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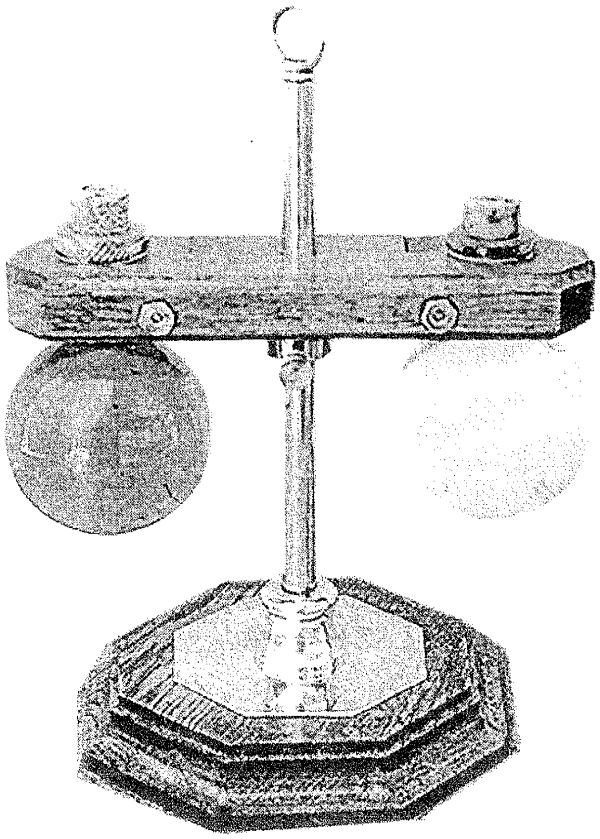
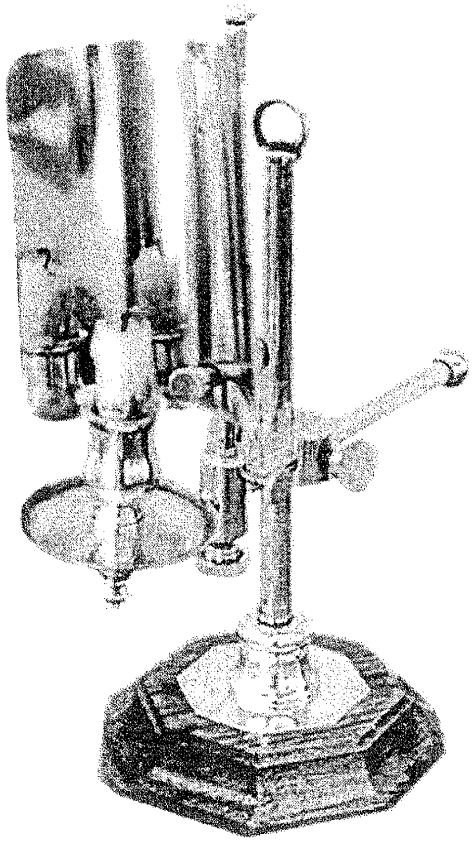
MICROSCOPE ILLUMINATION IN DAYS OF YORE.

David L. Hirsch





Light is that part of the electromagnetic spectrum visible to the naked eye. In conjunction with the microscope, it enables us to see magnified images. The object is defined by light reflected from it, as variations in shapes and shadings. To implement the optical process in situations where daylight is not extant, it may be necessary to have supplementary sources of illumination. In the period before electrically powered light sources became available, illumination options included tallow and spermaceti candles, and liquid (lamp) fuels such as sperm oil and coal oil (kerosene).

As various scientific disciplines evolved, it became possible to define and to measure luminous intensity, leading to the establishment of pertinent standards. In the early years of Photometry, a branch of science that deals with the intensity of light, the term, "candlepower" came into use. Although it has been technically obsolescent for over 150 years, candlepower is still used. Early attempts to define candlepower specified the use of candles made from spermaceti wax, and of such dimensions and wick length, as to consume 120 grains of the fuel per hour.

Later, the Harcourt lamp, a specially made lamp using pentane as a fuel, was the standard candle for Britain and the USA, while Germany adopted the Heffner amyl-acetate (banana oil) lamp. In 1909, the International Candle was defined as groups of specially made and precisely operated carbon filament lamps kept at national standardization laboratories. Finally, in 1939, the Commission Internationale de l'Eclairage in sessions at Scheveningen, Netherlands, recommended a new standard candle:"...of the luminous intensity per square centimeter of its surface equal to 1/60 of that of a black body (q.v.) (Planckian) radiator held at the freezing point of pure platinum (1773 deg. C.)." In the late 1950's, this was the accepted definition of the standard candle.

The term candlepower refers intuitively to the rate of flow (flux) of luminous energy as judged by the eye, from some source of light in comparison with that of a candle. The unit of flux is the lumen. This is defined as: "the rate of luminous output of energy, the flux, radially streaming outward through a unit of solid angle (steradian) from the standard candle located at the apex of this angle." In modern terms, a standard candle's power sends a luminous intensity of 4 pi lumens out through any spherical surface centered on the candle.

When light rays pass from one medium through another, as from air through glass, the velocity of light entering the denser medium (glass), will decrease. Light rays entering the glass at an angle less than 90 degrees will be refracted, or bent within the denser medium. If the opposing glass surfaces of the lens are both convex, the exiting rays will converge. Light, so condensed, will have increased in intensity in the vicinity of the focal point.

When darkness set in at the end of the day, some form of lighting other than daylight had to be provided for the microscopist. Until the early 20th century, the principal sources of illumination relied on the combustion of organic substances. Some of the fuels were tallow and spermaceti candles, and coal oil (kerosene or par-

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affin). Tallow is a white, nearly tasteless fat, rendered from cattle and sheep. Spermaceti is the waxy solid which separates from the oil of sperm whales and other cetaceans.

Paraffin is a saturated hydrocarbon; paraffin wax being higher in the series than paraffin oil. As an interesting aside, paraffin lamps[6] were used by microscopists until well into the 1930's. A lamp of this type is shown in Figure 1. Primitive illumination systems such as the previously mentioned flame oriented devices,

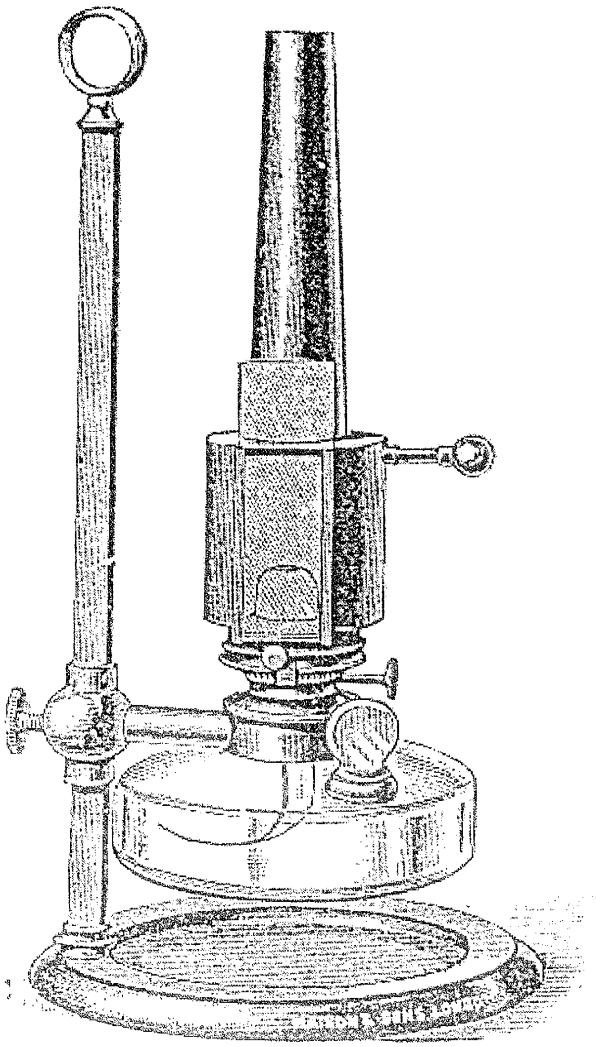

Fig. 1 Paraffin Lamp [10]

served to 'light the way' for the early microscopists' specimens. Using the candle flame as an example, what is the chemistry and mechanics behind that incandescent, gaseous part of the fire?

The candle consists of a wick, usually cotton, surrounded by solidified wax. The heat generated by the lighted candle melts the wax at the base of the wick. The melted wax, in turn, flows up the wick by capillary action. The melted wax then vaporizes and mixes with air. When the vaporized wax combines with oxygen in the air, combustion, an exothermic chemical reaction, occurs. Particles of carbon, not consumed in the reaction, are heated to the point of incandescence by the flame. The wick is consumed along with the wax. Fuel for the oil lamp is stored in a container. The lower end of the wick is immersed in the fuel. The wick passes through a holder having a means for raising and lowering the broad, tightly woven cotton wick. The fuel flows up the wick by capillary action. When lighted, the wick is out of direct contact with the fuel. The combustion process occurring in the lamp flame, is the same as that for the candle. When lighted, the flame covers the width of the wick. Although seldom used with candles, glass chimneys are necessary for oil lamps. The chimney controls the draft, thereby enhancing the incandescence. On the whole, light from lamps or candles lacks intensity and controllability to properly illuminate the specimen, and gave way to the implementation of new energy sources.

Using the technology and the resources available for the period, new methods were developed to enhance illumination. Prior to the introduction of the incandescent electric light and other electrically powered light sources, the 19th century saw the introduction of lighting systems such as the Welsbach Mantle and the limelight; definite improvements over candles and oil lamps. The Welsbach Mantle[8] is a gauze made of thorium and cerium oxides which are used for gas mantles. The mantle is used as a burner for producing gaslight by the combustion of an air and gas vapor mix, which heats the mantle to incandescence. The popular Coleman lantern uses such a mantle with either white gasoline or propane. Another pre-electric light worth mentioning is the lime light. This intense, white light was produced by means of an oxyhydrogen flame directed on a cylinder of lime. Early 'magic lanterns' were often illuminated in this manner. Lighting for the microscope can be directed, attenuated, intensified, collimated, polarized, reflected, and refracted.

These and other conditions can be implemented through the application of suitable devices situated between the source of light and the microscope. It should be obvious that coverage of all devices for controlling illumination would be encyclopedic in scope. Let us, then, apply the KISS (keep it simple, stupid) principal and limit this discourse to a few selected condensers of an historic nature. Speculae, the lieberkuhn, bullseyes, and such, will be subjects for future discussions.

SOLID GLASS SPHERES. We might surmise that back in time, an intuitive fellow (or woman) looked at an object through a drop of water and was startled at the apparent magnification of the object. Afterward, someone reasoned that if a water drop magnifies, why

shouldn't it work with a ball of glass? Lucius Anneaeus Seneca (ca. 4 B.C.- 65 A.D.) was supposed to have suggested that glass spheres might be used to concentrate light rays and to magnify images. If history is correct, this is the same Seneca[2] who was ordered by Nero back in 65 A.D., to end his life after being accused of complicity "in the conspiracy of Piso." He should have stuck to optical research.

THE CUTTING EDGE OF TECHNOLOGY - 17th CENTURY STYLE. If you have a 20th century Bausch & Lomb model AA microprojector (Fig. 2) in your collection, you may notice a basic similarity to the sketch of the horizontal microscope, (Fig. 3) featured in Bonanni's *Observationes*. In B&L's arc lamp, a clock-feed maintains the proper gap between the carbons to assure uniform intensity of the spark. By contrast, in Bonanni's

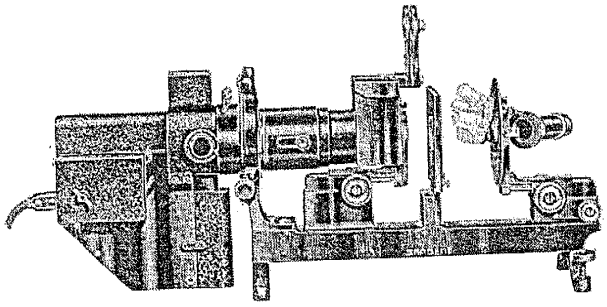

Fig. 2 Microprojector [5]

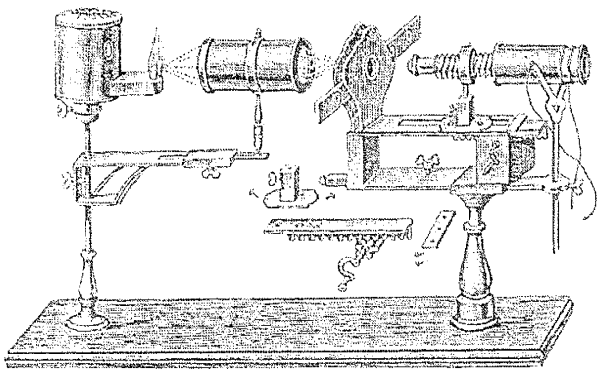

Fig. 3 Horizontal microscope [7]

spirit lamp, the fuel was gravity fed. Also, it does not appear to have means for adjusting the flame height. The cylindrical bodied condenser, located between the flame illuminant and the objective, can be moved and detented in the horizontal, vertical and radial directions to line up the optical path, and adjust the light pattern. Fig. 4 shows a glass sphere on a stand; This is part of the apparatus used by Stephen Demainbray (1710-1782) who lectured on natural philosophy in mid-eighteenth century England. The sphere has a diameter of 50 mm and together with its integral base, stands 240 mm high. The sphere served to enhance

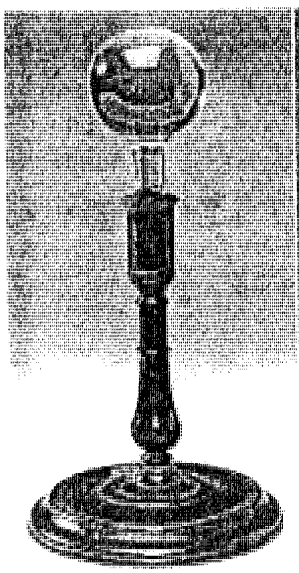

Fig. 4 Glass sphere on stand [4]

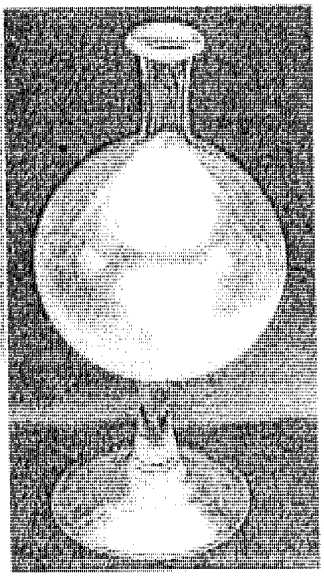

Fig. 5 Hand blown water lens condenser [3]

illumination during Demainbray's lectures on microscopy.

FLASKS. We, of the pre-computer generation, may recall those hanging globes filled with colored liquids, which graced drug store windows. The globes concentrated the sun's rays and sometimes acted as burning glasses, igniting any combustible material on which the rays might have impinged. In a similar way, fill a glass globe with a transparent liquid such as water, and it becomes a lens of short focal length. This 'lens' will reshape and concentrate the rays of the sun, or other light sources. Serving as a condenser of light, the liquid-filled globe becomes part of the microscope illumination system. For us contemporaries, this is not a breakthrough because in the mid 19th century, glass blowers were making round flasks which served as condensers of light for applications such as microscopy.

The globular flask shown in figure 5 is made in its entirety of hand blown glass with an integral stand. The 4.5" diameter globe is filled with water. The overall height of the condenser is 11.25". The water serves as both the magnifying medium and as an absorber of heat. The design (probably French), is rigid and does not allow for orientation of the globe. Figure 6 shows a lens shaped flask which is a hand blown, water filled glass lens with opposing double convex surfaces. The lens is retained in a gimbaled, iron frame which enables adjustment of the lens in height and orientation. This circa 1881 assembly is of American origin.

Rather than casting covetous glances at the genuine antiquarian items, let's take the initiative and build our very own historical technology inspired water-lens condenser. With artistic license to the fore, we back-

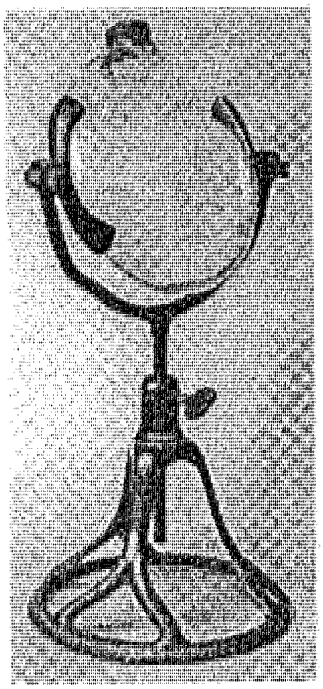

Fig. 6 Water lens bullseye condenser [9]

track to the Gaslight Era for inspiration to work on this somewhat whimsical project. Our apparatus is based on glass globes, 200 cc Pyrex boiling flasks which will serve as containers for liquid. The flasks are round bottomed, with short ring necks. Cork stoppers serve as seals. The thickness and composition of the glass envelope are considered to have negligible effect on the optical properties of the glass and liquid components. The liquid filled flask has a focal length depending mainly on the refractive index of the liquid. The light transmission characteristics of the liquid can be modified in two ways, by varying the tint and the refractive index of the liquid. The tint can be modified by adding a dye to the initially 'water-white' transparent liquid. Whereas the so called 'daylight' filter is most common, one applicable dye material which approximates this tint is methylene blue. The depth of color is controlled by the amount of dye added to the water. Water-soluble dyes are available in a variety of colors.

FABRICATING A WATER LENS CONDENSER

The apparatus, shown in figure 7 consists of two flasks, supported and detented by a hardwood yoke, which can be adjusted vertically, and locked at the selected height on the brass post. The yoke can also be rotated in the horizontal plane and detented in any position. One globe contains clear, distilled water. The other globe contains water tinted with a measured amount of methylene blue to create a blue filter. Other colors may be created using soluble dyes, such as food coloring, etc. A brass detent ring is locked to the post beneath the yoke. This allows the globes to be rotated about the shaft for setting either globe between the illuminator and either the stage, for incident light, or

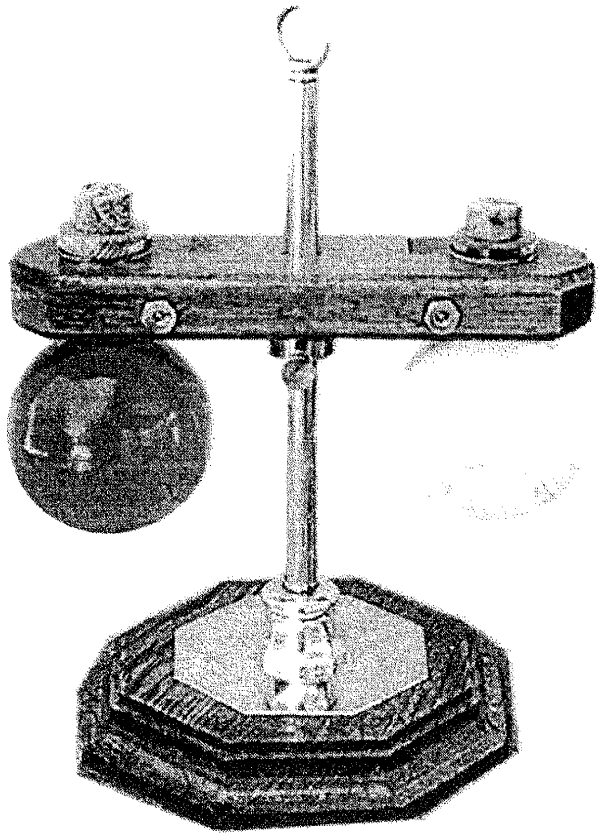

Fig. 7 Hirsch double globe illuminator lens

the sub stage mirror for reflected light. A brass lifting ring assembled to the top of the vertical shaft provides for portability of the apparatus. The base and the yoke are made of available hardwood, oak in this case. The flasks are retained in bored openings at each end of the yoke. A portion of each yoke end is split and hinged for assembling the flasks in the yoke. The hinges, hooks and screws are made of brass.

PREPARATION OF THE WATER-LENS CONDENSER

Scrub the inside of the flask with a test tube brush and detergent solution. Rinse thoroughly. Hold the flask upright and fill with filtered water, which is free of dissolved gasses to within 1/8" max. above the bottom of the neck. If necessary, agitate the flask to remove air bubbles which may be adhering to the inside surface of the flask. Seal with a cork, allowing a minimum of 3/4" air space above top of liquid. This space is needed to allow the liquid to expand if it is subjected to rising temperature which may result from heat generated by the light source.

ASSEMBLY. Place a flask in each end of the yoke and secure in position. Loosen the locking screw on yoke. Adjust the yoke height relative to the light source by raising or lowering the detent collar and secure it in place with the locking screw on the collar.

PLACEMENT of APPARATUS. Adjust the lamp to the

proper intensity. Make sure that the outside of the flask is absolutely clean. Set the distances between the microscope, condenser and illuminator. When properly set, the condenser will yield an illuminated circle which is uniform over its full area.

THE CANDLE ILLUMINATOR. In conjunction with the water-lens condenser, let's examine our pre-Victorian era microscopic objects by the light of a candle. An ordinary candlestick won't do, so we invoke the pseudo- scientific spirit of Rube Goldberg and build us an 18/19th century candleholder with gobs of adjustments, in the tradition of the old time instrument makers. Starting with a rectangular oak base and a brass escutcheon plate ala the water-lens assembly, a candle holder on a horizontal rod is clamped to a vertical post, providing adjustment along x, y, and z axes. A curved reflector of polished brass clamps between the candleholder and the vertical post. The reflector is adjustable vertically and horizontally. The assembled candle illuminator is shown in fig. 8.

As we delve into the history and provenance of microscopical illumination, it is apparent that the amount of information on illumination itself is as plentiful as the historical references to the microscope.

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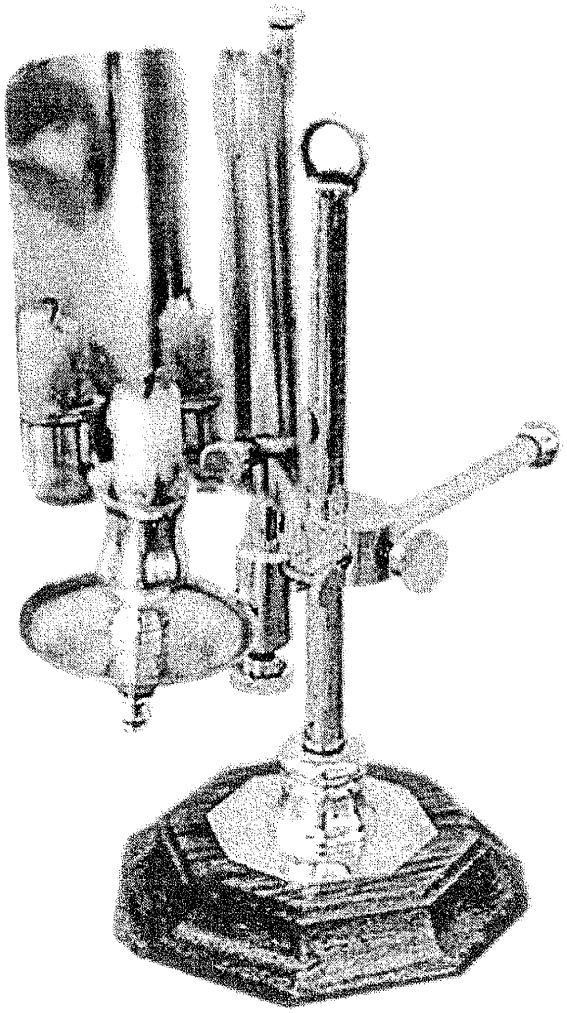


Fig. 8 Hirsch Candle Illuminator

A Little Bit About Hand Microtomes

John deHaas

For those of you who wish to make sections of leaves, small stems, or soft woods, one instrument that you must have is a good hand microtome. The very best is one that I used in high school, which was made by Ernst Leitz (Fig. 1). They sold these until after 1937, but you can still find one if you are lucky. Some Japanese firms make a copy of the Leitz microtome which is quite good. The thimble is large and is graduated in 10 micron divisions. In other words, a turn of one division raises the specimen 10 microns. The specimen holder and clamp are well made.

For sectioning, you will need a good straight razor which should have a 4 inch blade. Some razors made especially for this work have one flat side and one concave, however, a double concave razor will do in a pinch. The flat side makes the knife slide easily over the glass top of the microtome.

The specimen is held between two halves of elderberry pith or carrot. The elderberry is to be preferred.

The Japanese make a copy of the old (1883-1885) Zeiss table microtome. It is well made and can be clamped to the edge of the table, but it is expensive for what it is. (Fig. 2) The original Zeiss microtome, from which it was copied, is shown in Figure 3. The Japanese microtome has a very good specimen clamp and a ratcheted screw.

When cutting, both the specimen and the knife should be moistened with water. As the section comes off the knife edge, it is picked up with a soft brush and transferred to a petri dish filled with water.

Happy sectioning.

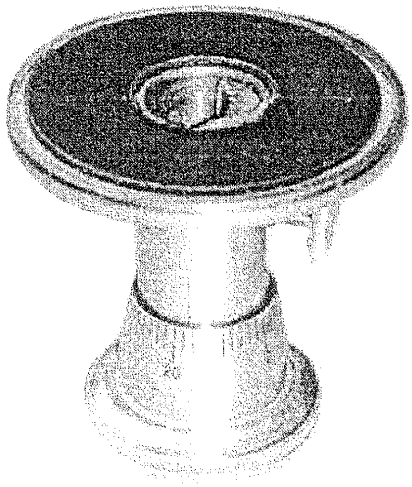


Fig. 1 Leitz hand microtome

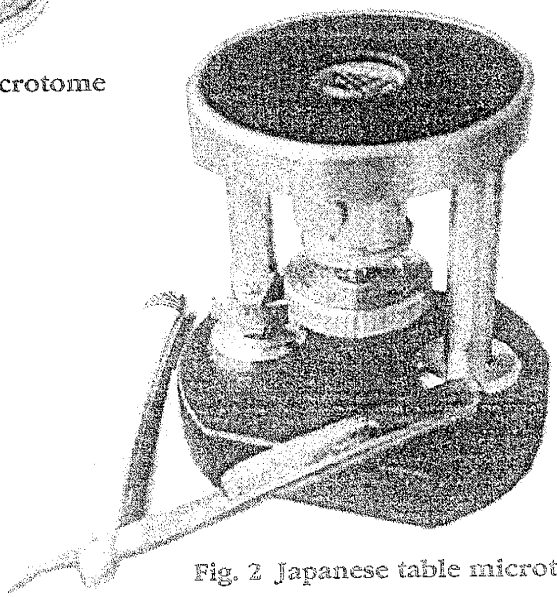


Fig. 2 Japanese table microtome

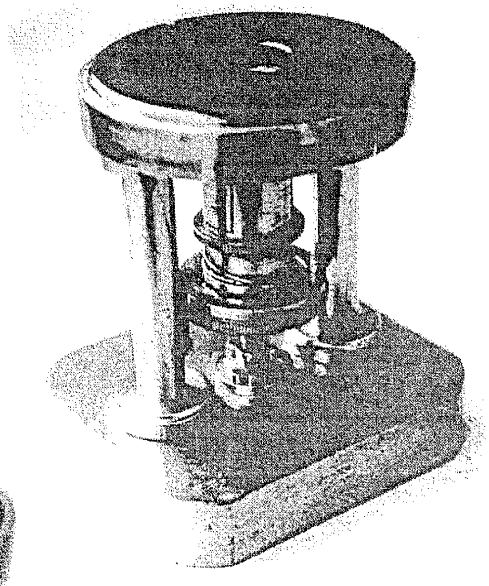


Fig. 3 Zeiss table microtome (1883-1885)

WORKSHOP of the Microscopical Society of Southern California

by: **George G. Vitt, Jr.**
Date: **Saturday, 5 September 1998**
Location: **Steve Craig's Lab.**

The Workshop started at 9:09am.

1. **Steve Craig** started the Workshop with a reading of a number of absolutely hilarious, double-entendre, definitions relating to the medical profession. The laughter was almost deafening, and set the mood for a great Workshop.

2. **George Vitt** showed a Meade catadioptric Maksutov telescope, c.1985, having a focal length of 1000mm. and an objective diameter of 90mm. With a 25mm eyepiece, it has a power of 40x. Using a 45 deg. erector prism, it can be used for terrestrial viewing and as a spotting scope for target shooting. With a 35mm camera adapter, it becomes an f/11 telephoto lens. He described an observation, at 12-foot distance, of a spider catching prey in its web, where it was possible to count every hair on its legs! At this distance, the 0.5" spider filled about 0.25 of the field-of-view diameter. George called this instrument his 'long-distance microscope.'

3. **Richard Jefts** described his ongoing work on wringing the last ounce of resolution in his photomicrographs by the use of near-UV illumination, and the results he obtained when photographing the Amphopleura pellucida diatoms at 3000X.

4. **Barry Sobel** showed a new book on the microscopy of metals, and an 1805 book, *Wonders of the Telescope*. He related that the English book dealer, Bill Krause, has American books on microscopy at good prices. Barry also told of his unforgettable experience when visiting and handling the 200-inch telescope at the Palomar Observatory. He then showed a cased microscope by Ladd, having a chain drive, magnetic stage (incomplete), a bulls eye condenser and live box. The 'piece de resistance,' however were large color photos (laser scanned) of a modern reproduction Antipythera made by Mr. Greaves of England, a friend of Barry's. Mr. Greaves is the acknowledged expert on Orreries and similar instruments. Since the Antipythera represents the earliest known 'analog computer', and an astronomical instrument, there was a general discussion on its origin, construction and meaning. In short, it is a multi-gear (bronze), manually operated instrument that was constructed around 200BC and was being transported by a ship that sank in the waters near Greece. When the ship was recovered in this century, the Antipythera was not recognized for what it was because its wooden case had collapsed and the many layers of bronze gears were squashed and corroded one to the other. It was not until the 1950s that its true identity and importance was recognized via x-rays and a careful disassembly. Portions of scales that had remained legible were measured, and the errors of scale calibration revealed an uncanny accuracy in its manufacture. It was probably made for use on a pedestal in some public building or exhibition, rather for nautical navigation service.

5. **Leon Stabinsky** showed an interesting, spring driven, flicker photometer which he had obtained from Christie's. A spinning disk has black and white areas painted on both sides, which can be simultaneously viewed through an eyepiece. When the incident light on both sides is equal, the visual flicker disappears. This is a nulling instrument. Leon then displayed a small cased Beck folding field microscope, and a French pocket microscope whose magnification can be varied by changing the draw tube length. It is amazing with what regularity Leon comes up with some fine miniature instruments at every workshop!

6. **Dave Hirsch** described some of the errors made by auction sellers on the Internet in describing their wares.

7. **Ken Gregory** showed the book *The Forces of Nature*, 1873, McMillan, London. Ken also showed some stereo photos he had taken of our MSSC 2nd Anniversary celebration (to the very month!) at the regular August meeting. The excellent camera with built-in Wheatstone type mirror beam splitters, and the compact foldable stereopticon with its Brewster type spherical/prismatic lenses, are currently being made by Argus, and available for $80. The prints are full color stereographs which are viewed by reflected light, as in days of yore. The writer was very impressed by this excellent design of the outfit and the fine results that Ken had gotten.

8. **Stuart Warter** showed the Manchester Field Naturalists' Microscope, c.1862: a single body (monocular), "manufactured by desire of the Committee of the Society," with chain focus. Signed on the base "J.B.DANCER/MANCHESTER/No.58" Microscope is of Ross type bar limb construction, available as either monocular or bin-

ocular (Wenham's arrangement), and with either rack and pinion or chain focus (same cost). It exhibits earlier design features than those of the same model illustrated in the 1873 catalog. There is an 1862 London Prize Medal label pasted inside the door of its case instead of the usual trade card. "Prize Medal was awarded for the general excellence of his microscopes as well as for originating microscopical photographs." Dancer had been making microscopes in Manchester under his name alone since 1845 without serial numbers and probably began assigning numbers by 1860. Numbers from 3 - 407 are recorded.

9. **Norm Blitch** displayed an article and extraordinary photos of Dust mites in the magazine *National Wildlife*. There was a general discussion on this tiny ubiquitous and totally unattractive creature.

10. **Jim Solliday** passed out a number of Palos Verdes Art Center brochures announcing our photomicrographic show being held there. Jim then described a B&L metallographic microscope, c.1930 with a beam splitter for incident lighting, a dual (swing-out) objective, and 215mm body tube length.

11. **Myron Lind** showed color enlargements of his recent photomicrographs.

12. **Ed Jones** passed around a micro display of color glass spheres arranged to spell "MSSC". These were viewed with a small high power magnifier. Ed had made the spheres according to the method he had developed and which he had described at the previous workshop. Ed then reported on the relative merits of the microscopy exhibits at two Los Angeles museums: Museum of Natural History, and the Science Museum. It seems that the microscopes in the former museum could not be focused on the subjects (microorganisms) that were intended for viewing by the public! Disgraceful.

13. **Robert Conacher** donated 74 wood samples to MSSC. These had been gathered from all parts of the world. **Ernie Meadows** volunteered to make some wood sections using the remarkable microtome he had designed and built. There was a general discussion on wood sectioning. **Alan de Haas** suggested the use of ammonia or urea for softening the wood for sectioning. **George Vitt** mentioned the progress being made in wood sectioning techniques by **Ernie Ives** of the PMS, England. At 10:35 there was a break during which **Jim Solliday** and **Ron Morris** displayed the equipment they had brought to demonstrate the setup and technique used for examining metallic specimens. The Workshop resumed at 11:05.

14. **Gary Legel** announced that a 2X converter lens for the Russian LOMO stereo microscope Mod. MBS-10, is available from Bill Rogers Camera Co (NV) for $27. He then showed a tungsten-halogen lamp, on adjustable stand, that he had gotten from Home Base for $12.95, which is a suitable incident light source for this stereo microscope. There was a general discussion on this type of lamp.

15. **Jim Clark** showed a c.1955 B&L metallurgical microscope with its 2-iris incident light device incorporating a green filter, a half prism, and a plate beam splitter. It was pointed out that Cole made the first half-prism in 1870). Jim brought for sale an A/O "Radioscope" used for measuring the radius of curvature of contact lenses.

16. **John de Haas** showed a Baker stereo microscope which he had re-adjusted and aligned.

17. **Alan de Haas** brought a large number and variety of technical and other books for sale. Alan stipulated that the buyer is to set the price and that the proceeds were to go into the MSSC treasury. Thanks again, Alan!

18. **Gaylord Moss** described some of the work being done at the M.I.T. Media Lab on "Digital Paper" which is an electrically writable/erasable display surface. Microscopic plastic spheres, colored white on one side and black on the other, are embedded into a flat sheet and, under digital control, are caused to rotate and show either their white or black side. The problem of how to make these spheres was solved by applying the black & white materials to opposite sides of a spinning disk and then 'spinning off' the material by centrifugal force, forming the required spherical microscopic droplets. Gaylord then told of the recent A&E TV program "Size and how it influences flight". He described the techniques used to instrument and record the motions of flies in flight and that very small flying insects, which have a small Reynold's number, literally swim through the air, rather than fly through it like larger creatures with larger Reynold's numbers.

19. **Steve Craig** told of a newly opened "Museum of Radio & TV", 465 N. Beverly Drive, Beverly Hills, CA. It offers for view vintage movies and TV programs which have been digitized, and is compensated for this service by user donation.

20. **Larry Albright** showed a B&L hand operated centrifuge which can be used up to 2500 rpm. It has two sets of gear ratios and very fine friction-free bearings. Larry also showed a very interesting and rare brass comparison microscope, c.1929, according to a design by Osborne c.1915. It is most unusual in that the beam splitter prism assembly is in a wooden casing. The objectives are individually focusable at a long working distance. The foot is of black painted sheet metal so that the microscope can be placed on a

continued on page 200

Member Profile

Julian Pulido

With Paulette 1998

Aaron, Julian, Paulette and Shondra 1998

I was born on the 16th of February 1935 in the village of Chapala in the state of Jalisco in Mexico. Chapala is a resort town on a beautiful lake about 48 kilometers South of Guadalajara. It is a beautiful place and I enjoyed swimming in the lake as a small boy. My mother died when I was a year and a half so I had only stepmothers.

I helped my father in the family candy factory, Dulceria Chapala, which was started by my grandfather and is still in the family today. I also went with my father to search for ancient Indian artifacts to sell to collectors. I also helped him to make reproductions.

Through my father's interest in Indian artifacts, he met the American writer and poet Witter Bynner who built an elaborate home on three terrace levels where he came to write several times a year. Bynnner hired my father as cook, housekeeper and watchman for his home. He then built a small brick home for our family next to the large one. The main house is now owned by the Mexican Government and is a national monument. My sister and nephew now have the much-expanded small house and run the candy factory. The Pulido candy, which is made from fresh fruits, is very popular and is sold all over Mexico.

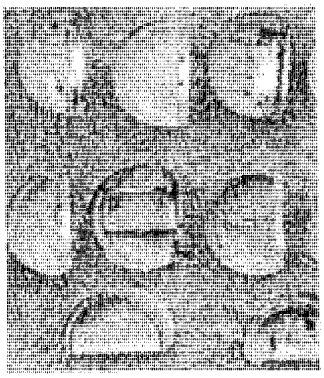
In school, I only finished the second grade before I started working at the first of the many jobs to which my enterprising and ambitious nature drove me. I did any job I could, such as buying gasoline from tanker trucks and straining it through chamois to sell to private aircraft. I also watched the occasional small aircraft that landed on the beach and helped the visitors unload and did odd jobs for them.

There was a man named Sotero in a neighboring village who was an expert carver of replica artifacts. He brought some to my father to sell and my father employed him both as a carver and to work in the candy factory. Sotero and I became good friends and he considered me like a son. When I was 13, Sotero left to go to work at a dirt strip airport near Guadalajara and I saw it as an opportunity and went with him. I worked at any job that I could get around the airplanes, cleaning, carrying baggage, and setting out the kerosene flares at night along the runway. I used to catch rabbits that were transfixed by the flares. I lived some of the time in an old Ford Trimotor which was out of service. Some friends bought an ex WWII B-18 bomber which they used to haul freight such as pigs and groceries around Mexico. I often flew with them to help load and unload. One time, I did not go and they got caught in a storm and were all killed in a crash in the mountains. I was very lucky. Another good friend was killed when the Stearman he used for crop dusting crashed.

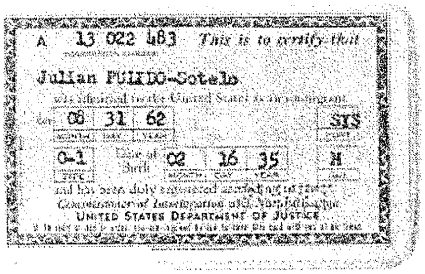
When the new civilian airport opened in Guadalajara in 1951, I was recommended by a captain I knew, whose brother was a general, to work there for the government. This was fortunate because the government job kept me out of the army. I worked in the office and eventually was in charge of authorizing flight plans for both commercial and private aircraft. I took courses at a private academy to learn English and typing. The teacher used the Reader's Digest Magazine to teach English pronunciation. My certificate of permanent position with the government, which was stamped and signed by the president, Miguel Aleman, was my passport to travel free anywhere in Mexico. I

Chapala in 1942. Front row L. to R.: brother Remigio, grandmother Matilde, Julian, step mother Umparo, sister Crecencia. Back Row; father Isidoro, Witter Bynner.

Guadalajara Airport 1952

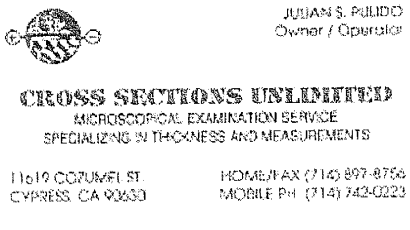


Sections potted in acrylic and polished.



A 13 022 483 This is to certify that
Julian PULIDO-Sotelo
08 31 62 SEX
C-1 02 16 35 M
Commissioner of Immigration and Naturalization
UNITED STATES DEPARTMENT OF JUSTICE

Green Card 1962



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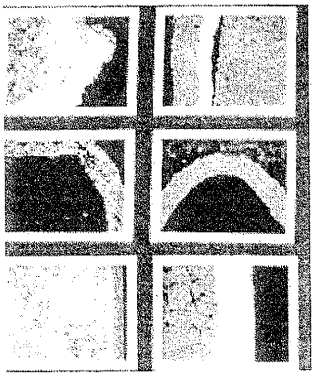


Microphotographs of sections

could have used it to have concessions in the airport, but I did not. I enjoyed the interaction with people in my job. In my travels, I went to the border at Tijuana and thought that there was much opportunity there. I, therefore, requested a leave of absence without pay and went to Tijuana and immediately found a job. I worked at several things there in sales and in a photo studio. I also could use my government card to get 72-hour passes into the U.S. which I liked very much.

I decided to emigrate and when a friend who was working as a waiter at the Miramar Hotel in Santa Monica recommended that place. I got my green card and went there in 1962. I worked as a busboy and lived in a room near Wilshire and Second across the street from the restaurant "Coffee Dan's" for $10 per week. Then I got a job at the exclusive Bel Air Club on the Malibu Coast where I had room and board. I worked as a bellboy for the cabanas on the beach and worked in banquets and other events. The members were some of the most influential people around such as the Donald Douglas family, and many people from the film

continued on page 200

Julian Pulido Profile - continued

industry. When I left there, I became a dental technician and worked in Santa Monica and Beverly Hills.

In 1968 I moved on to driving a truck for Burton Silver Plating. I studied and eventually became a quality control inspector. I then worked as an inspector in two other companies, Electronic Plating Service and Anodyne Corp. Three members of the Anodyne staff left to start their own company and I became their quality control supervisor from 1979 to 1986 with a staff of 8 working for me in the lab. I took many courses and also learned much from each company and from each manager. In 1986, I left and started my own business, "Cross Sections Unlimited" to provide quality control measurements of precision coatings. I now have about 25 good customers in the aerospace, medical, precious metal, electro-plating and instrumentation fields. Beckman Instruments was one of my first important customers in the early years. In my garage laboratory, I have three metallurgical microscopes: A Unitron Versamet II, a Unitron MEC inverted and a Unitron N11. I also have several other scopes including a Meiji EM-5TR trinocular zoom stereo. I am just now getting a Leitz Miniload microhardness tester. All my instruments have to be periodically calibrated and certified. I am proud of my high ratings at various companies that certify my 100% rating with no discrepancies in my evaluations. In my typical process, the metallographic specimen is potted in acrylic in either a hot press or cold chemical process. It is then lapped and polished to expose the desired surface or cross section for photographic analysis.

I met my wife, Paulette, in a restaurant called the Captain's Wharf in Marina del Rey. She had gone there with a girl friend and I asked her to dance and then to sit at my table. She is a nurse and her mother's family escaped from Russia to Canada through Odessa during the Bolshevik Revolution. We were married in June 4, 1972 and now have two children, Aaron, 22 and Shondra, 19. Aaron is studying at Embry Riddle Aeronautical University in Prescott, Arizona and already has his multi engine pilot's license. He is now flying around the country on an internship with American Airlines as part of his University work. Shondra is attending Cypress College and working part time.

Workshop of 5 September 1998 - continued

flat specimen without giving cast shadows. Larry had gotten the microscope from an ebay auction.

21. **Peter Fischer** showed a most unusual microscope he had found in Guadalajara, Mexico. He described it as having a highly unusual body made of high temperature ceramic! In addition, it was described as a very small field-type microscope made solely in Mexico. We were all on pins and needles as he carefully withdrew from its full-sized mahogany case this rare piece. In an instant, laughter and guffaws filled the atmosphere - for the microscope, in reality, had the body of a standard spark plug. The other parts were crafted in very clever fashion. It was very cute, and Peter gave us all a good laugh!

22. **Ron Morris** showed his Olympus camera tube, in like new condition, which he purchased over the Internet from ebay. Ron had also brought a metallurgical microscope and slides with microchip circuits mounted thereon. Everyone had a chance to observe the various microcircuits with great interest.

23. **Alan de Haas** announced that he has in storage a B&L metallograph and the 8X10 camera that goes with it. Anyone wishing to use it can come and get it! The only thing missing is the tungsten lamp.

24. **Chris Brunt** announced that he will be able to bring to the next meeting a working model of his newly designed photometer. Chris has already written more than 3,000 lines of code for the photometer's memory! A reminder: This 6+ decade range logarithmic photometer will be made available to MSSC members as a kit for a most nominal price! NOTE: In the previous issue of the MSSC Journal, Richard Jefts described the imagery results obtained through image enhancement in Photoshop. It has been the opinion of some that this technique introduces artifacts and/or obscures image details. Chris Brunt has promised to write a short article explaining the scientific basis of this image enhancement method and the fact that imagery is actually enhanced with the added information representing real data, rather than a spurious addition. We all look forward to this exposition.

The Workshop adjourned precisely at 11:59am.

Minutes for the MSSC Evening Meeting of 16 September 1998

David L. Hirsch

BOARD MEETING. At the board meeting of MSSC officers held this afternoon in STEVE CRAIG's lab, a number of issues were put to bed. Secretary RON MORRIS gives a capsule account of the proceedings elsewhere in this Journal.

BOIDS! The feathery rascals that pecked away at Tippi Hedrin in Alfred Hitchcock's thriller might have been among those Professor Stuart Warter spoke about in his illustrated talk on the class, Aves. Stuart showed some of the most beautiful and unusual photographs of birds in flight that any of us have ever seen. We were rewarded with the results of years of perfect circumstances along the California Seacoast when conditions of bird and light were just right. The locations varied from Orange County in the South to the Channel Islands off Santa Barbara. To photograph his dynamic shots of birds in flight and at rest, Stuart used 2 cameras: a Minolta Maxxum 7000i and a Minolta 7xi. Shutter speeds were: 1/500 sec, up to 1/1000 sec with the 500mm lens and 1/500 up to 1/2000 sec., with the 400mm lens. ASA 400 Ektachrome film was used throughout. In addition to the spectacular photographs of birds, there was a memory jogging shot of a B-17 Flying Fortress bound for who knows where.

Stuart also showed a copy of Audubon's *Birds of America*. Through the dramatic beauty of his drawings and the vividness of his prose, John James Audubon (1785-1851), an American artist and naturalist made known to the world, better than ever before, all the then known birds of America. Hernia prone persons, beware! The folks at the Audubon Society designated the very heavy tome as "The Baby Elephant Folio". PENCILS of LIGHT. With the overhead projector, ALAN deHASS used ray tracing diagrams and mathematical equations to explain the difference between critical and Kohler illumination. Alan will cover the subject in depth in an article to be published in a future issue of the MSSC Journal.

X-RAY MICROSCOPY. TOM McCORMICK displayed the vivid x-ray photographs of a fern leaf and a circuit board enclosed in an aluminum chassis. The pictures were made with a Hewlett-Packard Faxitron system x-ray unit, Model 43807A. Tom's recent acquisition operates from a 110 VAC, 60 cycle source. The self contained radiation shielded cabinet is 35" high x 22" wide x 20" deep. The beam current is 3 MA @ 10,000 to 25000 volts.

SHOW AND TELL. Don't expect to find hefty items like vintage World War I tanks in Leon Stabinsky's collection. Leon prefers scientific memorabilia, which he can carry about in his pocket. For example, Leon's' latest acquisition is an unusual and rare microscope which fits in a mahogany case, 3"L x 1"W x .75" H. The Bausch & Lomb "Excelsior," circa 1880, is built around a folding pocket magnifier. This fine example of 19th century miniaturization fits in the case which also contains a mounting post, a tiny mirror and a miniscule set of dissecting instruments.

MSSC MENTORS. JOE WISE, our contact with the Crossroads school, described a speakers program being launched at that school. The program uses speakers on scientific and technical subjects. The talks will be given on an informal basis during the lunch period. The student attendees will receive a liberal dose of microscopical lore as they chomp away on their pizzas and hot dogs. Join the speaker's panel and give these gifted youngsters (and future MSSC members) a shot at the fascinating ramifications of microscopy. To get the ball rolling, contact Joe Wise at (310) 829-7391.

HO-HO-HO. Just an early reminder that plans for the forthcoming MSSC Christmas party are afoot. Those members who attended last years memorable party at the home of the ERNIE MEADOWS' will agree that our Yuletide bashes are getting better and better. We'll keep you posted. Incidentally, all MSSC Corresponding Members and their guests are welcome to attend.

THE DISTAFF SIDE. Even when we include the wives' of MSSC members who attend meetings along with their mates, the member population is disproportionally in favor of us 'good ol' boys, but times they are a'changing. MSS. ELLEN COHEN AND KATE McDONALD have joined us, recently. Welcome aboard, ladies!

GET WELL, GARY! The entire MSSC membership send their best wishes and hopes for a fast and full recovery to GARY LEGEL. Gary has undergone surgery and welcomes correspondence from his fellow MSSC members. Let's hasten his journey down the road to recovery. Drop Gary a line. Write to: Gary Legel 1306 Sheppard Fullerton, CA 92631 (714) 870-0439

Microscopy and the World Wide Web

The Site of the Month

James D. Solliday

This month, I would like to bring to your attention a web-site that represents one the most important collections of scientific instruments housed at a University. The location is the Peabody Museum of Yale University at New Haven, CT. This is not to be confused with the Peabody Museum at Harvard University, Boston. Check out the following web-site.

The Peabody Museum
Yale University, New Haven CT
http://www.peabody.yale.edu/

On October 5th I had the opportunity to visit the scientific instrument collection at the Peabody Museum in New Haven. I was the guest of the Collections Manager, Eleanor W. Faller. Mrs. Faller is the person with the daunting task of identifying and cataloging the collection. From my perspective, she was a very good choice for the job as she represented the museum with hospitality and enthusiasm. She not only provided access to the microscopes but personally directed me through the maze of historical apparatus. The museum contains over 2000 instruments with over 30 microscopes associated with the collection. Describing and cataloging such a collection is beyond the knowledge of any single person and should be the responsibility of all who are concerned with our science heritage. The collections have received serious attention only in the recent history of the University. In 1960, Prof. Price of the Department of the History of Science was assigned as Curator of historical apparatus. By 1983 Prof. Price had accounted for 659 pieces of equipment. In 1991 the collection was moved from the Sloane Physics Lab to the Peabody Museum. Mrs. Faller has taken the task of conservation forward and continues to labor with a limited availability of reference material on certain classes of instruments. It would be quite appropriate if the Microscopical Society (MSSC) made its considerable resources available to assist in her efforts. She is now looking for assistance in describing early electrical apparatus. If any of you are knowledgeable on the subject or interested, please contact Mrs. Faller by e-mail at, eleanor.faller@yale.edu. She was very generous with her time and is interested in receiving any new information that may be associated with the collection. Those of us concerned with the history of scientific instruments can be assured that the collection at Yale is in good hands.

In addition to the microscopes, the collection contains apparatus associated with physics, astronomy, chemistry, engineering, geology and biology. Of special interest to me was the fact that the oldest item in the collection was Yale's first microscope. This was a microscope made by Matthew Loft (Culpeper type) acquired by Yale College in 1734. I did not have time to see all the microscopes including most of the petrographic types.
The following is a list of the microscopes I did have the opportunity to examine.

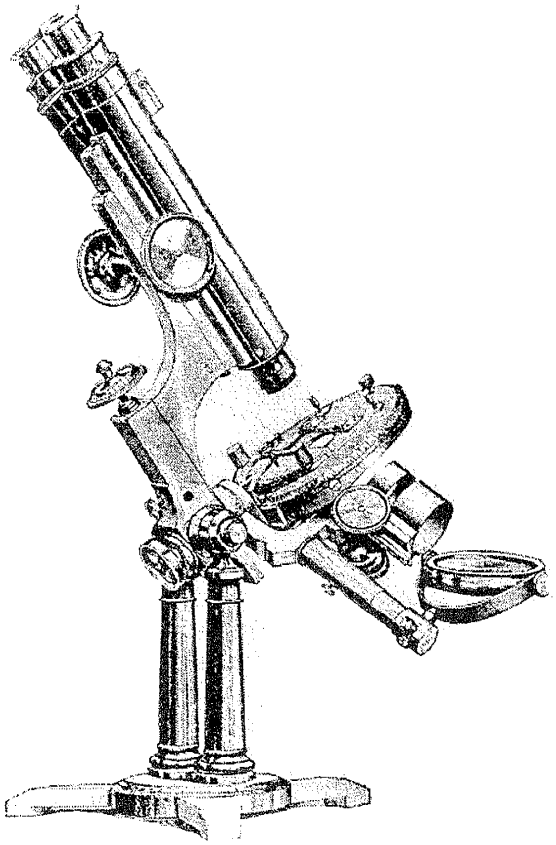
American Microscopes:

1. R.Tolles, Small "B" type stand, monocular having the draw-tube and eyepiece made of **vulcanite**. The limb is similar to the "B" stand and connected to double pillars with the usual foot. Three inch circular stage without condenser or substage holder. One Tolles objective. No case or accessories. This is the first time the use of vulcanite can be associated with Mr. Tolles.

2. J. Grunow, New York & New Haven. This was a very large stand which appeared to be a copy of the Tolles "B" Stand. The foot, pillars and limb are almost identical. It came in a very tall case having drawers full of accessories. There were 5 or 6 beautiful Grunow objectives, all having the early American bayonet mounting system. This was an amazing stand in perfect condition. I have yet to find any two Grunow stands that are exactly alike.

3. J. Zentmayer, Philadelphia (YPM 1.337). Large Zentmayer Centennial with the date of 1876 engraved on the foot. It has both a monocular and Wenham binocular tube. Exhibition case with two boxes of accessories. Every possible accessory was present, including a box of about 6 Wales objectives. The lenses all mount to the stand by a bayonet system, which may have been added later. The condition is perfect including the silvering on the mechanical stage, micrometer screw and graduated foot. This is the most amazing stand I have ever seen, and could possibly be the very stand that was exhibited at the 1876 Centennial Exhibition. The date of 1876 appears a number of times on the stand and the engraving work is impeccable. It is conceivable that the second figure is the serial number, however, the fact that by 1872 the serial numbers were only up to 449 creates doubt. Zentmayer began making microscopes in the 1850's, indicating a rather slow rate of production. The lacquer on this instrument is absolutely perfect and of a darker and richer color than the usual Zentmayer. This is a must-see if you ever get the chance to visit the Peabody.

4. J. Zentmayer: A second large Zentmayer Centennial stand with a Wenham tube and large circular stage. This stand came with the extra smaller thin stage which can replace the large circular stage that has a sliding glass clip. Includes a box of accessories and remains in wonderful condition. A great many of the accessories accompanying this stand are associated with mineralogy. Amazing.



Zentmeyer Centennial Microscope 1876

5. Dana's Grunow case and accessories. A very extensive and interesting box having the microscope itself missing. Mrs. Faller believes that the stand is in one of the other rooms of the museum. The location of this instrument is unclear,however, it is a very important and amazing outfit.

6. N.H. Edgerton of Philadelphia (not sure about the spelling). This was an unusual petrologic stand having an English foot and a Ladd type limb. It stands about ten inches high. Very interesting and I did not recognize it. There is an Edelmann of Germany but he was not known to make microscopes.

7. Unsigned simple (dissecting) microscope: The name of Grunow is implied by the appearance. At one time Grunow worked within a mile of the Peabody Museum.

8. Large box of Schrauer accessories. This box included a number of very nice objectives. I did not see the stand.

English Microscopes:

1. Smith, Beck & Beck Educational. The outer box was not available.

2. Large R&J Beck, first class: Wenham binocular in exhibition case with one (perhaps two) large boxes of accessories. Large circular graduated and mechanical stage, all in perfect condition.

3. Matthew Loft, London, (Culpeper type) obtained originally by Yale College in 1734. This is an example of the first form of Matthew Loft. He was in business from 1720-1747 as a London instrument maker and member of the Spectaclemakers Guild, Master of Spectacle Maker's Company (1744 & 1745). According to Clifton he worked from 1724-1747. He was apprenticed in 1711 to Thomas Gay and at some point succeeded his master. In 1730 he was known to be located at; The Golden Spectacles, the Backside of the Royal Exchange, London The Golden Spectacles the North side of the Royal Exchange, London. Edward Nairne (1741) served his apprenticeship with M. Loft, as did Richard Watts and John Stokes. His stands were of the Culpeper type and notable for their fine workmanship (elegant). At one point in time the Yale microscope was stolen and then returned by notification over the phone. The caller indicated the instrument was in the dumpster. The original case however, was destroyed. Most of the usual accessories are in the box foot. Very good condition.

4. Large brass solar (projection) microscope, ca.1800, having the Cuff type adjustable mirror.

European Microscopes:

1. Very large Chevalier, horizontal microscope, Paris: Large box with all the appropriate accessories. The foot (probably Dellebarre type) was not present but was very likely in one of the drawers that I did not have a chance to examine. Condition was excellent and the size was surprisingly large. Purchased in 1854.

2. Several Hartnack type stands having the usual continental configuration.

3. Drum type, very much like the type of Hartnack or Nachet. The stage was mounted on two pillars with the mirror mounted at the center of a circular base. The usual draw-tube type body tube.

4. Several very nice large Zeiss stands (Continental type) in their heavy mahogany cases. Good condition from the 1880's and 1890's.

5. Several continental type Leitz stands of the last century (1880's).

6. Very large wooden microscope obtained by Yale in ca.1860 but made in the 1760's. This stand mounts on the lid of the case and is over 18 inches high. It features the Cuff type arrangement having a screw type fine adjustment. Large wooden eyepiece and turned wooden objectives. The mirror mounts to the top of the box in the appropriate location. This is an amazing instrument that needs future investigation. Very interesting and remains in good over-all condition.

7. Simple microscope with interchangeable lenses, by R. Winkel.

8. A number of Petrographic stands all of which I did not get the chance to study.

An Afternoon with Bert Loro

Larry Albright & Gaylord Moss

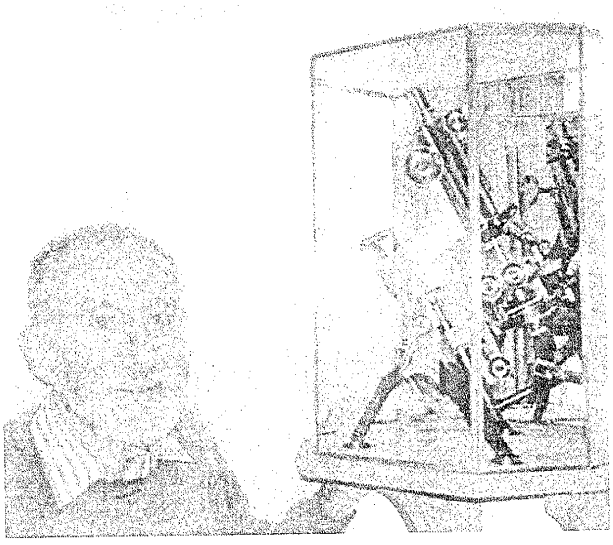
Bert Loro is familiar to the readers of this Journal from his several articles on ingenious microscopical devices of his own design and from his MSSC Member Profile of Dec. 1996. On a vacation in the San Juan Islands, we took the opportunity to visit Victoria to see Bert and to see firsthand the wonders of the Loro laboratory.

Bert was kind enough to pick us up at the Union Club of B.C. in town and to drive us out along the ocean past Foul Bay, named for dangerous rocks, to his delightful home on Foul Bay Road, complete with rose garden and passion fruit flowers creeping through the lawn.

We were stunned by a magnificent Canadian-made copy of a Ross #1 with complete accessories, many by Ross. In the same room was a pristine van Heurck, which his company had presented to Bert on his retirement. After looking at several other interesting historical microscopes, we entered the basement laboratory, an amenity missing in most California homes. Bert had arranged a series of demonstrations of his various instrument designs and experiments.

We saw his rocking microtome, (Fig. 1) which was described in the Dec 1996 issue of the *MSSC Journal*. He is presently using it to make difficult lichen sections.

Figure 2 shows Loro's design for a variable slit mechanism in double slit form. It uses two flat pieces with knife-edges that slide along separate 10-degree ramps to adjust the slit widths. A taut wire separates the slits. It is a very clever, effective design. By looking through the single slit at a light bulb we could a see a single spread pattern and then looking through the double slit we could see the interference line spectra.



The Magnificent van Heurck

Bert and Freda September 1998

Figure 3 shows Bert's finely designed and constructed ruling engine that he described in the *Queckett Journal* 1995,37. With this device, Bert has ruled lines of 0.24 micron spacing on chromium thin film on glass.

Bert has constructed a very handy MacArthur-type microscope (Fig.4) which has a flip-up mirror on top for illumination and a slot for filters or a polarizer. It also had a convenient shelf for a disk to achieve dark field or Rheinberg illumination. The complete unit is very rugged, using mirrors, instead of heavier prisms. We again used Pleurosigma as a test plate for this microscope.

Figure 5 shows a large static electricity generator of the general appearance of a Wimshurst machine, but actually using a completely different electrical design of Bert's invention. The "Loro" generator, hooked up to a Leyden jar, generated for us a loud crack as the spark jumped over 3 inches. Under ideal conditions Bert has seen sparks of 9 inches.

The inverted microscope described in the *MSSC Journal* of February 1998 was on the bench (Fig.6) alongside the Leitz model on which it was patterned.

Figure 7 shows Bert's useful optical bench.

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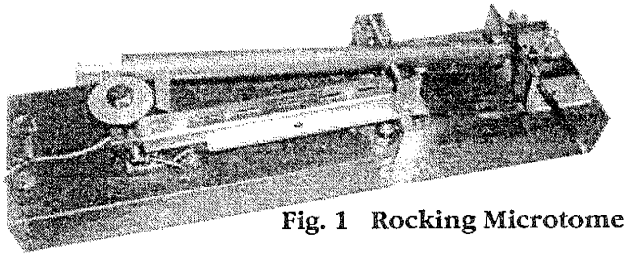


Fig. 1 Rocking Microtome

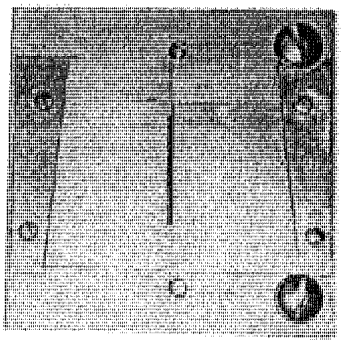


Fig. 2 Adjustable Double Slit

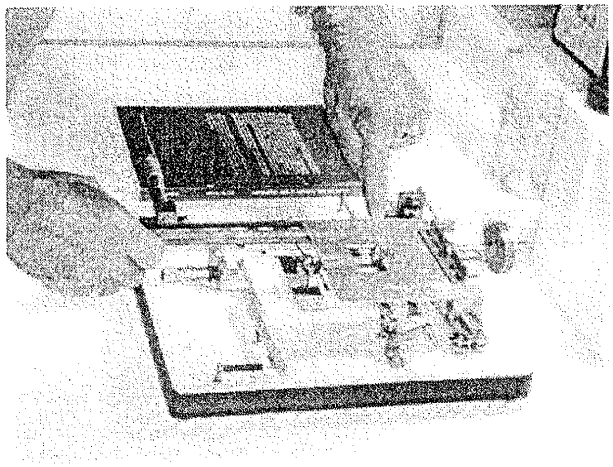


Fig. 3 Precision Ruling Engine

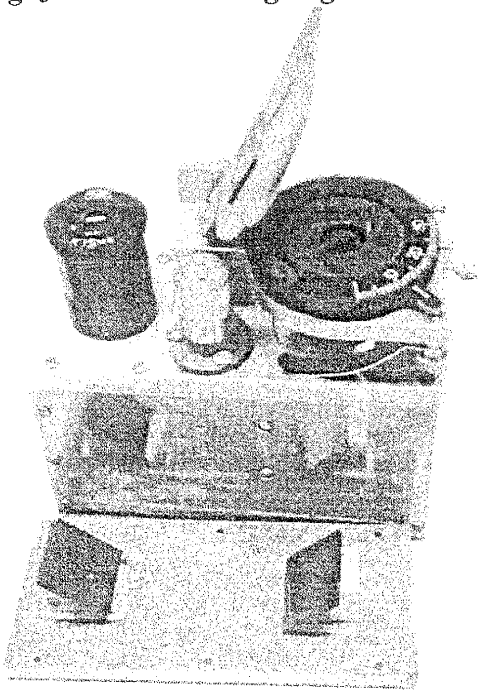


Fig. 4 Loro MacArthur-type microscope

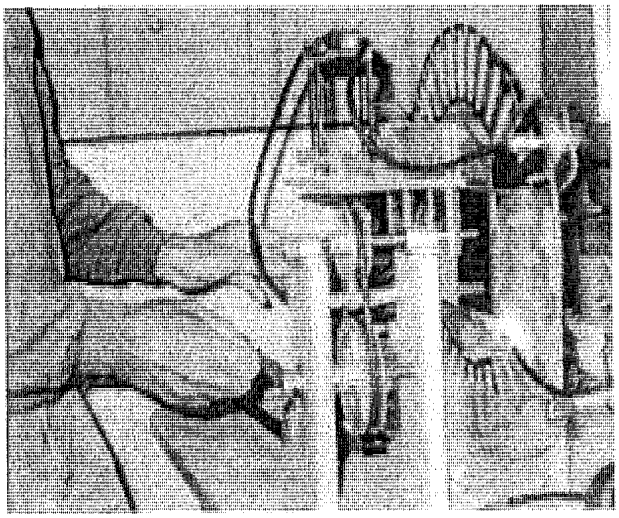


Fig. 5 Loro High Voltage Generator

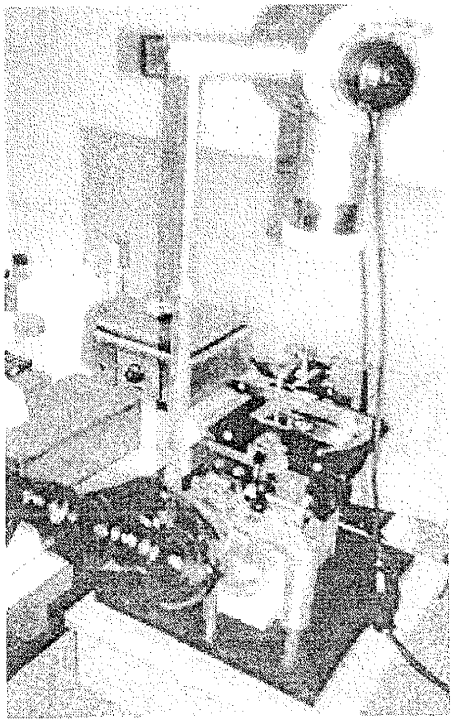


Fig. 6 Inverted Microscope

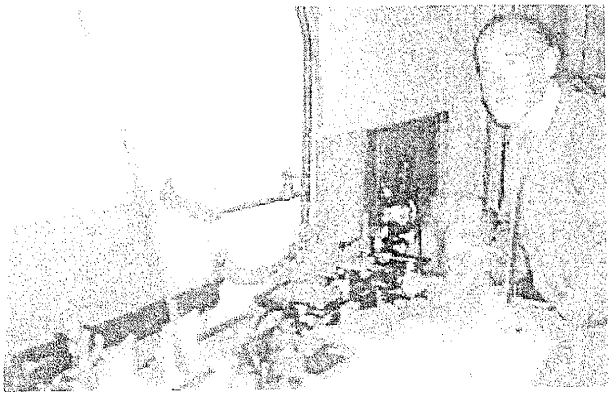
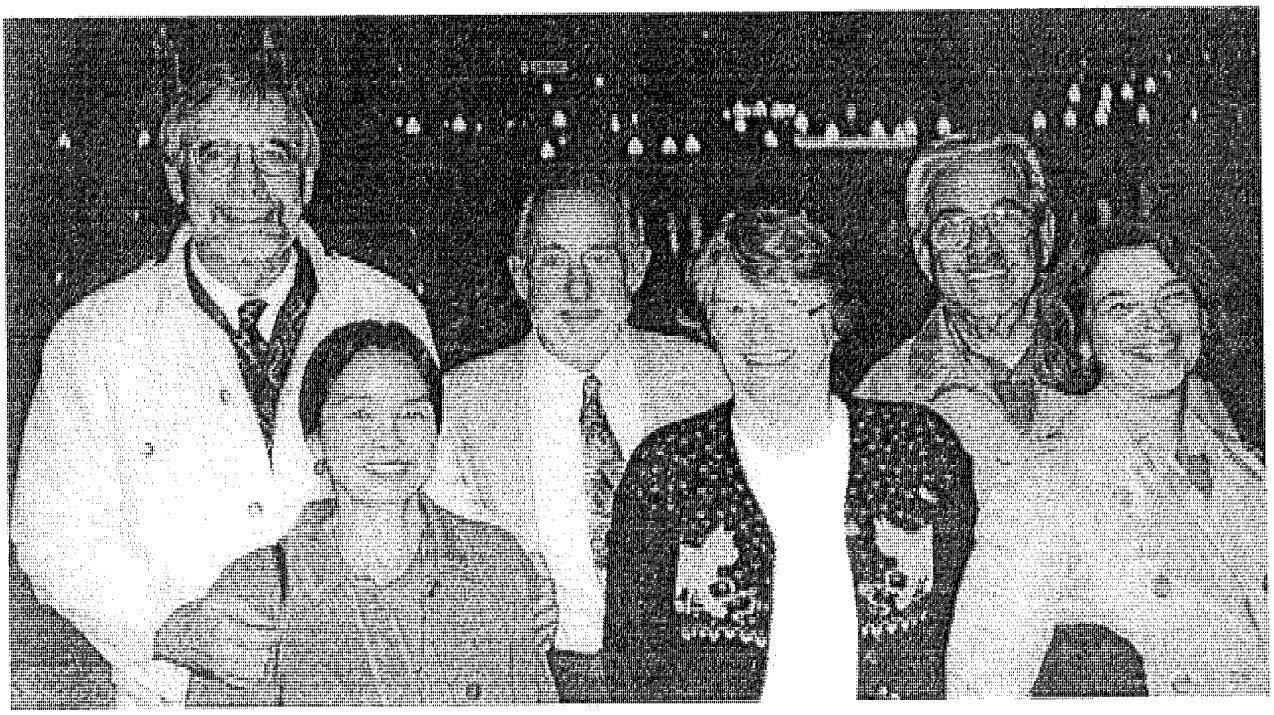


Fig. 7 Optical Bench



Left to Right: Gaylord Moss, Meg Mitani, Bert & Freda Loro, Larry & Helen Albright. Victoria, B.C. September 25, 1998.

Bert showed us a Mirau Microinterferometer that he had built and described in *Microscopy,* 36 July,Dec 1988. This is an interesting interferometer that is like a Michelson , but is constructed in a straight line instead of with 90 degree arms.

We were impressed with his images through a home-made phase contrast system. The phase shift was achieved by acid etching a thin layer from the substrate and then a smoke layer was added to adjust the amplitude. Bert has his own techniques for determining the diameter of the rings for a given system.

In another demonstration, it was most interesting to actually look through the Leeuwenhoek-type single lens microscope that was described in Loro's article in the *MSSC Journal* of July 1998. The fine structure of Pleurosigma diatoms could be clearly seen. Bert has published an article on his construction of Leeuwenhoek lenses in the *Queckett Journal,* 1993,37.

Another well engineered and most useful device of Bert's is the rotating table shown in Figures 7 and 8. This table uses a high quality bearing and has an X-Acto knife blade mounted so that it can be adjusted to any point on the table's radius by a micrometer screw. It can very effectively cut precise rings for masking off areas in the microscope field. Bert finds that black electrical tape is a good material for such rings. Of course, the table is also perfect for ringing slides.

continued on page 207

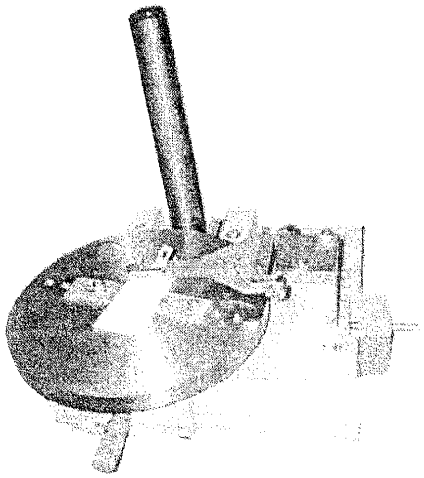


Fig. 8 Turntable assembly

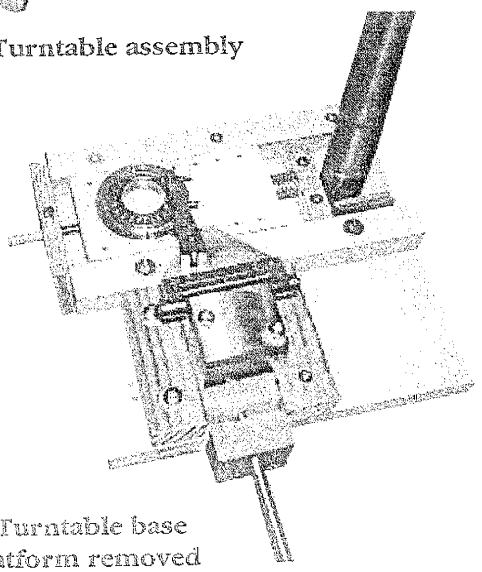


Fig. 9 Turntable base with platform removed

Book Review

Microscopical Mounts and Mounters by Dr Brian Bracegirdle

Barry J. Sobel

I awaited the publication of this book with great anticipation and was not at all disappointed. Dr Bracegirdle states in his introduction that this is an alphabetically arranged listing of mounters and subjects for mounting followed by color plates with captions. That is an understatement. This nearly comprehensive and nearly all-inclusive book is amazing in its coverage and discussion. Not only are mounters discussed in as much detail as Dr Bracegirdle has been able to gather over some forty years, but, in addition, there are other very useful entries which mandate that this book be in the library of almost anyone interested in microscopy and its history. For the novice, things like "ringing" and "diatoms" are defined. Not only are the mounters listed but also the retailers or resellers of mounts. Dr Bracegirdle goes on to differentiate between these when possible. Many samples of catalog entries are also included. As in his prior publications, what makes Dr. Bracegirdle's work stand out above the rest is that he is careful not to speculate without stating such and in this way the book is a sound and reliable reference. Even slides, which to this day are known only by the preparer's initials, are discussed, in whatever detail is possible. The book is not 100% complete. But as far as I am concerned it is more complete than 99% of similar books on the history of science and it should be the standard to which others are compared. What's more, because of the charitable support of various agencies, nearly HALF of the book is composed of fully captioned full color plates! In the 228-page book there are about 60 full color pages containing up to 18 examples. At $43.50 this book is one of the great bargains in microscopy. The book is available from its exclusive distributors (in the U.S.A. from the Gemmary, and in the U.K. from Savona Books).

An Afternoon with Bert Loro - continued

We had a most interesting and informative afternoon, looking at the series of optical devices that the exceptional Bert Loro dreams up, engineers and builds, often from scrap materials.

One of the truly remarkable things about Bert Loro's work is that he is able to build very sophisticated instruments that push the limits of accuracy without having recourse to exotic machinery. Bert's workshop includes only a lathe and a drill press. Clearly, his achievements in making devices that operate with submicron accuracy is possible only by his great understanding of the science of kinematics. His ruling engine and rocking microtome could be used as textbook examples of the proper and most elegant way to design precision mechanical systems.

The quality of Bert's work is understandable when one gets glimpses of the things that he did in the workaday world before his retirement. He is modest about his inventions, but he has numerous patents to his credit and we saw some impressive technical achievement awards that he had received in the past. A measure of his worth to his former employer surely must be the exceptional Van Huerck microscope that they obtained for him as a parting present.

In the evening, we gathered with our ladies at a restaurant on the Victoria waterfront and shared an excellent dinner with lively conversation. The group photograph,(opposite page) with the lights of the Parliament building in the background, was taken later as we strolled about in the brisk night air.

Our visit with Bert was a high point of a microscopist's vacation. It was a great pleasure to meet someone who has contributed so much to our Society and to enjoy for a few hours, his ideas, achievements, hospitality and pleasant company.

October Meeting

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

NATURE'S ARTWORK As Seen Through the Microscope

James D. Solliday

The first part of the program will feature the slide show that was presented on the opening night of our photomicrography exhibition on Friday, September 11th in the Norris Gallery of the Palos Verdes Art Center. The exhibit of the photomicrographs continued from October 4th to October 11th. The Norris Gallery is the Center's photography exhibit room. By all accounts, the opening night was a great success as we had over 150 people attend the presentation. The slide and sound show is entitled NATURES ARTWORK As Seen Through the MICROSCOPE. The 12 minute program features dual projectors which are controlled by a dissolve unit with musical background. The program features images taken through the microscope and will represent a wide spectrum of subjects including the usual chemical crystals as well as living and geological subjects. The intention is not to educate as much as it is to provide inspiration. For those who are not accustomed to seeing images through a microscope this will be a new and revealing experience. It is hoped that the viewer will leave the meeting with a sense of excitement and a renewed interest in taking photographs through his or her microscope.

HOW TO PREPARE CHEMICAL CRYSTAL MOUNTS and HANDS ON PREPARATION

The second part of the evening will be a slide presentation on "how to" prepare crystal mounts. Each image will take the audience step by step through the techniques associated with making proper chemical mounts. Both the melt and evaporation methods will be discussed. The basic equipment and supplies will be illustrated and the methods of use explained. After the slide show, members will be given the opportunity to practice the techniques illustrated in the presentation. The basic tools, as well as chemicals, will be made available for the members to try out their newly acquired knowledge. Please bring your own MICROSCOPE and a small alcohol lamp if you have one. Also, please bring a glass rod, blank slides,covers,a watch glass and a small bottle of deionized water. If you don't have these items, bring your microscope anyway, as members can share the limited materials provided by the speaker. Your microscope must be fitted with a polarizer and analyzer. If you don't have these, Ron Morris will provide Polaroid film that can be cut to size to fit your stand for a small fee to cover the cost. If you want to learn to make crystal slides, come to the meeting with your microscope and let some of the experts show you how. You should be able to take home a few slides to add to your collection.

If you don't have a portable microscope to bring, there will probably be a few extras there so that everyone can still have a chance to try the techniques.

Also, there will be projection microscopes for group viewing of the finished slides, which should be most interesting.

NOVEMBER ANNUAL EXHIBITION MEETING

The November meeting on Wednesday the 18th will be our special yearly demonstration evening when everyone will have a chance to set up an exhibit to show some microscopical topic. This is your chance to show a piece of microscopical apparatus that you have built or to show some optical principle, or to repeat some famous experiment of the past or even just to show a favorite slide. Anything goes.The more members who participate, the more interesting it will be. Some of the exhibits of past years have been wonderfully elaborate, such as the classic demonstration of blood circulation in a fishes tail. Others have been just the exhibition of a favorite microscope or a slide showing something of particular interest.

It is not necessary to make something really complex. Even if something seems mundane and simple to you, it can be of educational value to someone else.

One might consider the evening to be a microscopical science fair. Think of something that you can show and join in. Everyone will have a chance to explain their exhibit and then there will be time for everyone to walk around and see the exhibits.

In the past, we have had a vote at the end of the evening to select the favorite exhibit.

Please plan to participate, but if you don't have an exhibit, come anyway. It will be fun and educational for all.