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THE MICROSCOPICAL SOCIETY OF SOUTHERN CALIFORNIA
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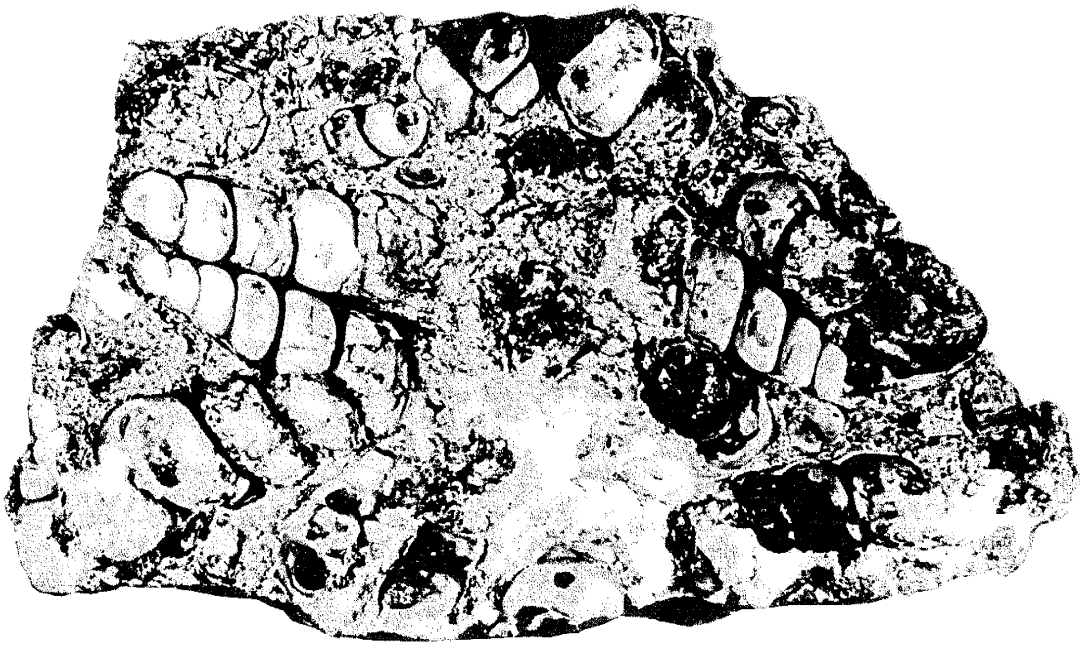
Turritellas and Ostracods: A Cursory Project of Interest.

Richard M. Jefts



A chance remark by a fellow member at our local Gem & Mineral Society lead to a sideline project that has proved to be of considerable interest. It appears that for some time now, he has wanted to write a geologically oriented article on two specific types of fossil shells for a different publication. His plans went so far and then met a brick wall, or geologically speaking, a rock wall, for the lack of necessary photographs to illustrate certain portions of the text. I made the offer to try to generate something photographically acceptable, given the necessary material to work with, and the project gradually took shape.

Briefly then, for our purposes, and to put all this in some perspective, it seems that back in the Eocene epoch of the Tertiary period, say some 50 million years ago, there existed in certain portions of what is now known as, but perhaps not necessarily limited to, the state of Wyoming, large bodies of relatively shallow fresh water. In these fresh water inland 'seas,' amongst other contemporary flora and fauna, there lived and thrived in countless numbers small, and on up to an inch or two in length, tapering, spiral shape shelled gastropods called Turritellas. Upon their death, they accumulated in thick bottom masses and the internal

chambers of the shells were emptied of the once living animal by other predators or through the normal processes of 'dissolution.' At some time subsequent to their death, the areas were inundated with vast quantities of much smaller bivalved crustaceans called Ostracods. These minute crustacea, at and below the limit of naked eye visibility, not only packed tightly into the surrounding area, but would often be washed into the empty chambers of the quiescent Turritella shells. Through both geological processes and geological time, the shallow beds were buried under an extensive overburden of debris and volcanic ash. They were subjected to silica charged ground waters, and through the action of silification, molecule by molecule the calcium carbonate shells were replaced with silica, the Turritellas and Ostracods were converted and the forms were frozen both in time and in beds and strata of often clear and transparent agate. A casual observer might be aware of the more obvious fossilized Turritella shells, for which these rock masses are well known, perhaps be less aware of the very interesting and very handsome smaller and microscopic fossilized Ostracod shells incorporated along with and actually within the chambers of the Turritella forms themselves.

Initially, I was given two pieces of material. The first was a chunk of host rock, exposing partially weathered out Turritella shells in high relief. (See cover photo in which the scale is in millimeters) The second piece was a sawn slab, 18.2 x 10.2 centimeters x 5mm thick, and although of larger material, it contained many slightly smaller, but still typical, fossil Turritella shells. It also served as an interesting specimen to establish the general nature of what is popularly known as Fossil Turritella Agate. However, although the slab was studded with many highly contrasting shells, none would lend themselves to viewing the tiny internal Ostracods, and surprisingly few would lend themselves to establishing the shape or form of a typical, full, cross sectioned Turritella. The best of the lot was the small shell, approximately 18mm long, circled in this slab, Fig. 1. A close up shot of this chambered shell is seen in Fig. 2, with just a

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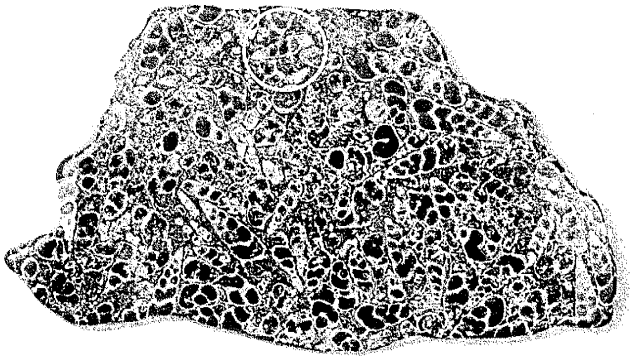


Fig. 1. Sawn slab of fossil Turritella Agate with many spiral shell forms. The circled shell is seen in figure 2.

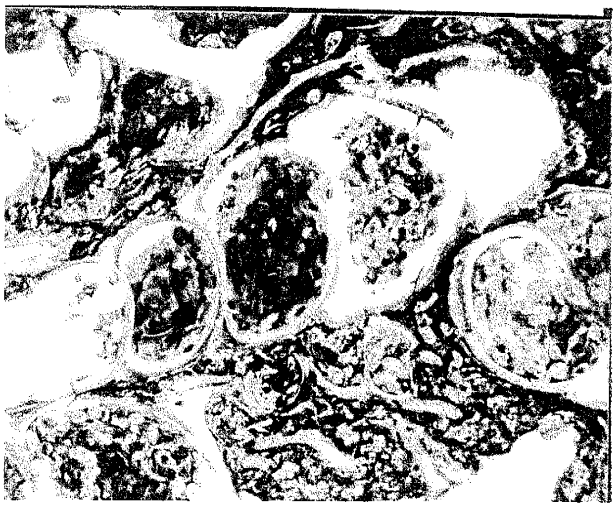


Fig. 2. The single fossil Turritella shell circled in figure 1.

suggestion of some tiny, internally included Ostracods. Even here, however, some of the problems were minimum working depth of field, poor subject orientation or lack of clarity due to cloudy agate and scratches and other surface flaws. Some of the latter problems were partially remedied by coating the area with Canada balsam. This will cover many of the cracks and flaws and increase the transparency of that area to the extant that at least the general form of the shell could be pretty well delineated. Lack of further satisfactory material immediately at hand slowed the project to a halt until a most interesting and unexpected source of polished Wyoming Turritella agate almost literally fell into our hands.

Tumbled stones are broken bits and irregular pieces, up to perhaps one to two inches in size, of larger hard and resilient material. Frequently they are feldspars and quartz family minerals, clear, smokey, sometimes with inclusions, colorful petrified woods, banded agates and mottled jaspers. In short, they are minerals that will take and hold a high polish. These odd shaped odds and ends of rock and mineral scraps are loaded into rotating drums and tumbled with charges of decreasing sizes of graded grinding grits, resulting in smooth and rounded stones that are then brought to a high polish by further tumbling with charges of suitable polishing agents. The resulting tumbled material, also called Baroque Stones, makes inexpensive display material for such diverse things as lining the bottom of fish tanks and colorful ear rings and necklaces. Like many gem and mineral societies, we buy our tumbled material, mixed stones of a dozen or more different types and kinds, shapes and brilliant colors in 50 pound lots from professional dealers. While sifting through some of this material one day, a dark stone with white inclusions was found and a hand lens confirmed the happy thought that it was indeed, Wyoming Turritella Agate. I went through the batch and all told, set aside a little over four dozen of the baroque or tumbled stones. The stereo-microscope confirmed the further presence of microscope Ostracods, both along with and within the Turritella chambers. Each stone was then examined from all angles under 30x stereo for best possible features, and the four dozen winnowed down to nineteen 'choice' individual specimens. These were then mounted on nine 1 x 3 inch microscope slides, see Fig. 3. Three such mounted stones are seen closer up in Fig. 4 and an extreme close up of a typical stone, with exposed fossil shells is seen in Fig. 5, the scale in the latter being in millimeters. In all cases, the stones were oriented for presenting the best features for viewing and mounted by pressing them in soft clay which allowed a firm temporary mount or when the clay hardens, a more permanent mounting by cementing them in place with a rubber cement or carpenter's or white glue. (See "Goods, Gear and Gadgets," this Journal, September, 1997, p. 182.) Admittedly, a large selection of flat, highly polished fossil shell slabs to work with would serve admirably but none were available. The negative side of handling tumbled stones offers the same problems noted before, i.e., shallow depth of field, poor orientation of internal shells, etc., with the added problem of contending with bright highlights - brilliant bursts of light bounding off the rounded slopes and curved surfaces. If two light sources are used, as was done with many of these and other photos taken, one will have to contend with two possible 'hot spots.' Barring calming down or eliminating these highlights with a polarizing unit (contemplated, but not tried) the answer lies in judicious juggling of the lights coupled with a fussy orientation of the stones themselves. On the positive side, the tumbled stones offered a potentially almost unlimited supply of suitable primary material, conveniently available, very inexpensive, and in highly polished sizes easy to manipulate and store.

While the further problem of some possible surface flaws can be minimized or actually solved by coating with a suitable resin, the major and most frustrating

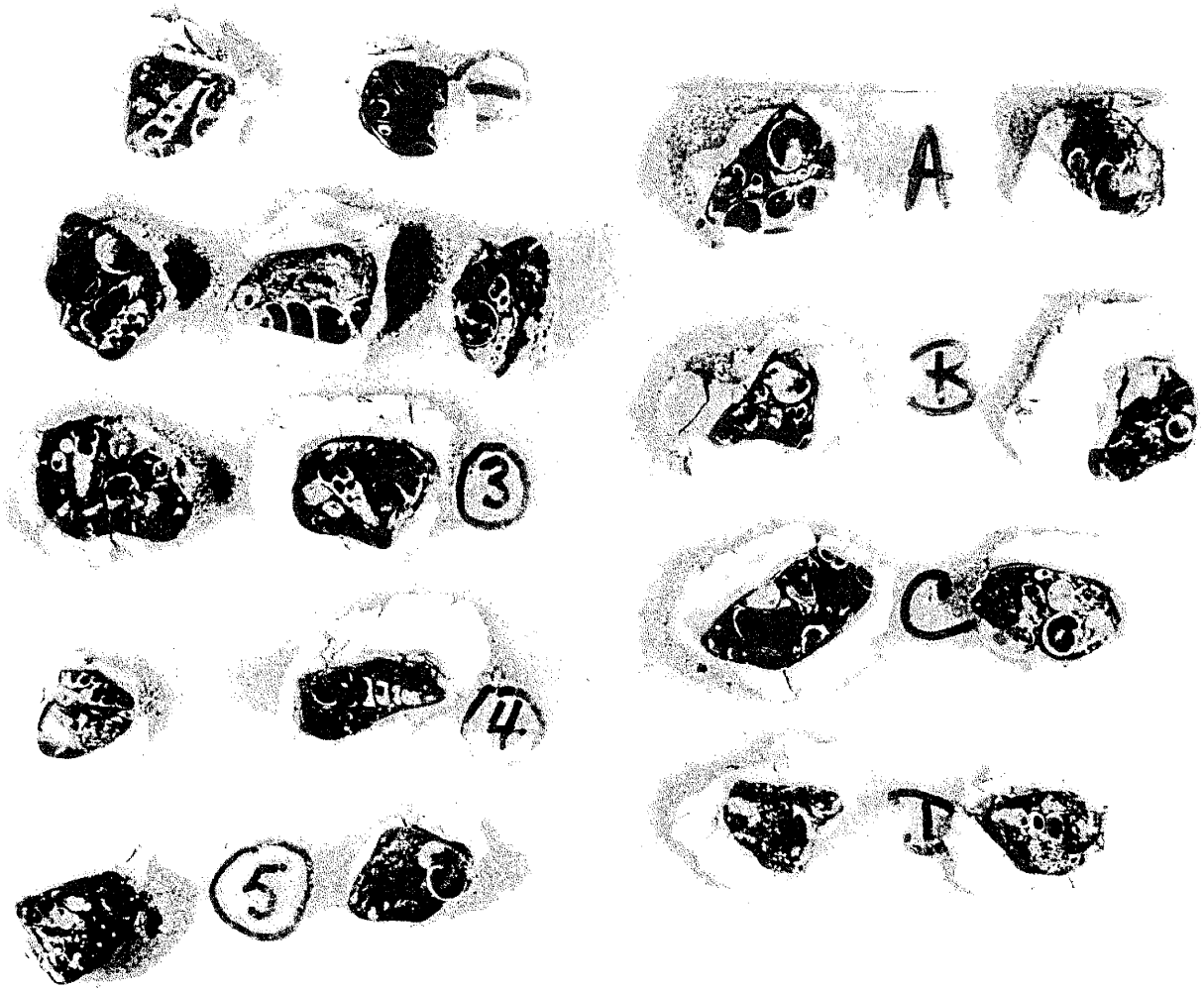


Fig. 3. Working set of 19 tumbled stones mounted on nine standard microscope slides.

problem, as has been noted before, was the lack of a sufficient working depth of field. This problem is a more serious one in photography than with eyeball viewing at the eyepiece where constant focusing up and down can cover a large area in the third dimension of depth. This might be remedied, at least in part, by using a lens system with a built-in iris diaphragm to allow shooting at, lets say, f.16, f.32 or higher and of a nature to allow magnifications in the 50x range, or so. Such a suitable lens on long extension tubes has been suggested. Long exposure times due to such tight diaphragm settings would pose no problem as the subject material is stationary and easily anchored in place. This quality of depth of field, also called penetration in some of the older books, is in inverse ratio to power and angular aperture. This is the basis of the old trick of photographing a subject that has moderate depth, with a lens system of lower angular aperture and reasonable but not necessarily high magnification and on as fine a grain of film as possible. One can then produce a high power photomicrographic print by enlarging the original negative to an impressive highly magnified image, thus achieving a marked increase in the depth of field while still retaining some of the fine inherent details. This is one of the approaches used here.

Figure 6 shows an excellent example of a Turritella shell with three major chambers packed with minute Ostracods. Note the range from black to white and also the variation in size. One has three smaller ones inside. Figure 7 shows a larger Turritella chamber partially filled with the tiny crustaceans. Note the small, elegant black and white Ostracod, like a balancing rock, perched on top of another small shell.

With Figures 8 through 14, we swing to a compound microscope. (All photo details given at the end of the article.) Here, at a higher magnification, the noted lack of depth of field begins to pose a more serious problem. The other way that this was partially overcome was by a patient searching of fortuitously arranged Ostracods that, when in mutiples of two or more, lay on reasonably uniform planes of focus and were oriented to show maximum details.

The high preponderance of jet black, boat shaped Ostracods in these samples, and the tendency for them to

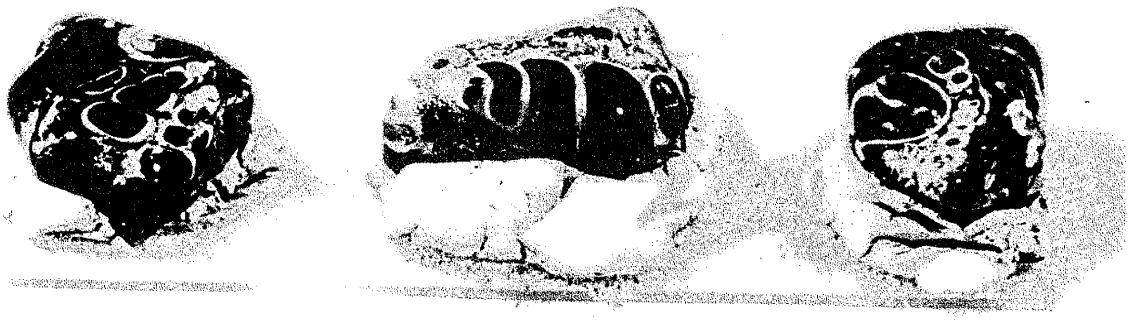


Fig. 4. Three clay-mounted tumbled stones on a 1" x3" microscope slide.

Fig. 5. Close-up of typical tumbled stone with fossil turritella shells mounted in clay. Scale is in millimeters.

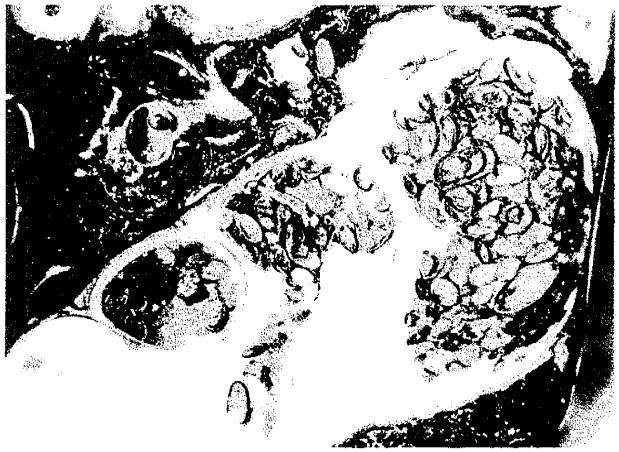


Fig. 6. Turritella shell with three chambers packed with minute Ostracods.

pack tightly together, is illustrated in Fig. 8. Note also the tendency of the sheared shells to pack one inside the other, like nested beakers or Chinese boxes. In Fig. 9, two Ostracods illustrate the possible large difference in shape and size and the bivalve like construction is nicely evident. The larger boat shaped shell is sprinkled with rust red particles and the smaller shell to the right is tan in color with fine black markings. Fig. 10 shows Ostracods that range from black, on the left, to near colorless on the right. The tendency to nest together is again evident. Fig. 11 focuses on two Ostracods, one boat shaped, black and sheared in half and one complete and whole, shaped like a hamburger, and sprinkled with reddish particles. It also illustrates again the bivalve structure of these minute crustaceans. The curve of a white, circular Turritella wall sweeps across the lower field. The total lack of color and exceptional transparency of the agate in this view, created the striking illusion of looking down at scattered bottom material through a clear and undisturbed body of fresh pond water. The walnut shaped Ostracod in Fig. 12 is another relatively rare whole and undamaged crustacean, with fine shell division and dark mottled markings. Fig. 13 was a fortunate find. Against the curved background of a white Turritella chamber, a row of three particularly well preserved Ostracods show marked variation in size, shape and color. The larger one is almost colorless and the one on the right is another with rust red sprinkles on the top surface. Fig. 14 illustrates a number of interesting points. The large black Ostracod was the largest single shell found. The shattered top shows detail in the broken walls and on the frayed and splinted tip, plus an interesting internal structure. The small one below, totally different and shaped like a conquistadors hat, has dark surface markings and another small walnut shaped shell to the left is tan in color and is sprinkled with both red and black surface particulate material. The three offer a thoughtful study in contrasts.

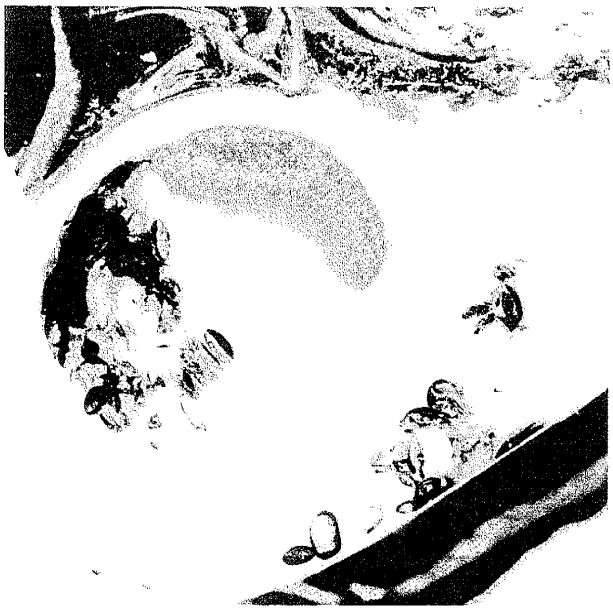


Fig. 7. Turritella chamber partially filled with Ostracods.

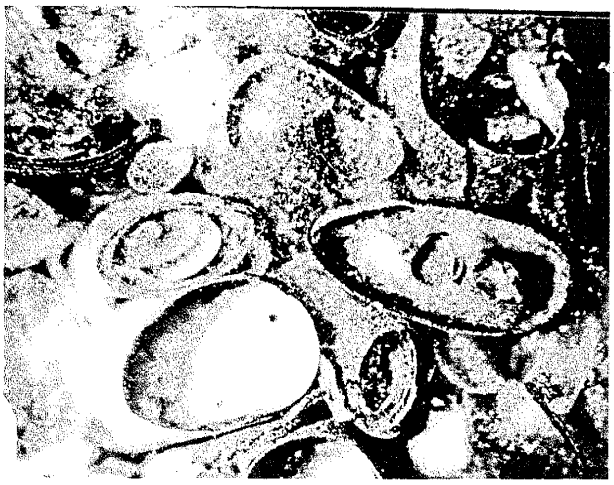


Fig. 8. Tightly packed black Ostracods.

Fig. 9. Two whole and undamaged Ostracods showing different sizes and shapes.

Fig. 10. Isolated group of Ostracods.

The work here, covering an off and on span of about two weeks, allowed interesting insights to a new and different discipline, and allowed developing techniques that might be used for future comparable and perhaps related projects. Whether or not a selection of these or similar photos will augment the text of my friends proposed article lies down the road and in the hands of fate, but in the meantime, this thought provoking and challenging, though somewhat cursory project, has shown again that one of the great pleasures of microscopy is its versatility and power of serving so many diverse areas of interest in the varied world around us.

Notes:

1. The cover photo and Figures 1 through 5 were taken with a 35mm Minolta with a Std. 50mm lens and supplementary lenses of 1 to 4 Diopters.

2. Figures 6 & 7 were taken with a 35mm Pentax, Std. 55mm lens and full extension bellows.

3. Figs. 8 through 14 - A Minolta camera body was used as this allowed a greater choice of eyepieces than would have been the case with my Olympus PM-6 Camera. A convenient combination was a 12.5x Wide Angle Leitz Periplan GF eyepiece with a 3x Wild Fluotar objective. This gave a magnification of 47x on the film negative. With an enlarger factor of 4x, the original 4x5 prints have a finished image magnification of 188x. All specimens were uniformly photographed and enlarged to allow relative size comparisons.

4. All lighting was incident. The cover through Fig. 7 used a conventional two lamp set-up.
Figs. 8 through 14 used fiber optics on the twin flexible arms of an Olympus Highlight 2000.

5. All photos were shot on Kodak 2415 Tech Pan film, developed in Kodak HC-110, Dil. D.

6. Enlarger : Beseler 67 cp, calibrated for height vs magnification plus various Ilford Multigrade Filters.

7. Enlarging paper: Ilford Multigrade IV, medium weight, glossy, resin coated.

9. The prints were developed in Ilford Universal.

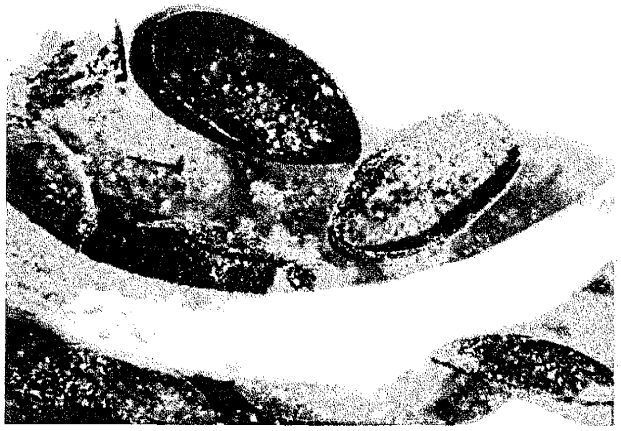


Fig. 11. White curve of a Turritella wall ses off two isolated Ostracods.

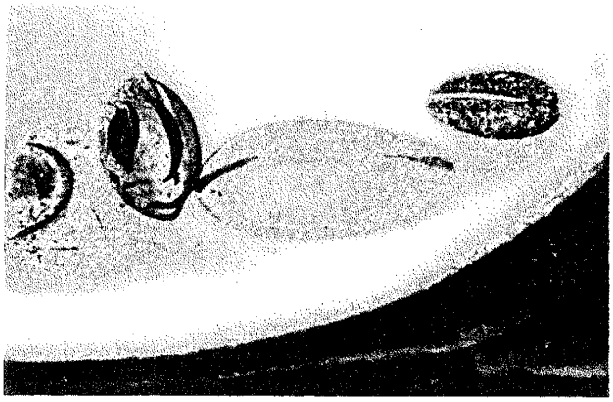


Fig. 13. Three Ostracods line up against the background of a white Turritella chamber.

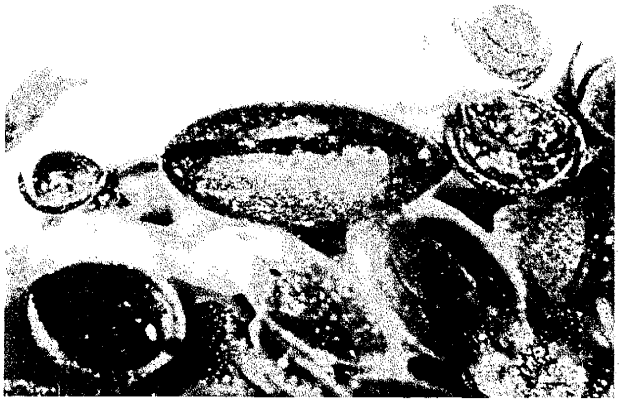


Fig. 12. Single undamaged almond-shaped Ostracod.

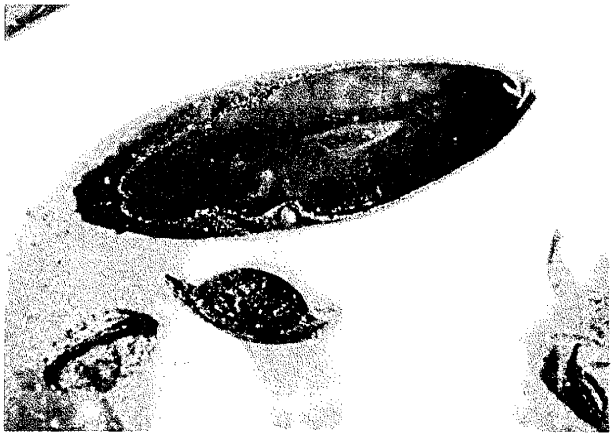


Fig. 14. Three Ostracods. A study in contrast....size, shape and color.

Prospectus

Microscopical Adventures in London & District

A guided tour conducted by Mr Erick Levick, FRMS

8-16 October 1999

Mr Erick Levick, well-known authority on the history of the microscope and collector of Victorian microscopes, will be leading a tour to significant English microscopical sites, institutions and events in mid-October of this year. Other events of scientfic, technical and cultural interest are included. The company will be limited to six, in addition to Mr. Levick, in order to gain access to certain collections not available to the general public, or even to most collectors.

For information, contact Mr. Levick at Spectra Services Inc. 770 Basket Rd. Webster, NY 14580. Or Telephone at work: (716) 265-4320. Home: (716) 217-8741. Work fax (716) 265-4374.

MSSC EXHIBITION MEETING

George G. Vitt, Jr.

The Annual MSSC Exhibition Meeting, held in November 1998, was a resounding success. The participation was outstanding and enthusiastic. The entire available table space in the meeting hall was filled with apparatus, charts, books, drawings and diagrams! Each of the many exhibitors had picked an aspect of microscopy that was both historically significant and technologically interesting. The thought and care that went into the preparation and presentation of each and every exhibit is highly commendable and all the exhibitors are to be congratulated for their fine efforts. We all look forward to this year's Exhibition!

The entire meeting was devoted to each participant giving a short dissertation dealing with his exhibit, and the entire proceeding was ably and efficiently hosted by our Educational Chairman, Jim Clark. George Vitt took many photos which were then scanned and processed in Photoshop for publication. The following descriptions of the exhibits may not be all-inclusive, for which I offer apologies.

Tim Rudnick, a guest at the Exhibition meeting, described his work in the collection and study of various marine creatures off the coast of California. Among the many preserved and jarred specimens he had brought, was a "vampire squid," an extremely rare creature, which he had netted at a great depth. It was about 10" long, and had the appearance of having a toothed hood. Everyone remarked on its forbidding and repulsive appearance! Only an extremely small number of these have ever been caught. He also exhibited an Olympus stereo microscope that he uses in this work.

Leon Stabinsky exhibited several fine microscopes with photos and drawings which illustrated the evolutionary development of the Queckett Microscope.

Leo Milan displayed his favorite and highly reliable photomicrographic outfit which consists of an Olympus biological microscope and a Minolta Mod. XD-11 35mm camera. (Leo is very partial to this excellent camera). Leo also displayed some photomicrographs he had taken of Klaus Kemp's arranged diatom microslides.

Bill Davies won the First Prize at this exhibition with a beautiful and cleverly constructed microscope intended to be used by three observers, as shown in the old illustration. This was Bill's "Nachet Style Microscope Project" which he describes as follows:

The original microscope was acquired during a trip to the UK in 1997. The brass body tube was missing, but the lens and accessory kit was complete, (and the price was reasonable.)

The project was started as soon as a suitable piece of brass tubing turned up. When restored, the microscope didn't look particularly imposing and it was unsigned, so it was just put in its box and stored with all the other "collectibles." About six months ago, one of the MSSC members loaned me a Nachet catalog which has several illustrations of the famous "trois corps" and "quatre corps" three and four body-tube demonstration microscopes. These instruments are rare and also quite beautiful. A trois corps style head was quickly constructed, (using mainly plumbing parts, plus a large brass cap from a marine diesel fuel tank.) The microscope now looked impressive, but it was much too top-heavy for the small Ross type stand. A heavy base was machined from an antique floor lamp stand, and the brass supporting pillars were copied from Nachet illustrations.

Optical systems designed to produce triple images from a single objective were suggested by a couple of club members. One of these designs was quite sophisticated, utilizing multiple prisms, quite ambitious for weekend projects. The current optics are fairly primitive, consisting of a rotatable mirror suspended above the objective and positioned so that the objective back focal plane can be aligned with any one of the three body tube eyepieces.

The only remaining original components on the microscope are the rack and pinion and part of the central pillar. Lacquering was done using an air brush, and a Ferees lacquer kit

Jim Clark gives the following report on his exhibit: My modest contribution to the exhibit was to display one of my Leitz Ortholux microscopes as sort of a tribute to this fine instrument's longevity. Introduced 60 or so years ago as Leitz' top of the line research microscope, a place it held into the early 70's. These instruments featured a modular design which allowed for a wide range of configurations. The microscope I displayed was equipped with their Heine phase contrast outfit. This differs from the more often seen Zernike systems in that it allows the viewer to move from brightfield to phase to darkfield by the simple adjustment of the condenser. In my view, the Ortholux represents an excellent value to the user/collector of to-

day. This opinion is based on the large number available, the almost infinite number of accessories that were offered and, to me, the superb optical and mechanical quality.

Herb Gold displayed a group of fine folding microscopes which are packed in their very compact cases and are ideal for field use where space and weight are at a premium.

Izzy Lieberman, a professional chemist, lately involved in the development of inks for inkjet printers, demonstrated the inner construction of a Hewlett-Packard deskjet printer head. The hole plate had been removed so that the heating channels and the heating elements below it could be seen. Izzy had set up his Leitz Orthoplan microscope with incident illumination for this purpose.

Barry Sobel demonstrated the projection of microscopic objects from Scioptic ball to modern microscope projector with a poster showing the types and evolution of the various devices, and in addition the concept of an "optical cabinet" or compendium along with an example of such a compendium including the projection of a flea through the solar microscope of the same very complete compendium.

Stuart Warter demonstrated the origin and development of the microscope inclination joint, and exhibited a number of microscopes which showed the various types of joints and the chronological stages of their development. These types are:

1. SPINDLE: The earliest of the inclination joints traces its origin to the microscope of Robert Hooke, in which it inclined the body alongside the column. At the bottom of the column, it continued to be used in box microscopes into the 19th Century. This was demonstrated by a small Dolland Chest microscope.

2. BALL AND SOCKET: The second earliest of the inclination joints traces its origins to the Marshall microscope of cat 1700. It inclined the entire column at its base. This was demonstrated by a small French Parlor microscope.

3. COMPASS: The compass joint replaced the ball and socket in the 1 8th Century, providing greater lateral stability. It was used at the bottom of the column to incline the entire instrument upon its base, or at the top to incline the limb upon the column. It characterized the popular Adams, Jones, and Pritchard microscopes, among others. This was demonstrated by an early Victorian English microscope.

4. CRADLE: Used atop the pillar, the cradle suspends the arm between two upright plates, providing better support than the compass joint for the instruments of the Victorian era. It characterizes the later Continental microscopes as well. Demonstrated by an American microscope derived from the Tighe #5 stand.

5. TRUNNION: Popularized by Ross, the arm of the microscope is suspended on projecting pins, or trunnions, resting on upright plates, in the manner in which cannons had been mounted on their supports. It provided a sturdy, low cost solution to the problem of supporting the ever increasing weight of the complex English stands. Trunnion joints were used on both bar-limb and Lister limb instruments. It remains in use today. Demonstrated by a Victorian Student Stand signed by Negretti & Zambra (but made by Parkes of Birmingham).

6. SLIDING: Briefly popular in the last decades of the 19th Century, the sliding joint was an American invention of George Wale, who devised a clamp and groove "joint" which allowed a concentric movement of the arm, maintaining the weight of the instrument above the center of gravity. Demonstrated by Wales' "New Working Microscope"..

Stuart then showed ZENTMAYER'S SOLUTION to the limitations of the inclination joint. Zentmayer provided a prismatic elbowed extension tube for horizontal viewing. This microscope, equipped with a Shadbolt type condenser, was set up for dark field illumination of live animalcules. Demonstrated by Zentmayer's Columbian microscope equipped with prismatic elbow tube.

Stuart concluded with "THE END OF AN ERA". The inclination joint was introduced for the comfort of the viewer. It was satisfactory only for the use of prepared slides; anything else that might flow or slide down an incline would require a horizontal viewing surface. A variety of special purpose instruments, such as the horizontal and inverted microscopes, which used mirrors or prisms were introduced, but proved complex and expensive to produce. So inclination joints that would allow an instrument to be used in either position became standard on all but the least expensive stands. With the advent of cheaper manufacturing methods, prismatic bodies with inclined tubes have become the standard, finally spelling the end of the use of one of the oldest major design elements of the compound microscope.

Ed Jones demonstrated the techniques he uses in his criminalistic investigations to identify fibers, both natural and man made. Ed showed the Michel-Levy Chart which is of primary importance in this work. The chart shows the relationship between birefringence, specimen thickness, and the orders of birefringent colors observed under the polarizing microscope. With the use of the quartz wedge, and knowing the thickness (diameter) of the specimen, the order is determined and the fiber type is identified.

Richard Jefts put on an exhibit of apparatus he had constructed for use in his microscopy work. At the top of the photo is his optical bench type of apparatus for the making of microphotographs, as well as examples of the microphotographs mounted on microslides and positioned on an aperture board for convenient viewing.. Below is shown his reconstruction (with many improvements), of the "Science Gossip" microtome, the original having been written up in the Journal of Microscopy. Besides this apparatus, Richard had prepared enlargements of photomicrographs he had made during his investigations into the presence of diatoms in tooth paste and in mineral tablets.

Larry Albright showed a very clever 'Monkey Microscope' which he had assembled with a small sculpture.

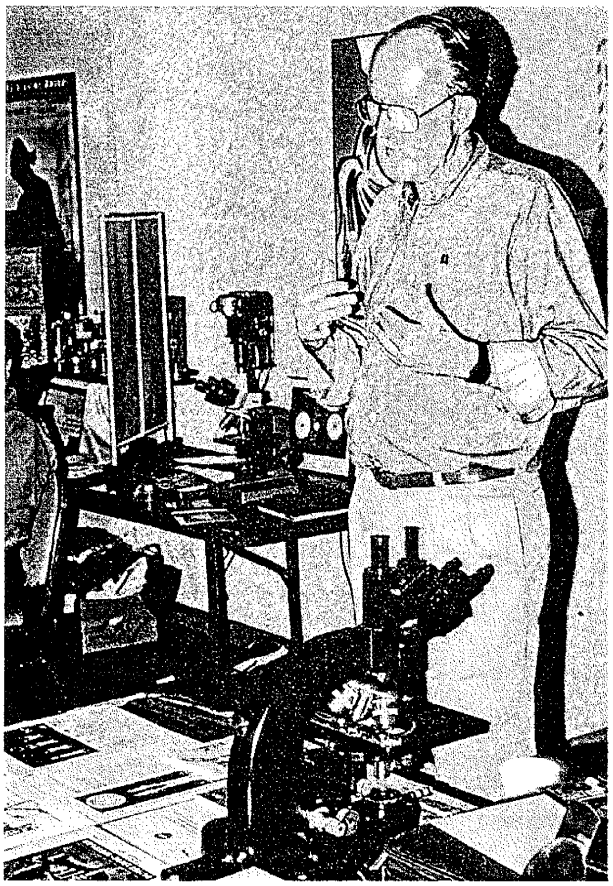
Gaylord Moss showed a Wollaston-prism camera lucida mounted together with a Baker microscope which demonstrated the skill needed to draw with such a device.

Bob Faust provided a microscope viewing the interior of a termite stomach in which one could see the simpler animals that digest the cellulose inside the termite's gut. Bob made the interesting point that although the main product of the sun's energy is cellulose, no higher animals can digest the stuff. From termites to man, we are all dependent on bacteria for this basic food resource.

Dan Cytron showed one book from a rare set of books of national treasure Japanese washi papers. The various materials and techniques employed in their manufacture are fodder for much microscopic study.

Jim Solliday showed a fine projection microscope, demonstrating its use for both horizontal and vertical projection. Dave Hirsch volunteered that his grandchildren are entertained for hours by putting things in his own projection scope.

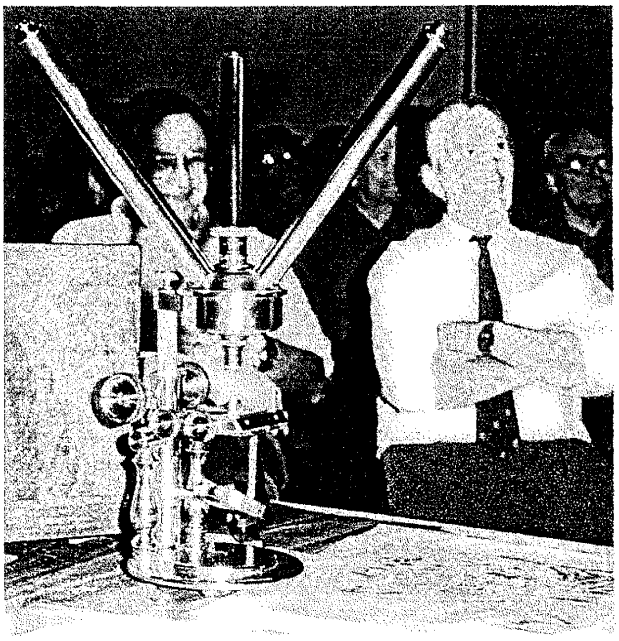
Ken Gregory had found photographs of Ramon y Cajal, the first person to use Golgi stains to determine the structure of the brain; work for which he shared the Nobel prize with Golgi soon after 1900. In these photographs, Cajal had three microscopes; a Verick and two Zeiss. By the clothing and other features, the two photographs appeared to have been taken only a few months apart circa 1887. Remarkably, Ken had examples of these exact microscopes in his own collection which he showed as part of his exhibition.



Jim Clark with his Leitz Ortholux.

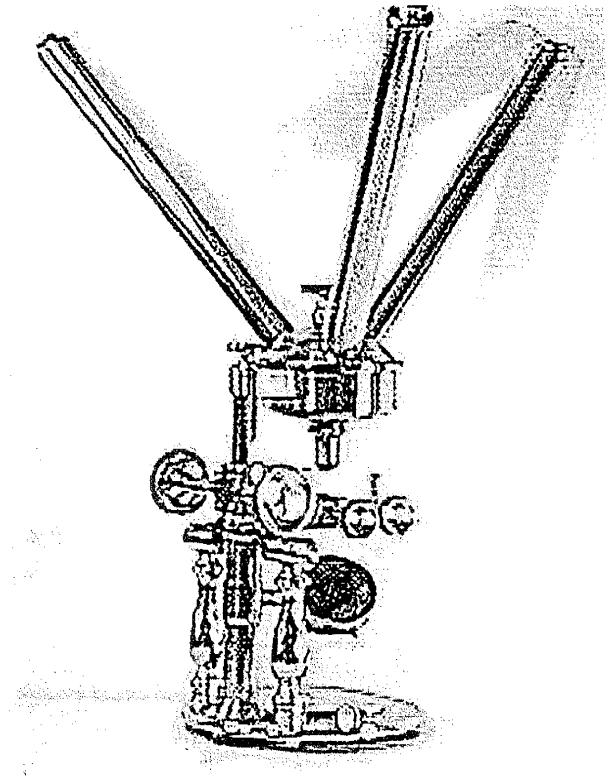
Alan deHaas with stereo scope.

Bill Davies with with illustration of Nachet "trois corps" microscope.

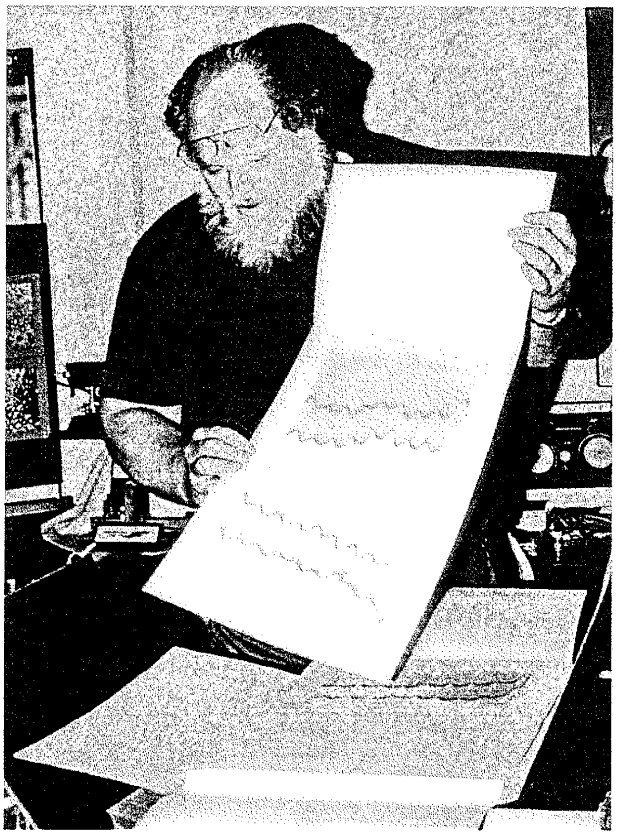


Bill Davies with his magnificent "trois corps" microscope.

"Trois corps" microscope in use.



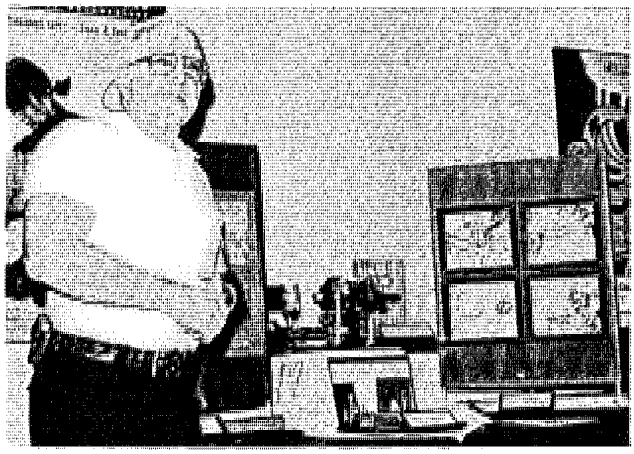
"Trois corps" microscope illustration.



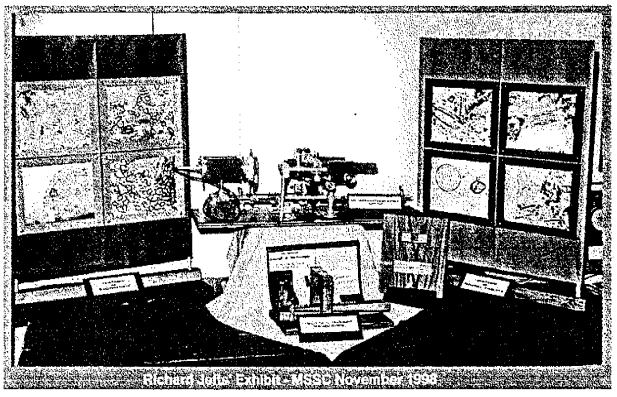
Dan Cytron with Japanese washi paper collection.

Herb Gold with his display of folding microscopes including the model used on the MSSC logo.

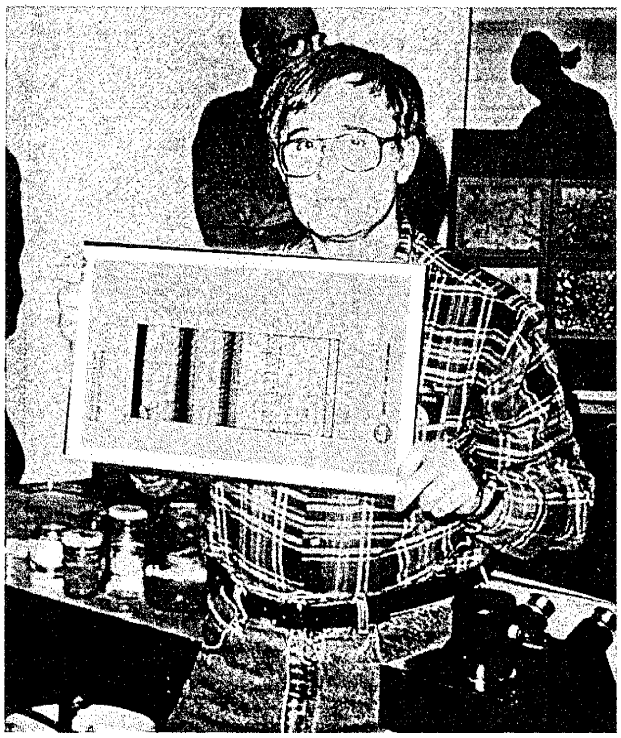
Ken Gregory with his examples of the two Zeiss and the Verick microscopes that were used by Ramon y Cajal in the first use of Golgi stains to analyze the structure of the brain.



Richard Jefts with his photograph and apparatus display.

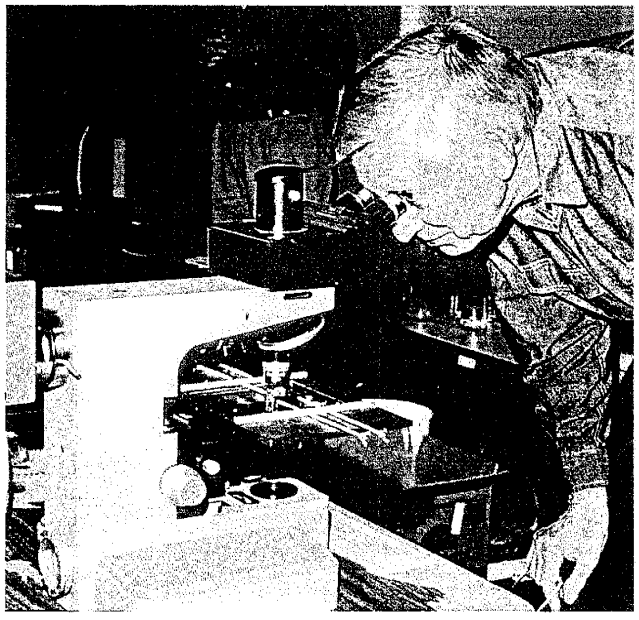


Richard Jefts' display of microphotographs, optical bench for making microphotographs and, center below, his reconstruction of the "Science Gossip" rocking microtome.

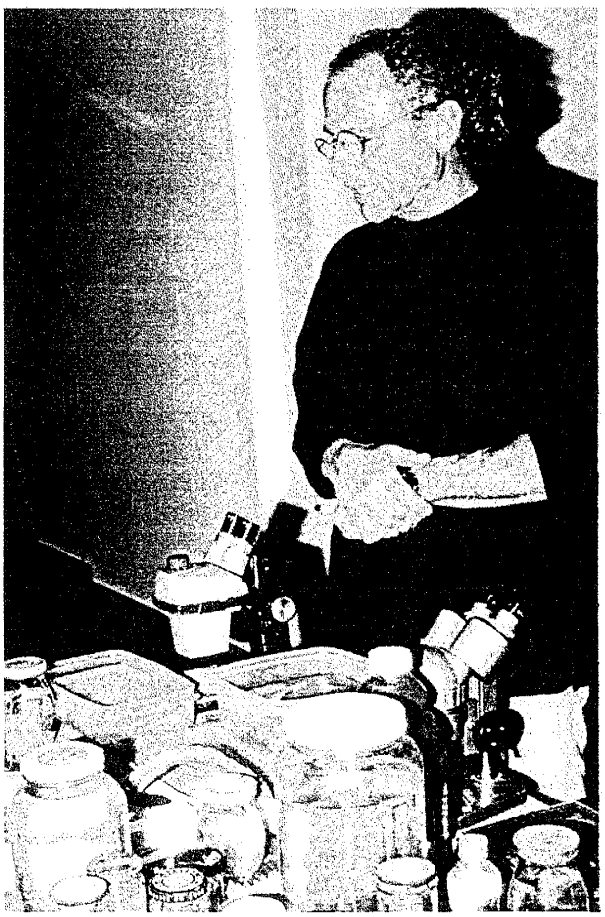


Ed Jones with the Michel-Levy chart used in his criminalogy studies to identify fibers.

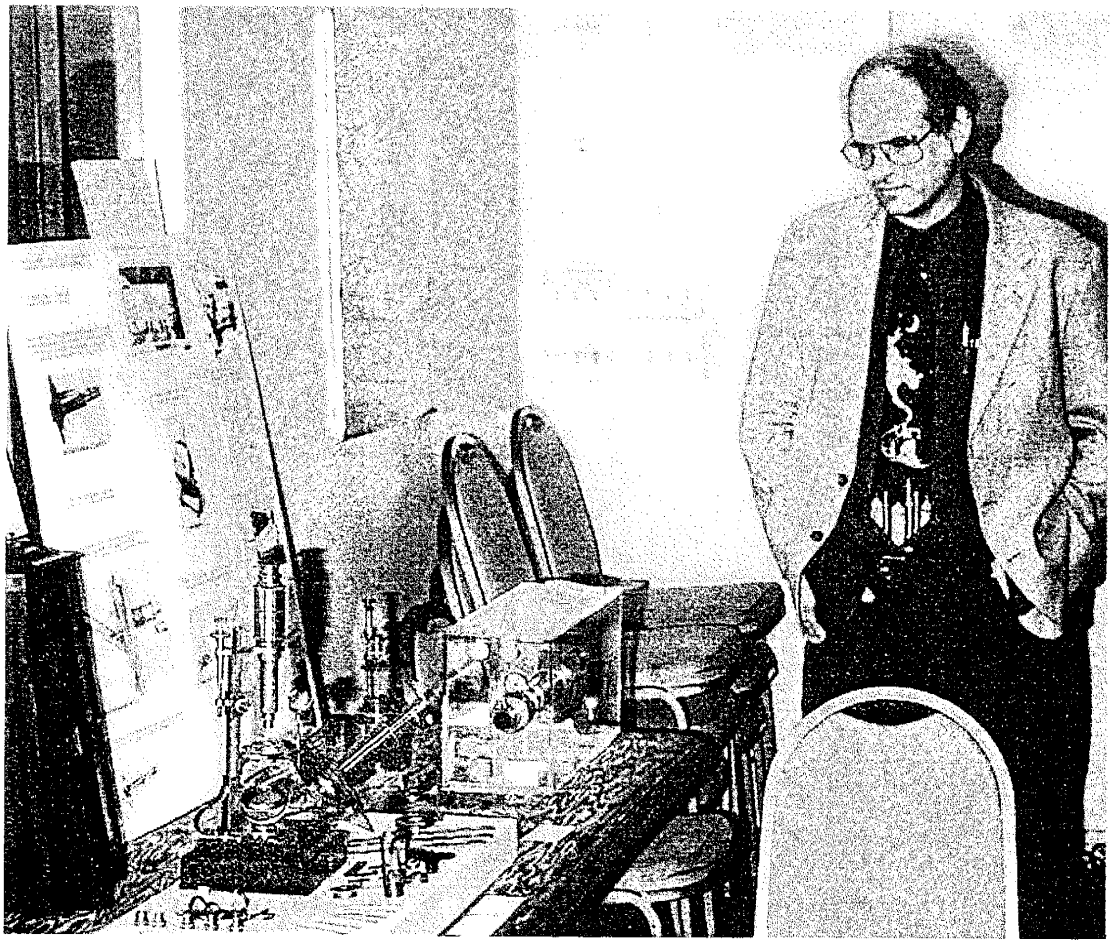
Leo Milan with his Olympus and Minolta photomicrographic setup.



Izzy Lieberman with his exhibition of a Hewlett-Packard inkjet print head.



Tim Rudnick with his display of sea creatures.

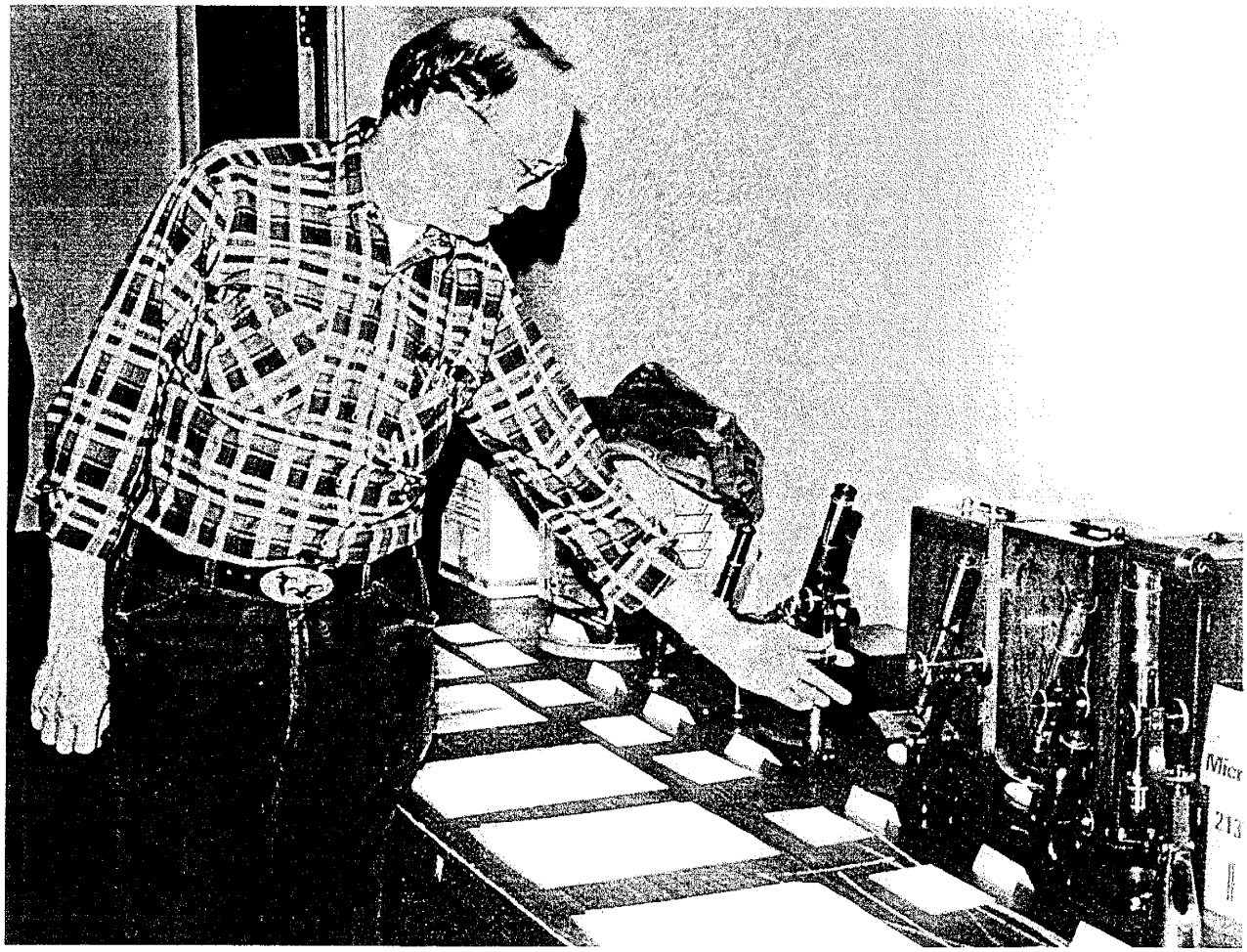


Barry Sobel with his compendia including solar microscope setup.

Jim Solliday with his projection scope.

Leon Stabinsky and his Queckett microscope.

l. to r. Alan deHaas, Julian Pulido and Jim Solliday.



Stuart Warter and the development of the microscope inclination joint.

Notes on THE MSSC MEETING OF 21 APRIL, 1999

David L. Hirsch

So far, MSSC has 85 paid members, a fact which came down on me with gusto when I realized that the membership cards were forthcoming. With herculean effort, a good portion of cards were distributed among the members attending tonight's meeting. Corresponding members will receive their ID cards along with the May, 1999 MSSC Journal.

JIM SOLLIDAY kicked off tonight's meeting by reminding one and all to bring pond water to the next regular meeting. Who knows what manner of wee beasties might make their debut under the probing lenses or our intrepid and curious members!

MSSC meetings are always upbeat, but this evenings cameraderie was diminished by a factor of one, namely HERB GOLD. Herb is undergoing a mending process after a recent automobile mishap. Hey, Herb - we all miss you, buddy, so get well fast!

ALLAN deHAAS was his usual dynamically erudite self as he spoke on the subject of:"Making Pictures Easier To See", whereby he reviewed various techniques for enhancing the observatiion of objects which might ordinarily present viewing problems. Allan drew spirited questioning from the floor indicating that the membership was paying attention. Allans' dad, JOHN deHAAS, added a note or two to Allans' discourse. Who can deny that the presence of these two scientifically accomplished gentlemen is more evidence of what MSSC is all about!.

Some members, especially those of us using ink jet printers in conjunction with our computer systems, were concerned with the relatively poor archival quality of ink jet printing. Izzy Lieberman, our resident writing material chemist, enlightened us on the use of pigments which, unlike most inks are not susceptible to fading caused mainly by exposure to ultraviolet light.

Two mini-slide shows were presented. LEO MILAN showed several slides of various diatom arrangements from his vast collection. From his recent field trip to South Dakota, DAVID PERUNKO showed pictures of fossil formations found in sedimentary deposits. Closer to home, fossil clams are one type of former fauna found in Malibu. As proof, I will bring a sample to a future meeting.

Show and tell is another happening that MSSC members look forward to; about as much as we do for those delicious home baked cookies provided for the coffee breaks. KEN GREGORY led the pack by displaying a small Leitz, circa 1885 Continental stand. It featured sliding course focus and a lever type fine adjustment, controlled by a knurled knob atop the column. A second Leitz stand, circa 1930, featured a design which allowed separation of the arm and tube assembly from the base.

Although my knowledge of the Japanese language is limited to words such as sayonara, benjo and arigato, the words on the front of that beautiful oak carrying case proclaimed to the world that inside, was a pristine folding microscope, accompanied by a comprehensive variety of accessories. This Toyoda, circa 1940 was the epitome of craftsmanship, and was shown by proud owner, JIM SOLLIDAY. LARRY ALBRIGHT comes up with some unusual instruments. This time he displayed a Russian inspection microscope. The storage case also served as the base for the instrument. A WWII astro compass was shown by STEVE CRAIG. The AAF navigator (who must be a very old man by now) was able to verify position by the stars during a mission.

A circa 1840-1850 Oberhauser drum type, continental design microscope was shown by STUART WARTER. - and hey! didja get a look at the beautifully restored Leitz Continental microscope? It was undoubtedly the handiwork of Master Restorer JOHN deHAAS. Corresponding Member, JOHN BELL sent a simple microscope to ALLAN de HAAS. The circa 1820 instrument fits into the drawer in its base. It is attributed to de Raspail of France.

WORKSHOP of the Microscopical Society of Southern California

by: George G. Vitt, Jr.
Date: Saturday, 3 April 1999
Location: Ernie Meadows' residence.

George Vitt introduced two young ladies, **Anastasia** and **Alexandra,** the daughters of his niece, Katherine. They are here for 'a week with George' from their home in Castro Valley, CA, where they are both "A students".

1. **John de Haas** announced that he has been preparing his many microtomes, embedding equipment, etc., in preparation for giving a demonstration of some techniques involved in the sectioning of specimens. John intends to have one or two sessions at his home for a group of no more that five persons. We wish to thank John for this valuable instruction that he has planned. Plaudits are particularly appropriate in view of the fact that the average weight of his microtomes is about 70 lbs., and John had no fork lift to put all these instruments in place! Thanks, John - we look forward to this workshop.

2. **Ron Morris** announced that he will prepare microslides of some unusual, and very personal, biological specimens. These will be biopsy sections taken from him during the course of recent surgery! How's that for the ultimate degree of devotion to microscopy?

3. **Dave Hirsch**, our MSSC Treasurer, announced that we have 85 dues paying members and that Peter J. Bruce of the British Postal Microscopical Society has recently joined the MSSC.

4. **George Vitt** discussed some aspects of the "Emboss" filter incorporated in Photoshop software. He then recounted the newly established contact with McBain Instruments Inc. which may well be a source of speakers for our regular meetings.

5. **Jim Solliday** spoke on the theme of traveling microscopes, making the distinction between 'traveling' and 'portable' microscopes: the former has standard features such as a standard tube length, etc., while the 'portable' may sacrifice some of the 'standard' features. Jim then showed an 'educational microscope' by Smith & Beck, c.1860, where a plate containing the microscope and lenses slides out of the very compact case. The outfit contains a bullseye condenser, substage diaphragms, and Lieberkuhn. Coarse focus is by a friction tube and fine focus is by a micrometer screw. A second plate contains a polarizer/analyzer, trough, stage micrometer and live box. It was remarkable how much equipment could be packed into such a compact case. Jim then showed a Spencer Mod.60 physician's traveling microscope, a brilliant American design, to say the least! (It happens to be part of the MSSC Logo). It has normal coarse and fine focus adjustments, and comes with a complete hematological lab. The hemocytometer can provide for the determination of the white blood cell count to see if there is an infection, and the extent of it. Jim pointed out that "CBC" stands for 'complete blood count', while blood smears are used only for studying the morphology of the white blood cells (abnormalities, etc.). Jim then showed a Leitz traveling microscope, c.1903.

6. **Ken Gregory** showed a c.1907 B&L traveling microscope with 'jug' handle, with top of the limb fine focus, cased, with objectives and eyepieces.

7. **Herb Gold** showed a cleverly designed Leitz traveling microscope. It was noted that the arrangement of parts in the case was practically identical to that shown by Ken, above.

8. **Stuart Warter** showed a cased Reichert traveling microscope. He also showed a c.1846 cased Ross folding microscope Stuart's third microscope was made by Abraham, Liverpool, c.1838, with 'direct screw' fine focus, with the stage racking for coarse focus. It is cased with a bullseye and two objectives.

9. **Larry Albright** showed a Victorian pocket microscope and a Japanese Tioda folding military microscope in its aluminum case. He then showed another, somewhat larger, Tioda folding microscope in a wood case with leather handle. The microscope is configured very much like the familiar small Spencer. Larry then showed a B&L folding microscope with a B&L 10X Apo objective; a pre-Victorian single lens microscope similar to a Leuwehoeck, and a small c.1920 portable field microscope of standard tube length, with substage condenser.

10. **Gaylord Moss** told about his new UMAX flatbed scanner with 1200 l/in optical resolution and showed results of scanning photos, insects and other subjects.

11. **John de Haas** showed a stereo microscope that he had put together from parts of four other microscopes!

12. **Richard Jefts** spoke about his diatom collection and the processing of diatoms for slide preparation, stressing the dangers involved in using strong acids for the process. To avoid this problem, Richard showed a glass condensing apparatus he uses for the boiling acids where the fumes are condensed internally and none escape into the lab. environment. He then showed a Czech book, *Life Under the Microscope*, by Jerovec, Spring Books, London, 1969.

13. **Dave Hirsch** showed a cased Wenham type binocular microscope.

14. **Steve Craig** thanked members of MSSC for their support and for re-arranging his lab in preparation for doing some motion picture work. Steve reported that he had ordered a large amount of live pond-life microorganisms from Carolina Biological Co., which he will photograph in video and on 35mm. He invited the membership to come and get some samples of these 'critters.' He asked for some husky volunteers to move some file cabinets to make room for this work.

15. **Kate McDonald** announced that UCLA is having a 'book fair' sale with 25% discounts.

16. **Ed Jones** spoke of comparing hair samples using light microscopy, where the comparison microscope is the 'body & soul' of this technique. Ed gave an example of making multi-sections from a single hair - to show its cross-sectional shape and its color.

17. **Jim Clark** showed a simple dissecting microscope of unknown Japanese make, with r/p focus. He recommended that we take a look at <www.molecular expressions.com>

18. **Jack Levy** showed a marvelous OLD book, a 1638 copy of the 1602 First Edition of a book, in Latin, on insects by Ulysse Aldervondi, who was the first to make an attempt at classifying insects (as to their being terrestrial, aquatic, etc.), which classification he had included at the front of the book. He also showed a sample holder he had devised (hollow sphere, magnets) for photographing things such as butterfly eggs.

19. **Ron Morris** thanked the members for their moral support and sympathy on his recent operation. Ron showed a small drum microscope with bullseye and also a Nikon PF-M (manual) and EFM (with photocell and 35mm) photomicrographic camera attachments (for sale).

20. **Tom McCormick** reported that he "is feeling OK".

21. **Allen Bishop** showed a black & chrome Zeiss Winkel microscope that he got via ebay. Allen had for sale a carrying case for a Spencer. He also has for sale a B&L Metallograph complete with apochromats and remote focusing. Allen announced that he has a Zeiss Neophot in his dining room, where he spend 20-30 hours cleaning and restoring it!

22. **John Fedel** had brought for sale a Heiland Repronar, used for copying slides (35mm full and half frame, and other transparencies up to 2.25x2.25". George Vitt is now the proud owner.

23. **Alan de Haas** showed a mystery object - a fiber optic 4-color coded light pipe which he surmises had been designed for multi-color colorimetry.

"Errata" for the March workshop writeup.

The discussion of the McIntosh microscopes was conducted by **Jim Solliday**, and not by **Stuart Warter**. Jim had contributed the two McIntosh microscopes mentioned in the writeup, and **Larry Albright** had contributed two more.

Stuart Warter had brought two models of Smith and Beck student microscopes. The smaller Student Microscope was No. 643, made in 1852, and the larger, Best Student Microscope was No. 1287, made in 1856. Both had the reverse claw foot which typifies these tall, slender microscopes, and were housed in compact fitted travelling chests, along with accessory condensers, polarizers and analysers. These relatively inexpensive (but not cheap) microscopes were added to the company's line after Richard Beck joined James Smith's firm, which previously had produced only a limited number of costly instruments. Smith & Beck Student microscopes were championed by Carpenter (one served as his own personal microscope), and were heavily relied upon for illustrations of the microscope in use in his early books.

Hardwicke's Science-Gossip 1875
Notes and Queries

A Novel Mousetrap

The Sussex Daily News states that at Augmering a singular and amusing incident occurred at the house of one of our villagers the other day. It appears that a mouse, being hungry, ventured on the kitchen table. Seeing some oysters with their shells apart, he made up his mind to a quiet repast. He accordingly inserted his head between the shells of one, but the bivalve being still alive, objected to this intrusion, and closed its shell, killing the mouse upon the spot. Several persons were in the room at the time, and can testify to the accuracy of this account.

Courtesy of Larry Albright

A Brief History of the Microtome

James D. Solliday

Last Saturday, after the regular workshop (May 1, 1999), a group of six members met at the home of Dr. John de Haas for a demonstration of the use of the microtome. As usual, John was enthusiastic and informative. Regardless of a bad back, John had assembled a half dozen "heavy" instruments for our instruction. He first described the history of the examples in front of us and proceeded to demonstrate the mechanical action of each. The mini-workshop ended up with all present getting the chance to cut sections from embedded paraffin blocks. Sections of 3μ were achieved at the hand of our host. Examples of some of the microtomes demonstrated were automatic sliding types (sledge), rocking, rotary and examples of the type introduced by Minot. All who were present at the meeting are grateful to John for the willingness he continually exhibits to share his vast knowledge and experience.

As a result of this mini-workshop, I have put together a brief account of the important historical benchmarks associated with the development of the microtome. The nature of the compound microscope led early users to work out methods of cutting thin slices of the material under study. The use of transmitted light and the depth of field of the higher powers required innovative techniques to properly view the subject. The study of wood was one of the first materials to inspire the need for developing sectioning skills. In 1770, Sir John Hill (c.1707-75), author of *The Construction of Timber* (1770) was probably the first to use a manufactured microtome. The design was invented by Mr. Cummings and made by George Adams of London. Adams referred to it as the Cummings' Cutting Engine (L. Woodruff, Microscopy Before the Nineteenth Century., *The American Naturalist*, Vol. 73, 1939). Adams included an illustration in his contemporary catalogue. As expected, Hill was to use the instrument to cut wood sections and, in the process, also made use of alcoholic cochineal in the staining of his stems (H.J. Conn, *Ciba Symposia,* Vol. 7, No. 12, March 1946). Hill claimed sections could be cut no thicker than 2000th of an inch. (Hill published over 80 works on natural science, including the first Linnean flora in English).

Over the next one hundred years, a number of makers manufactured cutting engines with slight variations to the George Adams model. Continental makers also provided a variety of models to meet the demand of a growing number of researchers. In fact, in 1875, Rudolf Jung (c.1846-1900) established a business in Heidelberg, Germany that specialized in manufacturing microtomes, ophthalmic & physiological apparatus. Eventually this became part of the Reichert Group. In 1881 the firm of Ernst Leitz listed their first microtome (Keller, 1996). In 1883, Cambridge Scientific Instrument Co., of Saint Tibbs Row, Cambridge, England. issued their first price list. By the turn of the century, their rocking microtome was illustrated in the catalogues.

John deHaas at home with his newly acquired Karl Zeiss Ultraphot 1 microscope presented to Prof. deHaas by the faculty at the University of Southern California.

In America, progress continued with a number of workers demanding quality instruments. During the year 1887, Zentmayer made, for Prof. Ryder, an automatic microtome (*AMMJ,* 1887). And finally, in 1906, the well known design according to Minot was developed and eventually manufactured by Leitz. Both Spencer and Bausch & Lomb produced an extensive line of microtomes, which began before the turn of the Century. Many of the latter were demonstrated by our expert Dr. John de Haas. Both Spencer and B&L issued a large number of catalogues specifically dedicated to the microtome. The use of the microtome has been the most important adjunct to the microscope, opening the door to the field of histology. Even the introduction of the electron microscope was, for some time, dependent on the microtome, forcing the development even higher. We look forward to Dr. deHaas's next mini-workshop.

Sigmund Freud the Microscopist

Allen Bishop

For many years, I have had a passing interest in the life of Sigmund Freud, but never to the point where serious historical research was entertained or a biography read through. Recently, however, I ran across a newly published guide to the Freud Museum, entitled, *20 Maresfield Gardens*, which was the London address of Freud's last home in the Hampstead district. Built around 1920, the house was purchased in 1938 by the doctor for himself and his family after his rapid departure from Vienna. Not only was Sigmund Freud Jewish, but also his pioneering studies and practice in human psychology were not exactly in accordance with Nazi philosophy (understatement). According to an article in the *Daily Herald* for June 6, 1938, Freud's liberation was ransomed, evidently by American cash; the doctor was met in Paris by the U.S. ambassador on his way to England. Freud was escorted by a descendant of Napoleon's, Princess Marie Bonaparte, also a psychoanalyst.

The property in Hampstead was purchased for £6,500 and Freud's daughter, Anna, also a psychoanalyst lived out her life there. Today, this residence would command nearly half a million pounds or more on the London real estate market. Anna Freud ensured that the property and all its contents were preserved for posterity. It is in a superb state of preservation-yes, right down to the famous couch!

All very interesting, but how does this relate to our studies of the microscope? You may recall that Sigmund Freud was a medical doctor. His specialty was neurology; the disciplines we know today as psychiatry, psychology and analysis did not exist when Freud became an MD. There were reasonably humane hospitals for the mentally disturbed. Neurotic and psychotic syndromes were generally referred to as "nervous hysteria" and many dedicated doctors in all countries were baffled as they worked to treat these conditions. Freud's pioneering development of the "talking cure" has been thoroughly documented and is far beyond the scope of this article. Some of his terminology and conclusions may draw a chuckle today, but so does the work of Newton and Ernst Abbe.

As a 19th Century physician, Sigmund Freud was proficient in the use of the microscope as well as rapid preparation of specimens for immediate pathological examination. He was also versed in the fixing of permanent slides for histological studies. Can you imagine what a set of slides signed "S. Freud" would fetch today? What make and model of microscope did he use? I have no idea. If found and identified, it would certainly be one of the most priceless stands in the world. Since Freud was from Vienna, an educated guess would be a Reichert, but any particulars are lost to my knowledge.

The guide refers to a paper in their archives by Freud that was published in 1879. It concerns the preparation of nerve tissue for microscopic examination. This caught my interest immediately and led to a phone call to the museum. I was informed that they retained several papers by Freud on the subject of microscopic preparation, and that one of the doctor's methods of fixation was pioneering. Less than two weeks later, copies of these documents appeared in the mail. One is a translation into English, the other three are in the original German. I append herewith the text of the English-language document. The other papers, while not lengthy, will require translation, and considering that it has been more than 20 years since I studied German, your patience is indulged!

Interestingly enough, on the back page of one of the documents is a photomicro of bacteria. It is captioned "Rob Schwann del 17.2.84" and Zeiss 1/12 01 Immers. Ocl.4" (eyepiece Nr. 4). I am assured that this has no reference to the appended paper by Freud.

I would like to thank Michael Molnar of the Freud Museum for his prompt attention to my request for the Freud papers.

References:

1. *20 Maresfield Gardens: A Guide to the Freud Museum*, Pub. Oct., 1998, Serpent's Tail, 4 Blackstock Mews, London N4. ISBN 1-85242-536-9. $25. paper. Avail. in the USA through Beeksbee Books, St. Paul, MN. 612-690-0907.

2. Facsimile of front page article, p. 9 of guide.

3. Guide, p. 109, footnte 5.

4. The Documents are as follows:
A New Histological Method for the Study of Nerve-Tracts in the Brain & Spinal Chord (sic). Publ. in *Brain, a Journal of Neurology*; XXV. April, 1884. Appended herewith. Freud Museum Document #5489.

Notiz uber eine methode zur anatomischen praparation des nervensystems. Publ. in Sep.-*Abdr. a.d. centralbl. f.d. med. wissensch.* 27 Mai 1879, Nr. 26. Freud Museum Document #5554.

Eine neue methode zum studium des faserverlaufs im centralnervensystem. Publ. in *Sep.-abdr. a.d. centralblatt f.d. med. wssenschaften*, Feb., 1884, Nr. 11. Freud Museum Document #5499.

Eine neue methode zum studium des verfaserlaufs im centralmervensystem. Publ. in *Archiv fur anatomie und physologie*, n.d.; monograph reprint signed & dated by Freud, 28.6.84. Freud Museum Document #5497. Brief examination indicates that the contents of this paper are entirely different from the foregoing, though titles are the same.

In: *BRAIN:A JOURNAL OF NEUROLOGY* XXV APRIL 1884

A NEW HISTOLOGICAL METHOD FOR THE STUDY OF NERVE TRACTS IN THE BRAIN AND SPINAL CHORD

BY DR. SIGM. FREUD,

Assistant Physician to the Vienna General Hospital

In the course of my studies on the structure and development of the medulla oblongata, I succeeded in working out the following method which will be found a powerful aid in tracing the course of fibres in the central nervous system of the adult and the embroyo.

Pieces of the organ are hardened in bichromate of potash, or in Erlicki's fluid (2 1/2 parts of potash and 1/2 of sulphate of copper to 100 parts of water), and the process of hardening is finished by placing the specimen in alcohol; thin sections are cut by means of a microtome and washed in distilled water.The washed sections are brought into an aqueous solution of chloride of gold (1 to 100) to which is added half or an equal volume of strong alcohol.This mixture is to be preferred to the simple aqueous solution of chloride of gold which has hitherto been used in staining preparations; the sections are to remain in it from 3 to 5 hours. With the aid of a wooden rod (metal to be avoided) they are taken out of this solution, washed in distilled water and placed in a concentrated solution of caustic soda (1 to 5 or 6 of water)j; which very soon renders them transparent and slippery. After 2 or 3 minutes, the preparations are taken out of the soda with the same wooden rod (toothpick or match) and the superfluous soda is allowed to drop off. The sections are then, with the soda they still contain, put into a 10 percent solution of iodide of potash where they almost immediately receive a tender rose-colouring which changes into darker hues of red during the next 5 to 15 minutes. Now, if the preparation be from the nervous system of the adult, it may be simply washed in water and transferred into alcohol, to be mounted in the usual way. But, if it be of the brain or spinal cord of the new-born or the embryo, this treatment would spoil the section, by causing it to shrink, and throwing it into folds. Therefore, these preparations must be brought upon a glass-slide by means of a camel's-hair brush, and dried by gently (without pressure) covering it with a piece of filter paper. If the sections be very thin and soft, even this must be avoided; for the fibres of the paper would leave traces on the surfaces of the sections, and render them unfit for the study of the nervous elements. Nothing else can be done but to apply a piece of filter-paper to the edges of the stained preparation lying on the slide, and to draw off the alkaline fluid in this way.This is by far the most tedious stage of the process, ye it is always possible to avoid shrinking and to preserve the most sensitive preparations. The sections nearly dried are allowed to remain in water a few minutes, and are then treated in the way mentioned above.

This method will never fail (as all methods of staining by chloride of gold will do) if the specimen be not overhardened and brittle, as it is sure to be if kept in the hardening fluid an inordinate length of time. In order to stain the central nervous system of the adult, the method just described may be modified in many ways; but satisfactory preparations from the new-born or the embryo will require scrupulous attention to the details mentioned.

By this method, the fibres are made to show in a pink, deep purple, blue or even black colour, and are brought distinctly into view, while the grey substance, vessels and neuroglia, lost in the slightly tinged background, are not obtruded upon the attention of the observer.A good many fine fibres, which cannot be revealed by carmine, and were not known until the methods of Exner and Weigert came into use, are seen scattered everywhere throughout the white and grey substance. In the adult, the big nerve-cells also appear, and the ensemble of fibres is much too complicated for analysis; in the new-born and the embryo, the nerve-fibres alone are strikingly brought out, and those bundles which are already possessed of a medullary sheath, are distinguished by darker colouring from the others. Examined under higher powers, the single axis-cylinders are so well defined as to enable one to count their number.

While this method is not adapted to the study of the grey substance, it is believed that it will prove of great service in the study of nerve-tracts, particularly if the central nervous system of the new-born or the embryo be made the subject of investigation.

MSSC June Meeting
Wednesday, June 16 at 7 PM
Crossroads School,1714 21st Street
Santa Monica, CA

Museum Forensics at the Getty Center

Narayan Khandekar PhD.

Dr. Narayan Khandekar will describe the research programs at the Getty Conservation Institute. He will describe the kind of questions asked of the Institute as well as the answers gained from the various methods of analysis in which various types of microscopy plays a large part. The information gained from this museum forensic work in telling how objects were made helps curators determine the history and authenticity of a given object.

Some methods used are pigment dispersal analysis of paint cross sections, Fourier transform of infra-red information, and X-Ray fluorescence.

Dr. Khandekar has a PhD in organic Chemistry from the University of Melbourne and has studied painting conservation at the University of London Courtauld Institute. He has worked at the Fitzwilliam Museum at the University of Cambridge and at the University of Melbourne. This promises to be a fascinating tour of the forensic research at the Getty.

Editor's Note. My apologies for the slip in publication dates of the Journal for the last few months. The press of other obligations has put me behind, but I hope to catch up in the next couple of months. Please, if you have been planning to write an article, finish it and send it in. Having publication material ahead of time will make it much easier to compress the schedule.

Gaylord Moss

Saturday Workshop - July 3 9AM

At the home of Marj and Ernie Meadows
707 Greentree Rd. Pacific Palisades, CA 90292
310-459-4788

Directions-Take Brooktree off of Sunset Blvd (Brooktree is the first turnoff east of Chataqua). Then the first right off of Brooktree is Greentree. Go to end of Greentree main road, park and walk up wooded lane to Meadows' (first house on the right up the lane).