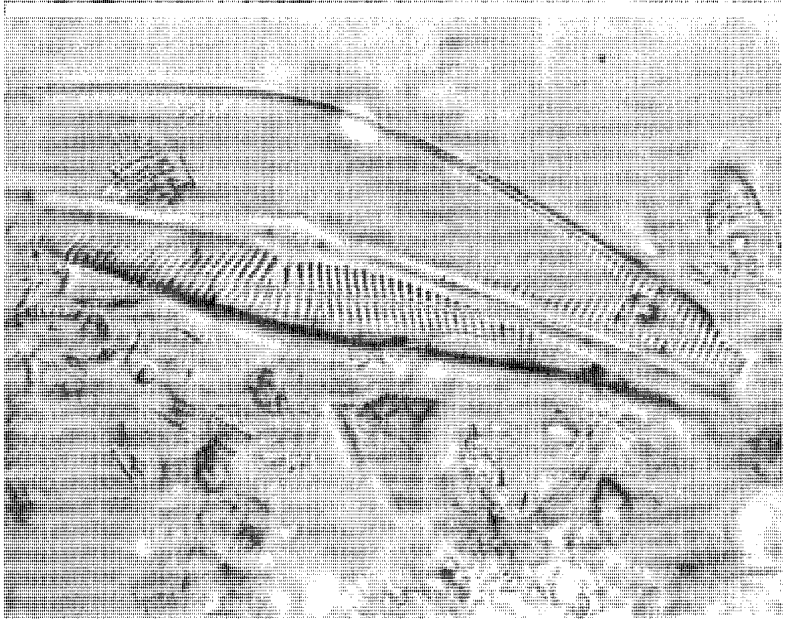


Fig.7 Although broken at both ends, this is still an impressive and handsome diatom. By roughly extrapolating the outline shape, the total length closely rivals the frustule in Fig.1. Tipped to offer a poorly oriented but extensive 'face' or valve view, this focal plane was chosen to show a dozen or so of the bands nicely resolved into beads. While at the microscope, additional fine details could be seen on both the center nodule and in the central area of the longitudinal raphe, or median line. Below and to the left, along with other broken bits and pieces, is the remaining half of one of the smallest diatoms found, still showing some fine 'edge' detail.



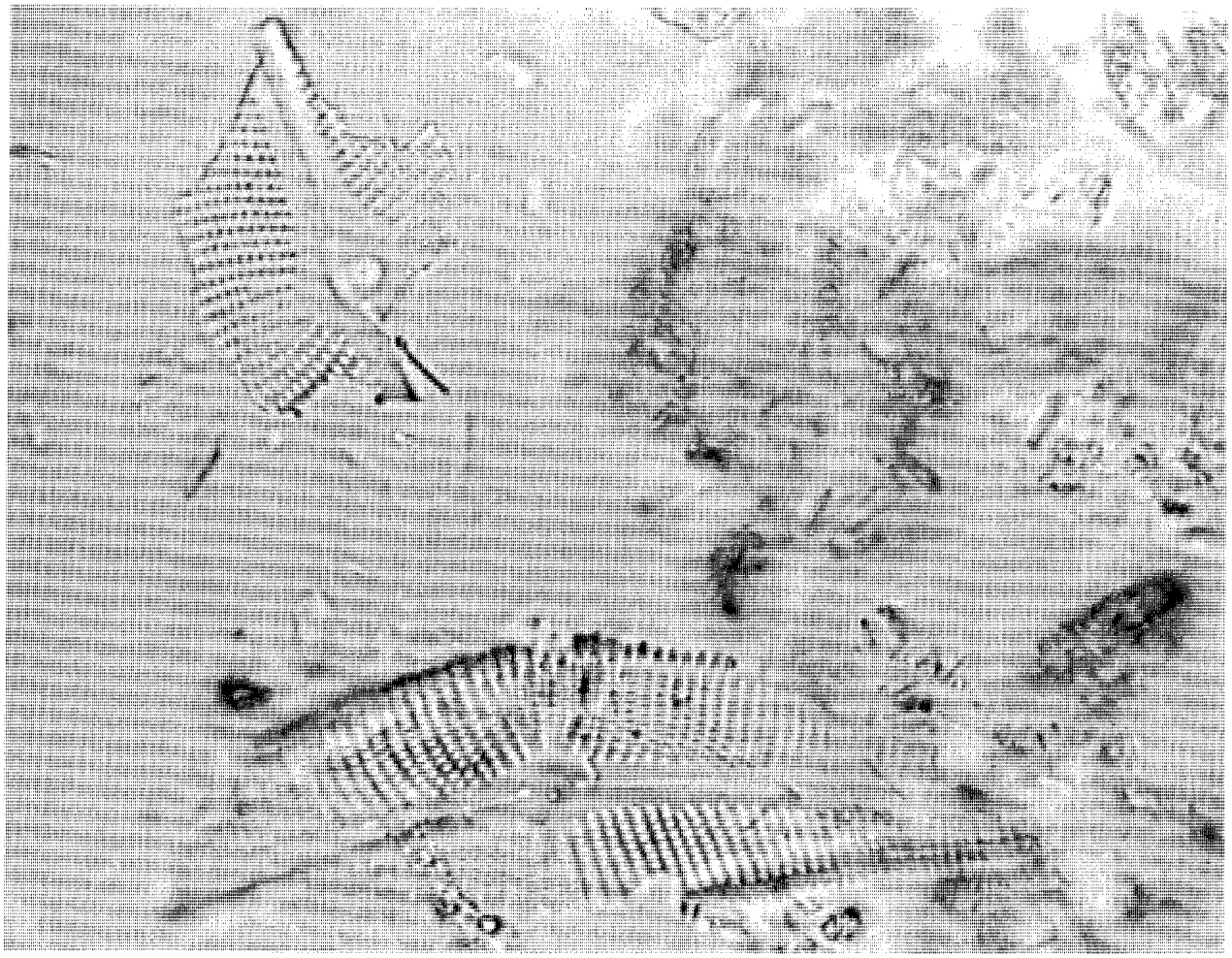


Fig.8 At the bottom is the shattered remains of another large diatom, perhaps of the same genus as in Fig.7, and also exposing a large area of its 'top' or valve surface. The small central nodule and the central terminal points on the long raphe lines, only hinted at in Fig.7, are nicely delineated. The transverse costae, or bands, are easily resolved into coarse dots, mostly seen here as optically white at this focal setting. Interestingly, the large, fractured shard, above and to the left, illustrates the way that individual puncta, dots or beads can be seen as both black and white structures, depending upon where they lay relative to a chosen plane of optical focus.

All photomicrographs were taken at the same initial high dry magnification of 625x and all prints were made at a calibrated and identical enlargement setting, allowing relative size comparisons to be made between separate prints and their details. All enlargements are a 5x increase of the original negative size and thus display images with a final, partially empty but still interesting and informative, lineal magnification of approximately 3,125x.

It would appear, then, that this worthy organization has afforded the interested microscopist with both potential health and happiness - with active minerals for the former and pleasant browsings for the latter. It would also appear that the paraphrased old adage that you can't have your supplement and eat it too, is not strictly true... that is, if you purposely keep a few spare tablets on hand for just those very same pleasant hours of microscopical browsings.

Camera: Olympus PM - 6
Microscope: Leitz Ortholux.
Objective: Leitz, 40x Apo, N.A. 0.95 with Correction Collar.
Film: Kodak, Tech Pan, #2415, 35mm, B&W plus deep violet filter.
Developer: Kodak HC-110, dilution 'D'.
Enlarger: Beseler, (calibrated).
Paper: Kodak Polycontrast Rapid II RC - F
Developer: Polymax T, 1:8 dilution.

MSSC Meeting Minutes for Wednesday, October 21, 1998

Ron Morris

President George Vitt called the meeting to order. We briefly talked about the upcoming Christmas party planned at Ernie Meadow's wonderful estate. The exact date for the party was not set, however, it will be one of the weekends in early December.

George Vitt then turned the meeting over to our Educational Workshop Chairman Jim Clark. Jim explained the format for the evening, which we will adopt occasionally, in which a speaker lectures for the first half and then a related "hands-on" workshop makes up the second half of the meeting.

Jim will facilitate the progress of such meetings, making sure that there is adequate time allotment for both the speaker, and the hands-on portion. This new format, as facilitated by Jim Clark- school teacher/professor extraordinare, turned out to be very successful, as outlined below. This meeting format is a throwback to earlier years of the Society when there was more emphasis on hands-on use of the microscope at the meetings. Also, this format leaves our beloved Saturday "show and tell" workshops intact.

Jim Clark then introduced our speaker for the night- our very own Jim Solliday. Jim opened his presentation with the slide show that was shown on our opening night at the Palos Verdes Art Museum, which is entitled " Nature's Artwork as Seen Through the Microscope." The 12-minute program dazzled the audience with a fascinating array of colors, textures, and sound that were masterfully blended with dual slide projectors, a dissolve unit, and sound system. Jim's excellent legendary slides were awe-inspiring, and a visual and auditory treat - a perfect prelude to the rest of the meeting.

Slide shows of this caliber tend to leave an indelible mark on the audience, and can often inspire members to strike out on their own, and pursue new interests in microscopy-such as crystallography. I was motivated many years ago when I attended some of John Chesluk and Leo Milan's crystal slide programs, and I still continue today to enjoy the making and viewing of crystals under the microscope.

Jim's second slide program was an instructional series of slides on " the step by step guide to making chemical mounts." Jim's superb macrophotography clearly showed the steps involved in preparing chemicals for microscope viewing. In shallow watch glasses, very tiny amounts of chemical is dissolved in water or alcohol to make a super-saturated solution. A small drop is put on the cleaned microscope slide (remember; precleaned slides really are coated with soap; you need to clean them again with rubbing alcohol, or Bon-Ami as mentioned by Alan deHaas). A cover slip is then placed over the chemical on the slide, and an alcohol lamp is used to evaporate the liquid, leaving behind the crystal growth. Depending on the chemical, either the above "evaporation" method is used, or the "melt method" is used whereby the chemical is placed directly on the slide and the cover slip laid on top, and the slide is gently heated over the flame while holding the slide with a wood clothespin.

Some of the chemicals used in Jim's demoonstrations were : Ascorbic Acid (Vitamin C), Adipic Acid, Urea, Hydrocodone (Vicodin), and Acetanilide.

Bill Davies was good enough to bring an array of video gear including 2 video cameras and 3 monitors. With this equipment, the audience was able to see Jim Solliday's bench top preparations of chemical mounts, and well as actual crystal growth under the microscope.

The audience gasped as the real-time growth of Adipic Acid crystals were shown on the video monitor as Jim Solliday pressed on different parts of the cover glass on the crystal mount. The localized strains forced crystal growth in new directions. The new growth would collide with the previous growths, and form colorful pyramid and starburst patterns. This view on the video monitor was a very dramatic demonstration of crystallography.

Bill Davies brought a German copy of the Zeiss WL stand for use at the workshop, Ron had a Russian LOMO Biolam P-15 scope, Ken Gregory brought a Zeiss WL Pol scope, and Stuart Warter brought a Bausch and Lomb Petrographic microscope, circa 1924. There was such a plethora of microscopes set up that one can not remember them all, but virtually all the countries that make microscopes were represented by their instruments- A/O, B&L, Nikon, Olympus, Steindorff, Zeiss, Leitz, LOMO, and Swift. Ed Jones brought and demonstrated a projection type microscope that was very easy to use, and gave great images.

The members who all brought scopes to the meeting are to be commended, because it is their interest and activities that made the evening a great success. We

Jim Solliday demonstrating. Note video cameras on the microscope and for overview.

Jim making a slide.

Photos courtesy of Jim Clark

Overview of the lecture. Standing room only. About 45 members were present.

hope that this is a new era in the chapter of our society in fostering the hands-on use of the microscope by our members.

Ron Morris and Steve Craig passed out pre-cut squares of Polaroid material to those who needed it in order to use their microscope as a polarizing microscope. Ron helped many members with custom-fitting the polarizers to their respective scopes.

Steve Craig showed videotaped footage of some of his 16-mm cine work on crystal growth. He worked on the photography of linear crystal growth that represented a new type of jet engine turbine blade material created by TRW. In a very dramatic commercial, the stark differences between Epitaxial (linear) crystal growth, and Polycrystalline (random) crystal growth was clearly shown in the ad for TRW.

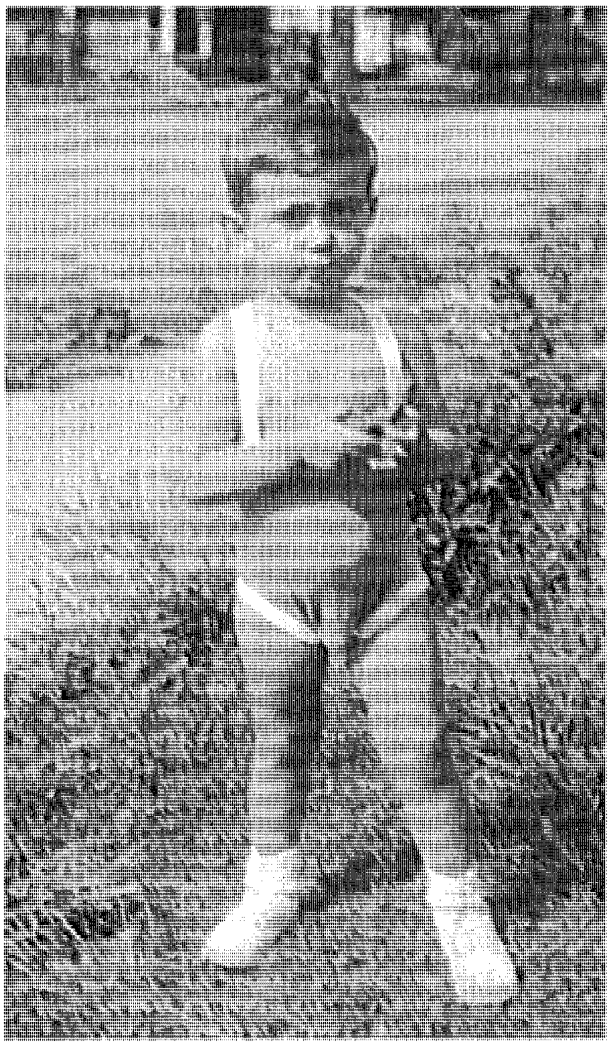
The bench where Jim Solliday was demonstrating was overflowing with eager on-lookers who were able to make their own crystal slides, some for the very first time! Soon the meeting room was buzzing with activity, with budding, newfound interests in their microscopes. There were so many illuminators plugged in that it is a wonder we didn't blow any circuit breakers! Thankfully due to heavy extension cords and judicious use of the available electrical outlets, (and a few engineers) everything went well.

There were a few items for sale on the back table: a Swift stereoscope, and Don Battle's very complete Olympus OM-1/ OM-2 camera outfit with macro lenses, bellows, and a slide copier attachment.

This meeting demonstrated very clearly the best elements of the Society - the comradery, the eager newcomers and neophyte microscopists asking the more experienced members for help, and the terrific cross section of the membership and their collective pool of knowledge.

Member Profile

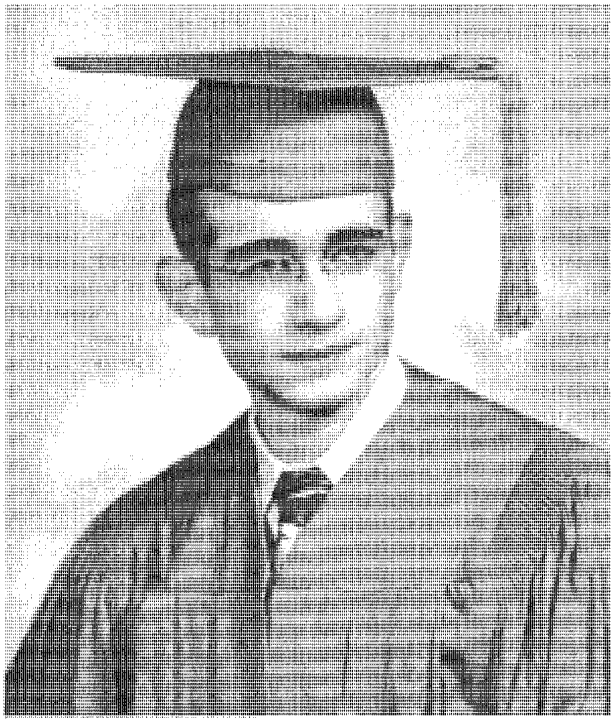
Herbert A. Gold



Viagra worked for me.

After reading the many wonderful and often exciting member profiles that have appeared in this Journal, it's difficult to know what I could possibly tell you about my comparatively dull life that would be of interest. But I'll try.

We have members who were shot at by the Japanese and members who hid from the Nazis. Well, I was shot at by an irate husband, but escaped half clothed down Fountain Avenue in broad daylight. Members have thrilled us with the heroics of their military exploits. What can I say? In the Air Force, several days before my first performance review, the unit under my command lost a 30 kiloton atomic weapon in a snow bank on the Canadian border. (It was not recovered until the following spring.) At my review, my Commanding Officer's encouraging words are still remembered,



"Hello Mrs. Robinson...."

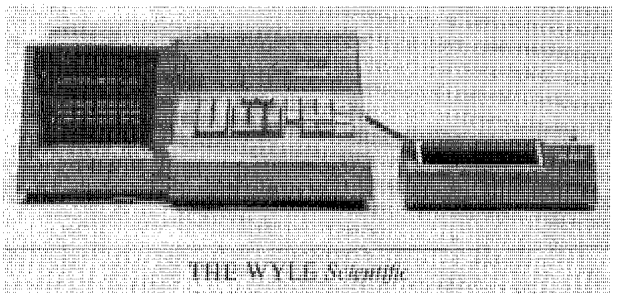
"Lieutenant, I really think you should look for another line of work." There were members who warmed our hearts when telling of marrying their childhood sweetheart. Good news here. I married my college sweetheart. Then I married my boss's secretary. Then I married my lawyer. Then I married a really neat computer analyst. Maybe I have something to tell you after all.

In the Beginning.

My paternal grandfather was a Talmudic scholar in a small Russian town on the border between Ukraine and Byleloruss. My grandmother said that all he did was hang around the synagogue all day with a bunch of unemployed neer-do-wells plotting the overthrow of the Tsar and wondering what she was cooking for dinner. I think she was right about his public musings on the Tsar's future because shortly before The Revolution the family hurriedly emigrated to Canada. Dinner was another matter. Haute cuisine never troubled any of my female progenitors.

To the surprise of my grandfather and the consternation of his many sons, the Canadian Welcome Wagon for immigrants led directly to the Army recruiting office. The family agreed that they did not endure the rites of steerage passage only to see their sons forced to eat non-kosher meals. Besides, at that time, and prob-

Dashing young officer and first wife.

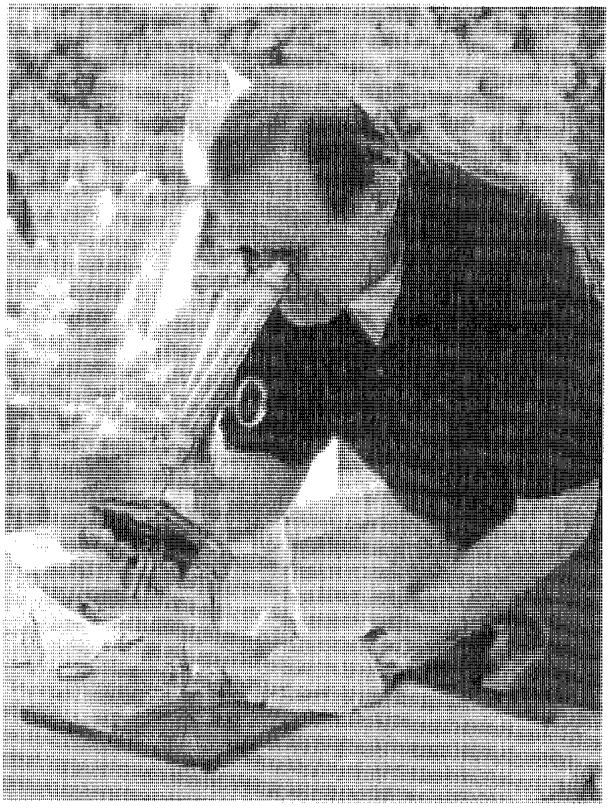


The Wylie Scientific, world's first desktop computer.

ably now as well, the Army was no place for a nice Jewish boy. Soon a boat was "requisitioned" and like Washington crossing the Delaware, the Gold family crossed Lake Erie for America. Unfortunately it was in the dead of night so no painter was able to commemorate the scene.

They made their way to Chicago where they permanently settled. In the finest tradition of Eastern European primogeniture, the eldest son was sent to law school and the other able-bodied went to work to pay his tuition. One son opened a grocery store and one started a hardware store. My father being the youngest was allowed to enter high school. My grandfather, I believe, was still wondering what happened to his dinner.

My maternal grandfather, living in a small town on the border between Poland and Russia, had a small family when he decided to come to America. He came to Chicago with several brothers leaving his family behind.



Smith and Beck and Gold.

The idea was for him to earn enough money to bring them over at a later date. However, what he earned during the day at his trade as a shoemaker, he spent at night in every bordello on the south side of Chicago. When he couldn't pay the ladies for their favors he resoled their shoes. Whores with holes in their shoes became a thing of the past. Through the labors of his older, more conservative brothers, his family was eventually brought to Chicago. My grandmother did manage to keep him home on one or two evenings as my mother and several other children were added to the family.

And Then There Was Me.

My father and mother met in high school where it was love at first sight. Seventy years later they are still married to each other. Whatever lesson is implied in that fact seems to have escaped me. My father left school to work in the family hardware store which he eventually took over.

The depths of the Great Depression were plumbed in 1931 when my parent's union was blessed with my arrival. My mother says they were so poor they had to borrow the $5 it took to get me home from the hospital. A great investment in my view. By the time I reached kindergarten, there was a malady sweeping the country we now diagnose as the "work ethic." Thankfully, we seem to have cured it today, but back then it was virulent. So I started working in my father's hardware store when I was six year old.

I worked on Saturday's at first, then a few days a week after school. The hardware store was the playground for the development of my mechanical predilections. I learned to glaze windows, make window shades, duplicate keys and change combinations on tumbler locks, lay Linoleum, thread pipe, repair small electrical appliances and all that stuff that they don't do in hardware stores any more. To my poor father's everlasting exasperation, his hardware store was my experimental laboratory. I disassembled door bells and buzzers, sliced dry cells in half and extracted the gun powder from small arms ammunition to make fireworks. I'm embarrassed today to think of the large cost of the new merchandise I destroyed. When I could possibly have the time to wait on customers was the source of endless discussion between my father and me. But he still thought that one day it would all be mine.

Because my two younger brothers brought new meaning to the concept of "klutz," their interest in the hardware store was nil. Although they put their time in, they didn't love it as I did. So it came as a big surprise to my father when I told him I wanted to go to college after high school and not join him in the "store."

I had a cousin who was a civil engineer. He was the head of the Right-of-Way Division of the Cook County Highway Department. It was a plum assignment in a governmental organization that exemplified the "Chicago" way of doing business. The power of politics personified. This atmosphere allowed my cousin to operate a surveying business on the side. On Sundays, during my last two years of high school, I worked for my cousin as an apprentice surveyor. That meant I got to carry a lot of heavy stuff and do the general dirty work. We did every manner of land surveying from the layout of housing developments to taking inventory in coal yards. My job in the later activity was to drag the chain (measuring tape) up to the top of the coal pile. My mother could never understand why my clothes were always so filthy. I think the instrumentation, the mathematics and the camaraderie of the surveying crews convinced me that I wanted to be an engineer.

College Days.

The University of Michigan in Ann Arbor had an outstanding engineering school and was not too far from home. My mother brow beat my father into accepting the inevitable. I enrolled in the winter of 1949 and wasn't in class more than 15 minutes when it hit me like a ton of bricks. THERE WERE NO GIRLS IN ENGINEERING SCHOOL! Oh yeah, there was Mildred Blicksendorffer; she was really smart but she had a mustache. You can imagine the number of buildings a school the size of Michigan would have. But I went through every one of them until I found where they were hiding the girls. Turns out the best cache was in a place called, the Fine Arts Department. I had no idea what that was, but I signed up for classes anyway. Not a total loss as I graduated as the only civil engineer in my class with a minor in fine arts. Those courses didn't hurt when I eventually became a director of the Newport Harbor Art Museum and member of the exhibition committee.

The Korean War was raging while I was in college. I missed the delights of kimchi and bombardments on the 38th Parallel by virtue of a draft deferment just like some of our most revered political leaders. Upon my graduation in 1953, my draft board told me I had two weeks before I would be a private in the U.S. Army. As honorable as it may be, you know from the early part of my saga, that my family has a genetic predisposition against military service in general, but particularly service in the enlisted ranks. One doesn't grow up in Chicago and not know that the solution to every problem lies in finding someone you know who knows someone who knows...

My cousin, the surveyor, was also a commander in the Coast Guard Reserve. He was convinced he could get me into the Coast Guard Officer Candidate School. In just a few short months I could be on the bridge of a Coast Guard cutter, sailing across Lake Michigan, protecting Chicago's shore from an invasion of the Canadian fleet. Only one problem. The Coast Guard only wanted men with 20/20 vision uncorrected. Mine was 20/200. Just before my physical exam, another cousin, an optometrist, put drops in my eyes to pinpoint my pupils and dramatically improve my vision to about 20/190. But he also gave me a note for the examining doctor saying he had checked my eyes and they were 20/20 and no, my pinpointed pupils did not mean I was a drug addict.

As I stood in line and waited my turn for the physical examination, I memorized the eye chart down to the bottom line. When the doctor got to me I handed him my note. He read it, smiled, wadded it into a ball and yelled, "Sailor, change the chart!" Needless to say I flunked the examine and my the cousin, the optometrist, got a call from the Optometric Licensing Board. Fortunately for us, Canada did not invade.

The Wild Blue Yonder.

My search for an alternative program took me to the Air Force. They claimed they were desperate for civil engineers. If I would sign up for 24 months they would make an officer out of me in 60 days and have me doing civil engineering in some domestic garden spot. And most important, they didn't care if I needed a seeing-eye dog. They would make him an officer as well. An offer I couldn't refuse.

I arrived at Lackland Air Force Base in San Antonio, Texas in the dead of night. It was quite an experience for a city boy to find the entrance to his quarters blocked by a hissing rattlesnake. But it was not a problem for the military policeman who was blasting away at the snake's head with his Colt .45. True to their word, they made an officer out of me in 60 days. I graduated the course second to last. The man at the

bottom of the class couldn't make the graduation ceremonies as he was in the stockade for punching out one of our instructors. But it was all worth it for now I was going to do civil engineering for my country.

We met with a personnel officer who determined your next assignment. He told me I could go to electronics school and then maintain radars on the Canadian border or I could go to electronics school and maintain fire control systems on the Canadian border. Take your choice. "Hey, what about the civil engineering assignments?" I naively asked. "What civil engineering assignments? What's a civil engineer? Radar or fire control, take your pick, I don't have all day." After a long, boisterous interchange, I discovered that the personnel officer belonged to the same college fraternity of which I was a member. At that point, the tone of the discussion changed dramatically. He unlocked his bottom drawer, pulled out a folder marked SECRET and whispered, "Do you want to become an atomic weapons officer?"

Wow! The Cold War was in full swing. The Rosenbergs were being tried. Joe McCarthy was finding Commies under every bush. And I was going to be initiated into the secrets of the atomic bomb. What more could a 22 year old, still wet behind the ears, wish for. Of course, I had no idea what the job entailed since the job description was classified and I didn't have a clearance. They shipped me off to electronics school in Biloxi, MS, putting an end to my civil engineering aspirations, forever. In Biloxi I learned how to do long division (some of my classmates were still pointing at the words and moving their lips when they read), Ohm's law and how to repair a television set. All very important stuff, especially the long division.

Then I married my first wife.

From Biloxi we went to Sandia Base in Albuquerque, the center of learning for blowing things up. I sat around for six months waiting for my security clearances. In typical government fashion they made a mess of my background investigation. The FBI got their street addresses mixed up. They thought they were interviewing a neighbor of mine about my political leanings but were actually interviewing my mother. She says she gave me a good recommendation. You know how Mom's are. I thought my roommate in college would be a perfect reference. He was at that time a navigator on a SAC B-52 long range bomber. Who could be more patriotic? They confused him with some well known Communist and thought I was trying to be cute in using him for a reference. It took months to sort that fiasco out. By the time I got the clearances and finished bomb school I had less than a year to serve on my tour of duty.

With the short time left and my outstanding performance in bomb school, I was able to snag a coveted assignment at Limestone, Maine. Limestone is on the Canadian border, shortest great circle route from the U.S. to Moscow and where the average annual temperature is zero...Kelvin, a veritable garden spot. The base sported a 10,000 ft steam heated runway and a flotilla of B-52 and B-47 bombers. A small secret enclave (cleverly disguised, as I remember, as a Taco Bell) housed the nuclear arsenal. That was to be my home.

Before reporting to Limestone, I took a side trip to Los Angeles for my first visit to Southern California. It was February, the dead of winter everywhere else, but here it was beautiful. I remember driving down Sunset Boulevard in Beverly Hills. I saw a home set back about 100 ft. from the road with a lawn of flowers stretching in every direction. That picture stayed in my mind and was recalled many times as I stood at the end of the 10,000 ft runway, the wind howling at 60 or 70 knots, the bomber wing tips tied to the ground with ropes to keep them from lifting off and the temperature at minus 40 F. I knew California was going to be my home if I ever survived this God forsaken place.

The Civilian Years.

I did survive and Los Angeles became our home in 1955 where I went to work for North American Aviation in Downey. I was supposed to design ground support equipment for the Navaho missile. It was difficult for me because the plant was next door to the Bandini fertilizer factory. The aroma blew into my office with gale force and nearly asphyxiated us all. From Downey, I improved my social geography to Brentwood where my electronics and math background took me into acoustics. At the Western Electroacoustic Laboratory, I worked on the acoustical design of the Los Angeles Music Center and the sound insulation for the Waste King Super Hush garbage disposal. I think my extensive exposure to Bandini qualified me to make hundreds of sound level measurements on garbage being ground.

From acoustics I went into the design of very high powered audio amplifiers. These behemoths were used primarily for driving vibration tables, some large enough to shake an entire missile. From amplifiers, it was a short hop to designing data processing equipment. For the Union Oil Company, I designed the "computer" that read the name and account number from a punched card and drove the machine that created the customer's plastic oil credit card. My creation was all relays and selenium rectifiers, heady stuff for those days.

Then I married my second wife.

The Digital Days.

With my new wife and my new mastery of digital logic, I entered the computer age. Wyle Laboratories in El Segundo and Huntsville, Alabama was a major provider of environmental testing services to the major defense contractors. Wyle had acquired a small manufacturer

of digital logic boards and a contract to build and operate the range timing equipment for the JPL Ranger moon missions. I was hired to oversee the later operation. I think it was this activity that stimulated my interest in time and time measurement. Those were exciting days at JPL before the manned launches. It was considered a major triumph to just hit the moon with an instrumentation package and get a signal back.

As Wyle expanded their digital product line, I learned a lot about multivibrators, logic gates and De Morgan's theorem. I went on to design a computer for New Jersey Bell that measured telephone traffic using a newfangled ferrite core memory. Eventually I became chief engineer of that division.

Revealed here, probably for the first time in print, is the true story of THE first desktop digital computer. In 1962, I ran into three engineers who claimed they could make a transistorized digital desk top calculator. It would have a magnetic disk, cathode ray tube display and memory. It would add, subtract, multiply, divide and do square root. I brought the guys to Frank Wyle, the president, and he decided to fund the project. In about eight months there was a working prototype. Remember, there were no off-the-shelf components as we know them today. Everything had to be made from scratch. The disc was a machined 4" aluminum plate with iron oxide coated polyethylene glued to its surface. The read/write head came from a tape recorder. There were no integrated circuits. Every flip-flop was two transistors, resistors and capacitors. Every leg of a logic gate had a separate diode. Even though it all worked we decided it had to be programmable to really seize the market. I designed a photoelectric punched card reader that turned the calculator into the Wyle Scientific, the world's first desktop computer. About 150 units were manufactured and all eventually failed while in customer use. The germanium transistors were not up to the task and the disk technology was far too primitive. But we were the first.

About this time my first son was born. He is now teaching English at U.C. Irvine.

The Entrepreneur.

With my boss at Wyle and a buddy of his, we founded a small company called Certron. We began by cleaning and certifying magnetic computer tape. We then bought an audio tape plant in Anaheim. 3M had just licensed audio cassette technology from Philips of Holland and we took one of the first U.S. sub-licenses. We then opened a plant in Mexicali to assemble cassettes with the tape made in Anaheim. The operation was very successful because we introduced the concept of private labeling. This allowed department stores, music stores, electronics outlets and many others to have their own brand name product rather than having to promote the 3M name which was the only alternative at the time. We expanded into tape duplication with most of the major record labels as our customers. We got into the country and western music business with studios and a manufacturing plant in Nashville.

In 1969 the stock market was roaring and they loved new issues, not unlike today. We went public and were soon listed on the American Stock Exchange. We expanded dramatically in areas about which we knew absolutely nothing. Our hubris was unbounded. Our apparent success led to internecine warfare on a scale rivaling the Peloponnesian Wars. My former buddies ganged up on me and I was ousted. A few weeks later, Time Magazine reported that I was the cause of all of Certron's troubles and was probably behind the Kennedy assassinations as well.

With my golden parachute, I speculated in over-the-counter puts and calls and backed a small Los Angeles commodity brokerage firm. The broker's back office was an administrative mess which I attacked with a computer program I had designed. Word got around and a very large commodity firm in Chicago bought the Los Angeles operation to get me and the computer program. I became a partner in the Chicago firm and brought a crew of programmers from L.A. to Chicago to expand my program for their massive operation and build a computer data center in the basement of the Chicago Board of Trade. As part of my compensation I was given a seat on the newly opened Chicago Board Options Exchange. As a market maker in Xerox and IBM, I traded all day and wrote FORTRAN code all night. Trading on the floor of a major exchange was the most exciting job I ever had or could ever imagine anyone having. Except, perhaps, being a Navy SEAL or a kamikaze pilot.

With the data center operating and the program processing about 20% of the transactions on the Board of Trade, I married my third wife and moved back to Los Angeles. We had three sons, two of whom are in college and the youngest is in high school.

I became a computer consultant for several years eventually winding up at ARCO. I worked as a consultant for them for two years when they made me an offer I couldn't refuse. Fifteen years later, I retired from ARCO and here I am.

Along the way I became an ardent collector of pocket watches. The collection is mostly high grade pieces with something a bit different about each one. Eventually, I found it hard to find more interesting variations in chronometers, Karussels, minute repeaters, chronographs and calendars. I spread out into scientific instruments acquiring examples from the fields of surveying, navigation, computation and microscopy.

Oh, I married my fourth wife and acquired my fifth son.

WORKSHOP -Continued from page 217.

This instrument is a copy of the Hartnack design, made c.1870-85 by Constant Verick, 2 rue de la Parcheminerie, Paris. Verick was a special pupil of E.Hartnack.

8. **Ken Rogers**, our guest, showed his Siebert microscopec.1870, cased, which he offered for sale. (Ken Gregory is now the proud owner.) The accessories included a complete set of objectives and eyepieces and a glass immersion oil bottle, turned purple with age.The case bears the nameplate "Ernst Schultz, Breslau." Ken learned of the MSSC from the L.A.Times.

9. **Alan de Haas** stated that uranium glass, which is used by microscopists for the visual inspection of light rays, can be dangerous due to the dust that can be generated when it is saw cut. He added that it is not well annealed and will not 'crack' along a clean scribed line.

10. **Leo Milan** showed the folder-type book *Optical Designs in Motion*, Carol B. Grafton, Dover 1976. This contains a set of B&W transparency patterns which, when used in combination with one another, produce interesting Moiré patterns. As Leo began to report on some current experiments using lasers for the detection of gravitational waves, a large number of noisy and potentially dangerous bees were spotted swarming high up near a tree on the neighboring property. This caused some justifiable alarm, but the bees eventually dispersed and went elsewhere! At this point, **George Vitt** told the members that **Gaylord Moss** had done some extensive pioneering research on a gravity wave detector while at the Hughes Research Labs. in Malibu, California and asked Gaylord to describe this effort. Gaylord told the story of the theory and that he had achieved a capability of measuring 10^{-15} meter displacement accuracy, stating that this was far short of the probable required 10^{-22} m. There followed a general discussion on this subject.

11. **Ed Jones** showed the book *Building Blocks of Light* by Roman Vishniak, 1976, which described interference methods in microscopy. (Roman had given a presentation to our group many years ago.) Ed also showed 24 magazine covers displaying photomicrograph and abstract art images of agate, folic acid, etc.

12. **Ernie Meadows**, who is THE expert and artist in wood, jokingly wanted to know how to grind wooden lenses! There was laughter all around.

At 10:30am there was a break for coffee, conversation, sales, etc.

13. **Izzy Lieberman**, who is doing extensive research and consultation on inks for ink-jet printers, brought and demonstrated a colorimeter used to measure two samples of diluted inks, where one is a "standard". The instrument was used by most attendees after the workshop, where Izzy explained its purpose and operation in detail. The colorimeter allows the observer to detect very minute differences in visual hue.

14. **Dario Solares** demonstrated a Fujix Photo-Video Imager Mod.FV-7, a digital color camera, which he uses for copying. It has a 350-line resolution and is obtainable from B&H Photo (NYC) for $350. There was a general discussion on digital cameras, with the major contributors being **Larry McDavid** and **Jerry Bernstein.**

15. **Herb Gold** said that John Petak, a book dealer, is producing repro copies of old trade catalogs of scientific instruments at $2 each. Herb will take orders for these catalogs.

16. **Larry Albright** showed a spoof toy microscope that looked like a cross between a microscope and a robot. Larry said that this missile-launching microscope could serve the dual purpose of microscopy and Home Defense! (Another milli-Albright?)

17. **Gaylord Moss** recounted his trip with **Larry Albright** to Victoria BC and their most pleasant visit on the island with **Mr.& Mrs.Bert Loro**. For this visit, Bert had especially set up 14 different items that he had designed and built for use in microscopy. Among these was his own MacArthur portable microscope and a Leeuwenhoeck replica with lenses he had made himself - and through which he has done some amazingly fine photomicrography.

18. **Larry McDavid** showed and described the operating principles of three different electronic receiver clocks which operate by receiving a 60 Khz ground wave signal or via a GPS signal. He found the Junghans (WWV) the least accurate and the one distributed by Oregon Scientific Co. ($29.95- made in China) the most accurate. He also described a means of clock setting via Internet, using the "Geoclock" software on CD-ROM. This software has the capability of displaying any geographic area with sunrise/sunset terminators moving; the AZ/EL of the sun and moon; great circle distances, etc. This software is also downloadable from http://www.Geoclock.com. Larry also showed the 1st edition of *Splashes & Soap Bubbles* by Edgerton, 1896.

19. **Bob Conacher** celebrated his 93rd birthday today! Congratulations Bob! Being a person of great experience, Bob philosophized on the current state of society which, in his opinion, is getting to be too tolerant and should be tightened up.

The Workshop ended around 12 noon and many members retired to Coco's for food and further talk.

November Meeting

Wednesday, Nov. 18 at 7 PM
Crossroads School
1714 21st Street
Santa Monica, CA

MSSC Annual Member Exhibition Night

Microscopical Displays. Prize for Best Exhibit

In the past, this Exhibition Night has been one of the most exciting meetings of the year. Everyone is encouraged to bring and set up an exhibit on some microscopical topic. One memorable year, Bob Faust showed the classic demonstration of blood circulation in a fish's tail. You can bring in something as elaborate as this, or just a favorite microscope or microphotograph that you have taken. Microtome demonstrations, microphotography setups, video through the microscope, homemade microscopes or apparatus - anything that bears on microscopy is suitable for exhibition. Equipment, techniques or results, all will be of interest.

Tables will be available where each member can set up their exhibit. Each person will have a chance to explain what they have brought. Then, there will be time to wander around and look at the demonstrations and talk with the exhibitors. There will be a vote to choose the most popular exhibit and a prize will be awarded to the winner. The prize is worth striving for; a set of Ernie Ives' superb insect slides already on order from England. As many members know, Ernie mounts insects in the grand manner with each leg and wing arranged to make a perfect display.

Barry Sobel has promised to set up an antique solar microscope, something that few of us have seen in operation. Jerry Bernstein has offered to set up some of the best modern microscopes and lenses so that we can compare their performance with some of the best instruments of the 1800's that will be available. With the varied interests and great capabilities of the members of the group, there will undoubtedly be exhibits that will be surprising and intensely interesting.

Plan to participate and bring something for exhibition. It promises to be a memorable evening.

MSSC Christmas Party

Sunday, December 6
hors d'oeuvres at 3 PM dinner at 5 PM
Marj and Ernie Meadows
707 Greentree Road
Pacific Palisades, Ca 90272
Tel. 310-459-4788

Marj and Ernie Meadows have graciously offered to host the MSSC Christmas party at their magnificent home in Pacific Palisades again this year. We will, once again, enjoy the delicious full turkey dinner, with all possible trimmings, catered by Barbara Black, Steve Craig's daughter.

As before, there is no extra charge to see the art treasures about the home, including Ernie's remarkable furniture and the Canadian wooden canoe in the living room. Also, a tour of the world's best, and most organized, home woodworking and metal workshop can be arranged.

Please bring a dessert to share and, if you wish, wine or other alcoholic beverage for yourself. The cost is $14 per person. Please make your check out to Beverly Black and mail it to Steve Craig at 3455 Meier St. Los Angeles, CA 90066. Please respond early so Beverly can plan accordingly.

WORKSHOP IS CHANGED TO 2ND SATURDAY IN DEC.

Steve Craig's Lab
December 12 at 9 AM

Clark Library Tour

A special MSSC member tour of the Clark Library of the UCLA Center for 17th and 18th Century Studies is planned for Saturday, Dec. 17 at 10 AM. This rare book library, which specializes in 17th and 18th century British works, contains more than 90,000 books and 21,000 letters. We will meet in the enclosed parking lot of the elegant old Clark estate at 2520 Cimarron St. which is one block east of Arlington and two blocks south of the Santa Monica Freeway. Call Steve Craig at 310-397-8245 to reserve a place on the tour list.

Editor's Notes The photographs in this issue are improved by direct digital printing and because George Vitt has kindly offered to use his Photoshop expertise to process the Journal illustrations before printing. George's skill is becoming legendary in the MSSC and his art will make a great difference in the illustrations in the Journal. Thanks George.

Gaylord Moss