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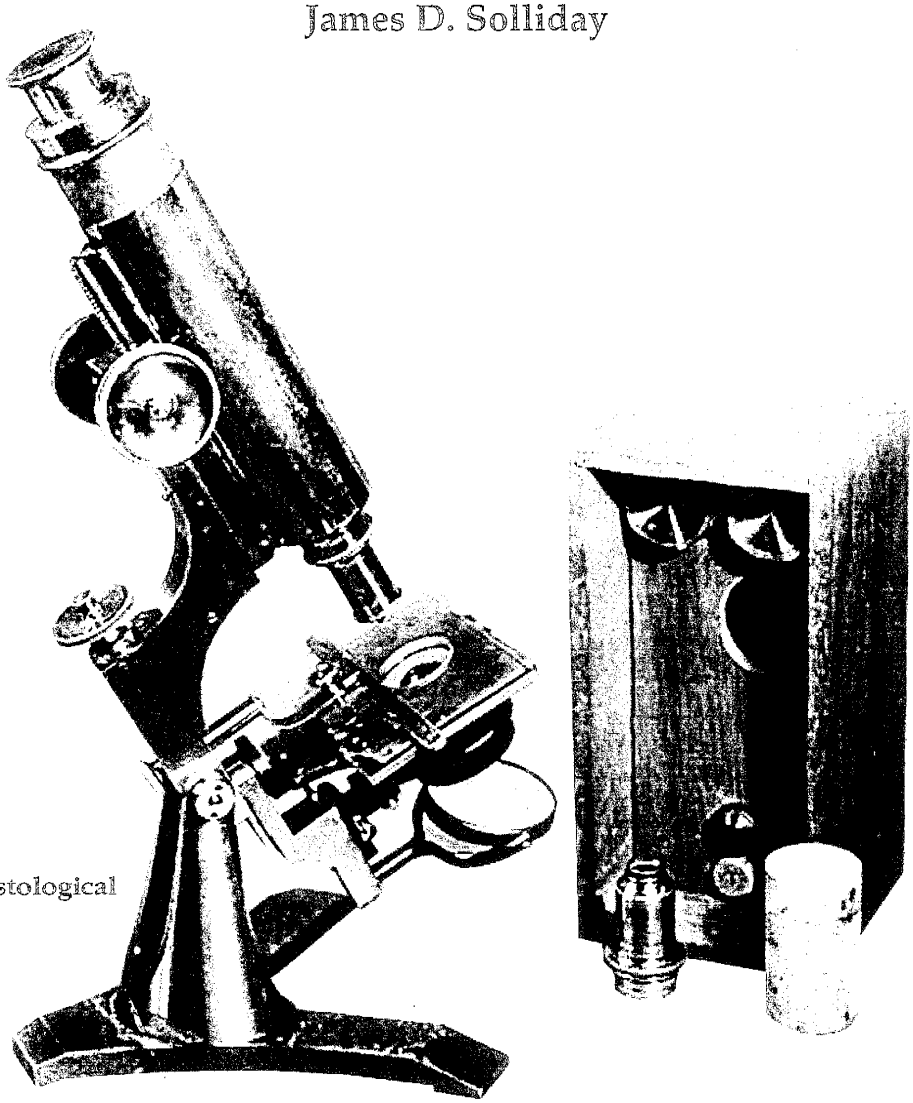
Joseph Zentmayer
An American Maker
With Clarification of his American Histological Student Microscope

James D. Solliday



American Histological second form

Introduction:

Joseph Zentmayer (1826-1888) was born in Manheim, Germany on March 27, 1826. He came to America in 1848 and by 1851 he was making survey instruments for Young & Sons of Philadelphia. He established himself in his own business in 1853 at 147 South Fourth St. Philadelphia. A few years later (1856-1859) he made his first large microscopes for Dr. Paul Beck Goddard, Dr. Joseph Parker and Dr. Hunt, of Philadelphia (Grand American, 1859, *Proceedings of the American Philosophical Society*, testimonial). He died on March 28, 1888, leaving his son, Frank Zentmayer to continue the business. The firm prospered until around the turn of

the century. By 1880, he was located at, 209 South Eleventh St. and in the 1890's he could be found at, 228 So. Fifteenth St., Philadelphia (Davis, 1986). In 1862, Zentmayer introduced his U.S. Army Hospital Stand to meet the need of the Civil War. It was made for about 30 years, eventually incorporating the swing substage and the 1876 long lever fine adjustment. The last examples included the horseshoe type foot (*SMMA*, 98, Vol.37, pp.7). The most common microscope having the signature of Joseph Zentmayer is his American Histological Stand (Fig.1). Sorting out the various forms and dates of this microscope will be the primary subject of this article.

Before concentrating on the Histological microscope, there are a few contributions associated with Joseph Zentmayer that the reader may find interesting. The year of 1876 was probably the most notable for the firm of Mr. Zentmayer as it was in this year that he exhibited his new Centennial Microscope. He manufactured some 44 examples of his large Centennial (*RMS*, June, 1964, pp.124). This stand featured his substage swing tailpiece, which was able to provide illumination from any radius to the object plain of the stage. Zentmayer obtained U.S. Patent #181120 which covered his swinging substage and his new fine adjustment design featuring a long lever for use on the Lister limb (*SMMA*, 1998, Vol.37, pp.8). Mayall points out that this was a revival of a system made by W&S Jones, and was an idea first suggested by the Rev. John Prince of Salem, Mass (G.Adams, Jr., 1798). Also in 1853, Thomas Grubb constructed his Sector microscope using a pivoting sub-stage arrangement (Mayall, 1886, pp.1099). However, Zentmayer's tailpiece with its ability to provide such high degrees of oblique action even to the upper side of the stage was quite unique. It was this ability to swing even to the topside of the stage that separated Zentmayer's design from the others. By 1878, a debate over the priority of the swinging substage was conducted in the pages of the *American Journal of Microscopy*. The idea was copied by most of the leading makers of the time. Of interest

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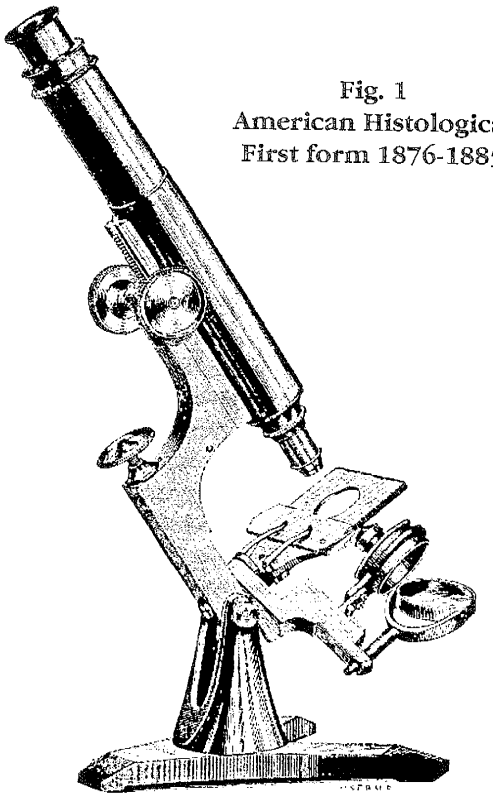

Fig. 1
American Histological
First form 1876-1885

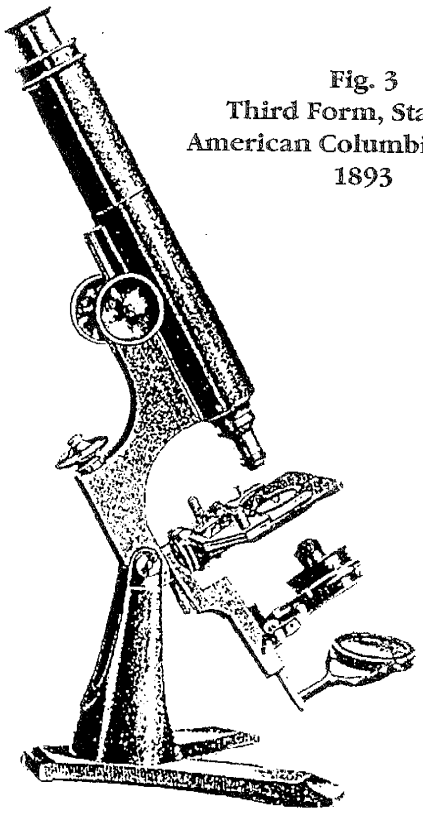

Fig. 3
Third Form, Stand III
American Columbian Stand
1893

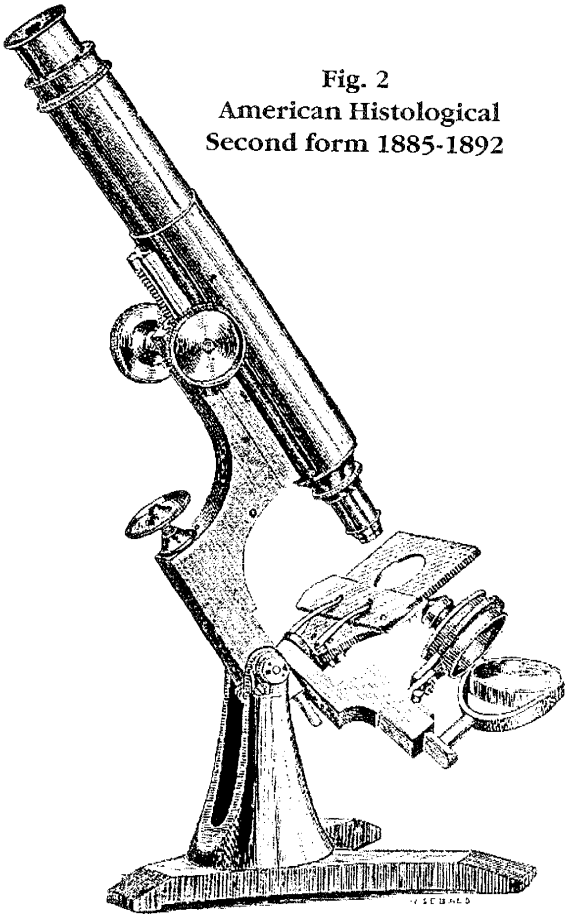

Fig. 2
American Histological
Second form 1885-1892

concerning this subject, is a note by the editor of *The American Monthly Microscopical Journal*, Vol.II, No.9, Sept 1881, pp.174, in which he says, "that about 1870, Mr. Bulloch showed a stand with one of his Swinging substages." See Bulloch's Sector Microscope, exhibited in 1873 and illustrated in the *RMS Journal,* 1880, pp.1063. On 30th of June 1871, Tolles paid J.J. Woodward, of the Army Medical Museum, a visit and exhibited for him a radial arm microscope having a circular track designed to provide oblique illumination (*RMS*, 1880, pp.1061).

Zentmayer's fine adjustment was effected by means of a second slide behind the slide of the coarse adjustment and the main limb. It was known as his horizontal lever fine adjustment and allowed a very fine action on the Jackson-Lister limb. This system was gravity dependent for the downward movement. A similar system was employed by Grunow (Mayall, 1886, pp.1100), and soon won the favor of most of the contemporary makers. One of its advantages is that it did not change the tube-length, as did the usual short lever types that acted on a sprung nosepiece. In historical retrospect, his horizontal lever fine adjustment was a much more important contribution then the swinging tailpiece. It may also be helpful to include a few words concerning the optics associated with Zentmayer's instruments. In 1880, Dr. J. Edward Smith indicates that Mr. Zentmayer produced his own optics (Smith, 1885). Many of Zentmayer's stands are found

today with objective by William Wales. This should not be considered unusual as Wales objectives were found on the stands of most of the American makers. At the time, it was the buyers prerogative to add whatever objective was desired. I'm sure that Mr. Zentmayer was willing to provide any objectives requested in order to sell a microscope. Zentmayer is not known for his production of objectives, but we do often find unmarked and rather plain lenses on his stands. Mr. Smith also records that; Messrs. Spencer, Tolles, Sidle and Zentmayer were providing eyepieces with relevant magnifications. For example, the two-inch has the same magnifying power as a simple lens of two inches focus, similarly for the other oculars (powers) produced (Smith, 1885, pp.156).

Zentmayer's American Histological

Beginning in Europe, a preference for a smaller and more practical instrument began to be expressed by physicians, anatomists and histologists. A convenient and inexpensive stand, which allowed the stage to remain horizontal and featured a shorter body tube became increasingly in demand. Simple instruments that would accept un-fixed wet samples and be used for only brief moments at a time were gaining in popularity. Zentmayer's response to this trend was the introduction of his new American Histological Stand. In the ca.1876 catalogue, Zentmayer acknowledges "the fact that microscopical investigations have become obligatory in many of our Universities and Colleges." The Histological was indeed a very practical stand when compared to his large and extravagant Centennial. He described the instrument as being made entirely of brass with superior optics at a moderate cost. The unique feature that sets it apart from all others was the foot and cone shaped support pillar, all in one piece. Zentmayer felt that the conical pillar "of peculiar shape," provided greater rigidity. Rather then the usual ten-inch body-tube, the Histological was provided with a five and one-half inch tube extendable by drawtube. The fine adjustment is of the same style as the American Centennial Stand, with its concealed lever, adjusted by a micrometer screw, which moves the entire body. The feature often associated with Zentmayer is the swinging substage. His description compares this feature with one of his earlier stands, "the arrangement of the swinging substage and mirrors is the same as in the United States Army Hospital Stand" (*Zentmayer's fifth edition catalogue*, ca.1876). The Histological was available in three basic configurations. The least expensive was with sliding tube focus, the next was with rack and pinion focus and finally there was a Wenham binocular body. The stage was available in two basic forms. The first was the glass stage, which featured Zentmayer's adjustable spring extending from the limb having a small ivory point. This adjustable point applied friction to a glass slide holder. The glass stage supported the slide holder, which could be moved in any direction under the pressure of the ivory point. Mr. Zentmayer had made this glass stage in 1859 for a Mr. Rosevelt of New York. The second form of stage available was a "modification of the glass stage." It was described as a glass slider kept down by two stage clips. The movement for both stage types was provided by hand. The stage clips could be used independently by placing them in the extra holes provided at the top of the stage.

Over a period of twenty-five years, the firm of Zentmayer manufactured three distinct forms of the American Histological. This fact can be used to help identify the time period from which any Histological stand was made. The use of a serial number for age determination is quite problematic as many of the instruments are without a number. Zentmayer was consistent in numbering his larger and more expensive stands, but the Histological, for the most part, went unnumbered. Our three forms of the Histological should not be confused with Zentmayer's American Student Stand (Fig. 5), which was also introduced in 1876. This is a smaller instrument without substage which uses only simple stage clips. The foot is also more rectangular, but the pillar is much like the Histological. It continued in production until the mid 1890's.

Zentmayer patented his American Histological in 1876, and both the Centennial and the Histological were first exhibited at the Academy of Natural Sciences in Philadelphia on April 2, 1876. They were next exhibited at the Centennial Exhibition of that same year. They were also exhibited again at the Paris Exhibition of 1878 (RMS, 1880, pp.1067). The Histological was first manufactured early in 1876, but the patent date was Aug 15, 1876. It continued with great success with its foot enlarged in 1880 (Smith, 1885). This first form was produced until about July of 1885. Its characteristic feature was a very short conical pillar, which supported the limb. From 1885, until about July of 1892 the second form of the Histological was advertised. This form featured a much taller conical pillar. Finally in 1893, the American Columbian Stand was introduced and it had the tallest conical pillar of all the three forms. In the meantime in Oct. 1892, Frank Zentmayer (the son) began advertising his new American Continental Stand (Fig.6). It can be described as having a Histological upper half with the lower half being that of a typical continental stand (RMS, 1892, pp.663) (AMMJ, 1892). From here on, I will be referring to the Histological as the first, second and third forms. The following is a description of the important features that distinguish each form from one another.

First Form: (Fig.1)

As mentioned above the first Histological was made in 1876. The last time this form was advertised was in July of 1885 (Journal of the New York Microscopical Society, Vol.1, No.7, July, ad). The two distinctive fea-

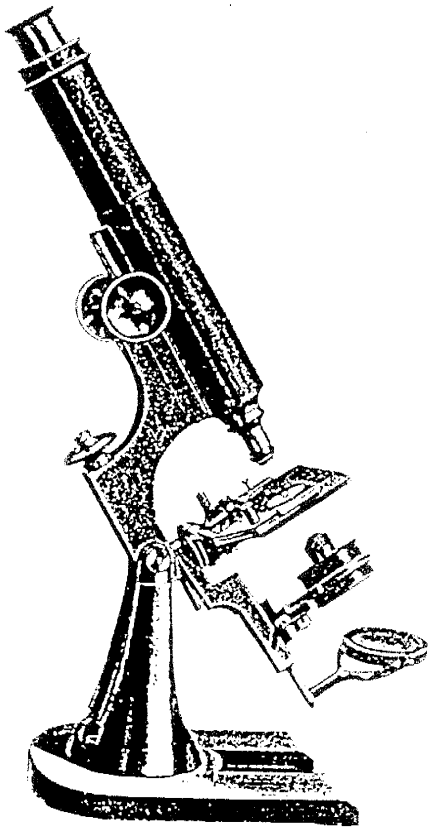

Fig. 4 American Columbian Stand Portable with horseshoe foot 1893

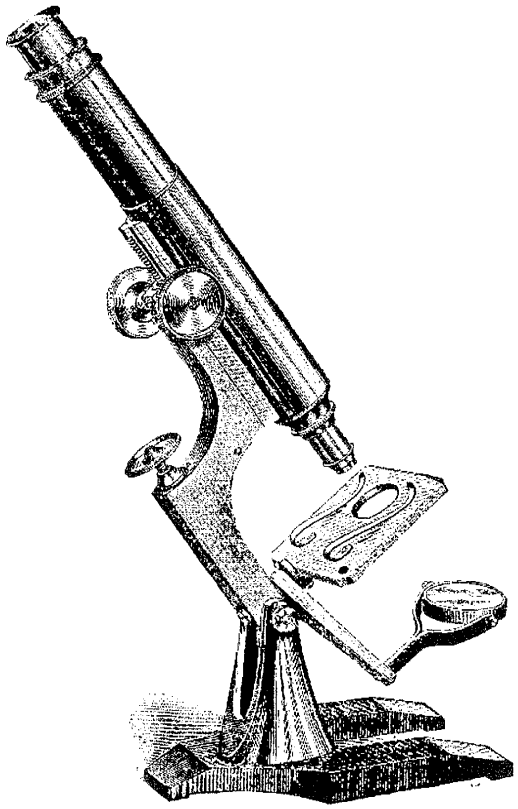

Fig. 5 American Student Stand 1876

tures were a "Y" foot with a short conical pillar and a fixed mirror. The condenser could be adjusted by hand on a dovetail cut into the swinging stem. In the catalogue Zentmayer describes the stage as being only three inches from the table when in a horizontal position. Because the mirror could not be adjusted up or down the cone shaped pillar remained quite short.

Second Form: (Fig.2)

The second form is similar to the first with two important exceptions. The cone shaped support pillar is now much taller and the mirror can now be adjusted on a dovetail cut into the stem. This new adjustable mirror required the pillar to be higher. The first advertisement I could find for the second form was in November of 1885 (*Journal of the New York Microscopical Society*, Vol.1, No.8, 1885, ad). The last advertisement appeared in July of 1892 of the same publication. In October of 1892 the firm began advertising the new American Continental (Fig.6), although they continued to produce the Histological second form.

Third Form: (Fig.3)

In 1893, Frank Zentmayer again made improvements on the Histological pattern. The third form was now called The American Columbian Stand. In the 1895 catalogue, this new form is introduced as the microscope "formerly known as the Histological Stand." The most noticeable difference is a very tall conical pillar, by far the tallest of the three forms. He also included mechanical improvements to the stage. In 1893, the World's Columbian Exposition was held at Jackson Park, Chicago. The Exhibit was a major event for the emerging mid-west. It included the newest scientific achievements such as Pullman cars, electric light bulbs, the linotype, and replicas of the three caravels of Columbus. The Fine Arts Building was later rebuilt becoming the home of the Chicago Museum of Science and Industry. Zentmayer obviously intended to exhibit his new and improved model of the American Histological (new American Columbian Stand). However, circumstances prevented him from participating. In the introduction to his American Columbian stand in the 1895 catalogue, Zentmayer indicates that the new model "was reconstructed with many improvements in time for the World's Columbian Exposition," but confirms that "circumstances prevented exhibition there"(Zentmayer, 1995). According to Mr. Tolman's Exhibition report (*AMMJ*, 1893), Zentmayer was not present. He states, "Among microscope makers, Joseph Zentmayer of Philadelphia, one of the oldest and best-known men of his line, is unfortunately not represented." It should be noted that after the passing of Joseph Zentmayer in 1888, his son, Frank Zentmayer controlled the firm.

The microscope section of the Chicago Academy of Science established a committee assigned the job of soliciting exhibits from both American and European

makers. Mr. Henry Tolman was chairman of this committee and travelled throughout Europe arranging for the various microscope makers to commit themselves to participation in the Exhibition (*AMMJ,* 1893, pp.15). In his report before the microscope section of the Academy, he declared that "it is safe to say that the exhibit of modern instruments and accessories will be the most extensive that has ever been made at any World's Fair" (*AMMJ,* 1893). The preparations for this exhibit were well publicized within the American microscope publications and no doubt inspired Zentmayer to make improvements in the Histological stand. The reason for his absence remains unknown to this author. There was an alternative model of the American Columbian, which came in a portable form (Fig.4). This stand permitted the tall conical pillar to be turned up over the back of the limb for storage in a magazine case. It had a horseshoe foot that could be removed and stored in the bottom of the case. The rest of the microscope was the same as the standard Columbian model.

Frank Zentmayer was no stranger to the State of California and even had a representative selling his stands in the City of Los Angeles. In the 1890's his agent in California was H.M. Sale & Son, located at 220 S. Spring St. L.A. California. Sale issued a catalogue of Surgical Instruments; they were known as Druggists and dealers in Physicians Supplies. The microscopes included those by Zentmayer and J. Hicks of London. This was one of the largest suppliers on the West coast and one of the first in Los Angeles.

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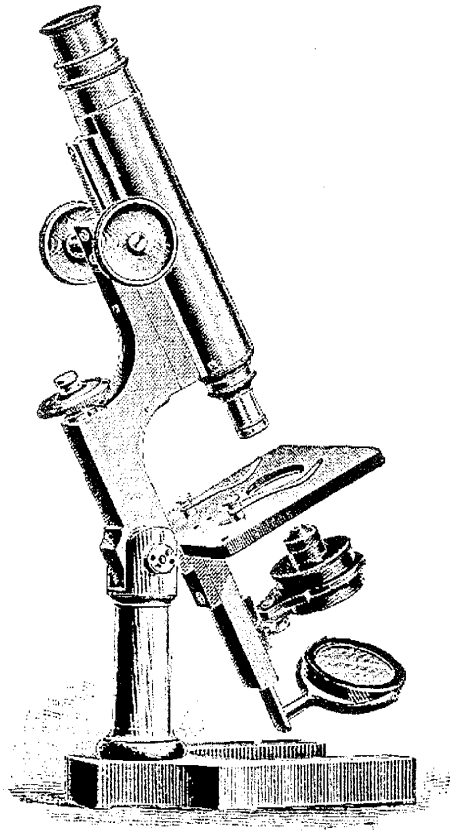


Fig. 6
New American Continental, 1892

In May, Steve Craig received a round of applause for his recovery and return to the workshop.

MSSC's President, George Vitt, had worked as a development engineer at The Lionel Corporation in New Jersey, before coming to California in.1956 to work for the Hughes Aircraft Company. In 1997 George became the subject of chapter nine in the book, *The World's Greatest Toy Train Maker - Insiders Remember Lionel*, by Roger Carp, Kalmbach Pub. Co., Waukesha,WI. The book, and especially chapter nine, are replete with photos that George had taken while at Lionel with his trusty Exakta and home-built strobe. The photo above was taken by a Kalmbach staff photographer as a lead to George's reminiscences of his days at Lionel.

WORKSHOP of the Microscopical Society of Southern California

by: George G. Vitt, Jr.
Date: Saturday, 5 June 1999
Location: Ernie Meadows' residence; 27 persons attended

1. **Jim Solliday**, our most energetic and able VP, related to the assembled group how John and Alan de Haas had 'resurrected' the Society in the early 1970s. We all expressed our appreciation to these two fine members. Jim then related how a search had been made for the rare book, "The Great Age of the Microscope", for the purpose of presenting it to John de Haas. Finally, after fruitless efforts, a copy had at last been found by Colin Lamb, a former President of the Postal Microscopical Society (England). It was this copy that Jim now presented to John as a token of our esteem. Jim then showed a small bench-type microtome by Flatters & Garnett, Ltd., 302 Oxford Road, Manchester, England which Colin Lamb had donated to the MSSC to be sold at an MSSC auction, the proceeds going to the MSSC treasury. There was a round of applause for Colin's generosity and good will. With Jim as Auctioneer, the auctioning of this fine microtome took place after the coffee break with a starting minimum of $50. Finally, after some spirited bidding between Barry Sobel and Richard Jefts, the instrument went to Barry for $225.

Jim then reminded us of the many sets of fine Scottish Foraminifera samples donated to MSSC by Roy Winsby of the Manchester Microscopical Society. Each set consisted of labeled samples in 3 poly bags within a

folder of explanatory text. He reported that John de Haas had already mounted some of these, using his special mountant technique and that all were invited to see them. Jim also described the work of George Wales, an American maker of inexpensive but good microscopes. Jim showed a Wales microscope, c.1880 with a Swift limb and Swift fine focus adjustment, cased with 3 objectives, bullseye and other accessories.

2. **Gaylord Moss** reported that Larry Albright is "doing well" in his recuperation from recent surgery. This was certainly very happy news.

3. **Ernie Meadows**, at whose residence the Workshops are held, cautioned all of us to be careful and not disturb the Morning Dove which had just deposited two pristine little white eggs in a hanging nest adjacent to our 'coffee break table'. We all took heed.

4. **Dave Hirsch**, MSSC Treasurer, reported that MSSC checks are now being deposited at Home Savings, which happens to be quite convenient to his home.

5. **Ken Gregory** showed a c.1917 cased B&L traveling microscope, in excellent condition, whose stage rotates into a flat position for compact packing in the case. It is not illustrated in Billings.

6. **Stuart Warter** showed an extremely rare, cased, portable traveling microscope by Jiovanni Batista Amici, c.1832-52. Amici was a professor of physics in Modena. He did not make microscopes but had them made under his direction. He developed the horizontal reflecting microscope and collaborated with Chevalier in Paris. In 1835 he moved to Florence (Firenzi) and set up a workshop. This example has achromatic lenses, an undocumented condenser, and a very unique lensatic prism on an articulated arm which is used as a highly efficient bullseye type condenser but with a greater range of adjustment and flexibility. There was a general discussion of Amici's other important contributions to optics..

7 **John de Haas** donated a stereo microscope by ScherrTumico which he wishes to be auctioned with proceeds going to MSSC. This microscope has a large single objective above which is a rotating drum containing a telescopic system of paired lenses for changing magnification. This system is similar to that used in Zeiss stereo microscopes as well as the Russian LOMO stereo microscope with which we are all acquainted. We thank John for his generous contribution and look forward to its auction at the June meeting.

8. **Peter Fischer** showed a Spencer monocular microscope which he had restored most effectively by "de-rusting" it with Naval Jelly compound.

9. **Barry Sobel** showed his rare "Symposium" research microscope which weighs 25 lbs.! He related that Powell and Swift had a symposium in the 1920s the result of which was the set of design features incorporated into this model. It has a Wales limb, a heavy foot with the ability to screw down to the case, a calibrated R/P draw tube, rotating centrable calibrated stage, petrographic fitting, Sloan substage with dovetail fittings, triple nosepiece, and a swing-out calibrated irised polarizer. This microscope and one in the RMS collection are the only examples known.

Barry reported that Mike Dingley (President, Postal Microscopical Club of Australia) is writing a book on portable microscopes and has the best collection of MacArthur microscopes. Barry then showed, with pardonable pride, his recent rare acquisition - a MacArthur made by Cooke, Troughton & Simms, c.1960 - which he had obtained on a trade with Mike. It has three objectives (hi, low, oil immersion) and all sorts of accessories and all in immaculate condition. Due to its inverted microscope principle, the glass slide thickness has no bearing on focusing and, therefore, only a fine focus adjustment is installed. Barry refers to this as 'automatic focusing'. He then told a fascinating story of the history of the development of the MacArthur design and the amazing adventures some of these microscopes have had in such remote parts of the world as the Antarctic (first microscope ever used there), Borneo, and Africa! (It looks to all the world that Barry is taking more than a passing interest in microscopes and microscopy!)

10. **Ed Jones** related his observations on the use of a stereo microscope at a public exhibition. It seems that the microscope was a "people and kid magnet" which elicited both curiosity and an irresistible attraction. In fact, he had to turn the microscope with its eyepieces facing away from the public in order to keep people from using it during periods of intermission! (And it was not made of Alnico 12!)

11. **Fred Hantsch**, our devout mineralogist and micro-mount mineral sample preparer, told of the difficulties of observing small specimens from various aspects at high magnification. To solve this specimen holding problem, Fred showed his "Easter egg" sphere device. It rests on a hollow base which allows rotation at all angles with the micro-mount box held at the top.

12. 20 Minute Break

13. Auction of the microtome.

14. **Allen Bishop** showed two microscopes:
1) An unused, cased Zeiss No.3 microscope with an accessory projection eyepiece and the unusual feature that there was an extra rotary stage mounted on

a wooden plank which slides into the case.Within the case he had found a slip of paper with the date "Dec 1920".

2) **Steve Craig's** incomparable cased Spencer large research binocular microscope, c.1930 with ergonomic head with protractor and, surprisingly, no serial number. (Was this the predecessor of the Mod.5?)! In a separate case, there was a large number of accessories, including a complete set of apochromats and matched pairs of compensating eyepieces, substage mirror with two protractors, oblique lighting capable 2-diaphragm condenser, x-y rotatable stage, co-ax adjustment knobs, dovetailed nosepiece (highly modular), filar micrometer, Spencer variable focal length objective, and monocular tube. A very unusual accessory was the Silverman illuminator:This is a ring-shaped glass tube with tungsten filament and silvered back which attaches around the objective and gives essentially shadowless illumination for incident light observation.This is truly a deluxe microscope and those familiar with the Mod.5 need no further description. Allen had done an excellent job in cleaning and adjusting this microscope, as well as refinishing the cases. Steve was very thankful for the job done.

15. **Alan de Haas** brought a pristine Spencer Research microscope Mod.5, cased with accessories, which looks like a twin brother to Steve's microscope described above! It was a most unusual event to have two of these superb Spencer microscopes on the same table! Herb Gold is now the proud owner of this fine instrument. Alan showed a seldom seen stage plate for this microscope that attaches to the stage for macro work, and an auxiliary condenser lens that slips on the condenser of the Mod.5. He then discussed the high capability for macro photography of early Kodak Ektar 16mm cine lenses, when used reversed. He stated that their image quality often exceeds that of the best modern lenses designed for this purpose, and that they are "dirt cheap" by comparison. Alan added a thought provoking piece of information: The Huygens eyepieces, as modified by Amici to provide for a variable spacing of its two lenses, may well have been designed for the purpose of making correction of color aberrations of early pre-achromatic objectives!

16. **Dave Hirsch** showed an early Zeiss portable microscope in which the rather long body tube snaps off the stand through the use of an A/O style spring detented circular dovetail attachment, and then is reversed and re-attached, so that the instrument can be stored more compactly in its case. Dave also displayed a fine kaleidoscope whose basic optics he had assembled from a kit, and then added embellishments of his own design to make it truly a fine table exhibition piece.

17. **Richard Jefts** directed our attention to two articles: the first in "Microscopy Today," which dealt with a video camera-to-microscope adapter, and cover glass considerations; the second in "Paleontology Today", a 1970s article on the study of the structure of the eye of the trilobite. He then showed and described the contents of a quart jar, which contained innumerable highly tumble-polished decorative stones (popular as 'cabs' in jewelry making) and minerals of every description. He described some interesting finds in such collections.

18. **Larry McDavid** showed several interesting and unusual pieces of laboratory equipment:

1. A London-made artificial horizon c.1900 used by surveyors and navigators in conjunction with the sextant when the actual horizon is obscured for any reason (weather, clouds/fog, mountains, etc). It consists of a sealed shallow steel box to contain mercury (which acts as a flat mirror at horizontal plane), and two plates of clear glass forming a protective roof.

2. A cased mercury thermometer with two separate scales at either end, and with an expanded mercury capillary in between (to shorten the column). One scale is graduated 0-20 deg. C. and the other 50-100 deg C. This thermometer is used to accurately measure the freezing and boiling temperatures of liquids.

3. A very small, delicate and utterly "cute"Technometer - a little volumetrically calibrated glass flask used to determine the specific gravity of fluids. It has the appearance of a round bottomed flask with a thin vertical neck on which are engraved two closely spaced scribed lines which indicate, presumably, when the flask had been filled with the prescribed 100 grains of distilled water.The 2" high flask is accompanied with an equally small glass funnel. For obvious reasons, these items were not "passed around".

4. A news release on the Martian Sundial.

19. **Bill Hudson** told of a lab that makes mineral thin-sections: Burnham Petrographics, 846-1 S. Myrtle, Monrovia, CA. They do not stock prepared slides for sale, but make them only to order from specimens brought to them.

20. **Jack Levy** showed a very rare volume of the first book in English (1634) on insects, by Thomas Tennent, while Thomas Muffet did the manuscript. He also showed a reprint by Thomas Muffet who, by the way, was the father of a girl later to be known to all as "Miss Muffet", who liked her curds and whey!

After the Workshop, a group of 12 went to Coco's for food and more conversation.

REICHERT AND TIYODA MICROSCOPES OF SIMILAR CONSTRUCTION.

By Mike Dingley.

The original description of the Reichert 'Heimdal' Field microscope was published in 1927 and the instrument was designed by F.K. Reinsch, who unfortunately died just prior to publication. The first microscopes were manufactured by Reichert, but Tiyoda of Japan also made what appears to be an identical model called the MKH. It appears that no other manufacturer made instruments along the original description. For a full description of the Reichert 'Heimdal' see the article by D.B. Payne, 'The Reichert 'Heimdal' Field Microscope after F.K. Reinsch', Microscopy 33:201-206, 1977.

This author has in his possession one of each and it was thought pertinent to compare the two models to discern their similarities and differences.

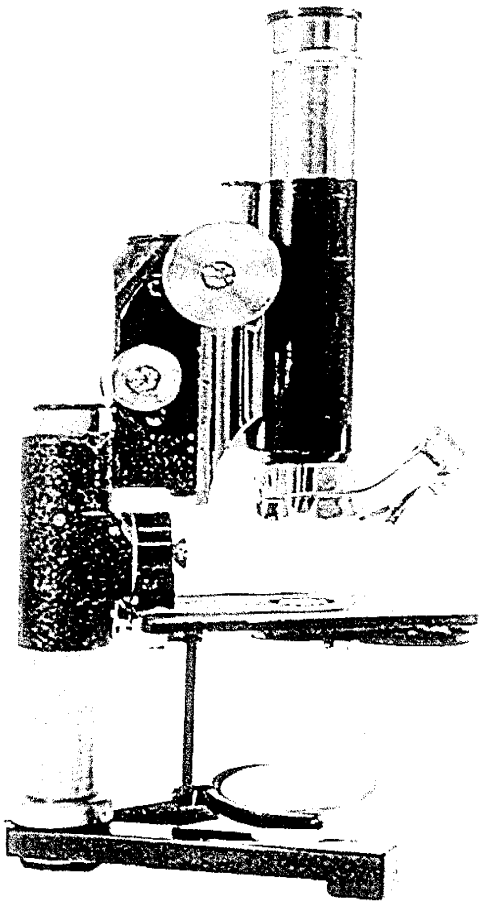
Reichert 'Heimdal'

The metal case with an unusual black speckling on a beige background measures 165mm X 130mm X 52mm and weighs 1.9Kg complete. This case packs into an outer brown leather case reminiscent of binocular cases. The hinged lid is securely closed with a double lock, operated by a slide. Inside the lid are places to hold accessories including a metal canister containing a 100X n.a. 1.25 oil immersion objective and two black metal canisters with screw tops each containing a tiny clear glass, ground stoppered bottle. One of the bottles is empty whilst the other contains a viscous yellow/brown liquid which could be Canada balsam. On the inside of the stopper on this bottle has a metal loop wire to deliver the liquid to the specimen slide. Both canisters have a spring in their bases and the lids are cork lined which, when the lids are screwed in position, hold the bottles without fear of breakage. The other side of the case contains the field microscope as well as a 10X eyepiece, funnel stop and an eyepiece micrometer having a line 10mm long divided into 100 divisions. In its smallest configuration the microscope is 153mm high X 120mm wide and 46mm deep and is finished in black crackle enamel, smooth black enamel and chrome. The opened V-shaped foot forms two sides of an equilateral triangle of 110mm side length with an angle of 65 deg. at the pillar. In order to prevent the instrument from sliding, the three toes have a serrated finish. The pillar is 18mm in diameter, the coarse rack and pinion focussing knob is 30mm in diameter and the fine focus knob is 18mm in diameter. There is a 5X eyepiece which stays in the tube when packed in its case. It has an un-graduated drawtube with an engraved line to signify a 160mm tube length. The tube carries a double nosepiece in a figure 8 pattern with RMS threads. There is a special divided objective whose front lens can be brought in by means of a slide guide and is marked 3X and 8X. The stage measures 80mm wide X 85mm deep and has two stage clips. The stage rotates 90ø for packing in to its case. The substage consists of an Abbe condenser mounted on a hinge so that is can be moved away when a dark ground illuminator is substituted. Beneath this is a separate iris diaphragm which is also mounted on a hinge and below this is a blue ground glass disc mounted in a metal 'bayonet' type flat fitting with a small handle. The plano/concave mirror has a diameter of 42mm and is mounted on a swinging arm.

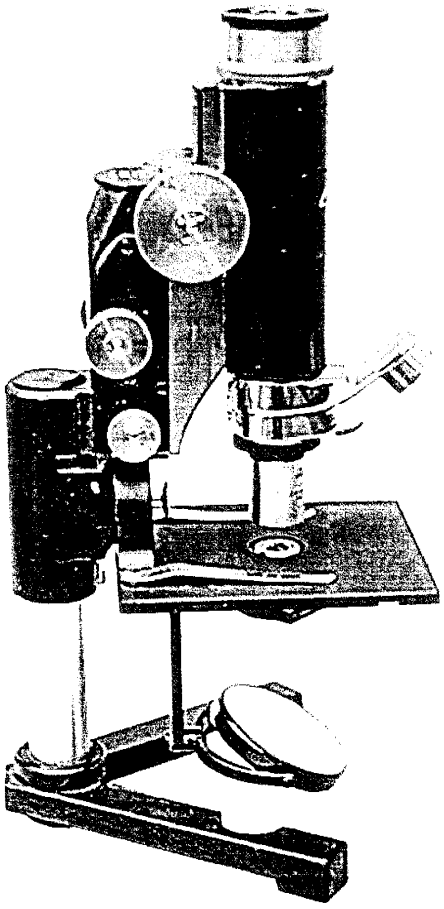
Tiyoda MKH.

This plain olive green painted metal case measures 184mm X 130mm X 54mm and weighs 1.95Kg. It is slightly larger and heavier than the Reichert. It packs into a soft leather bag. The hinged lid is held via a single lock operated by an external slide. The lid does not have provisions to hold accessories; instead there are three blue velvet pads to hold the microscope in position when the lid is closed. The microscope and accessories are all housed in the base of the case. There are two black metal objective canisters housing a 90X n.a. 1.25 oil immersion lens and a 40X n.a. 0.65 dry objective. The canisters are held in position via metal tubes by friction. The same is true also for the eyepiece which has a magnification of 10X. There are two smaller canisters that are chromed with one having the letter C and the other X marked on the lids. These contain small brown ground glass stoppered bottles. One stopper has a moulded glass rod in the underside of the lid which would be for delivering the mountant to specimens. This presumably would be under the letter C for Canada balsam? The other would be to contain xylol. Both bottles are empty. As with the Reichert they have springs in their bases and the lids are cork lined.

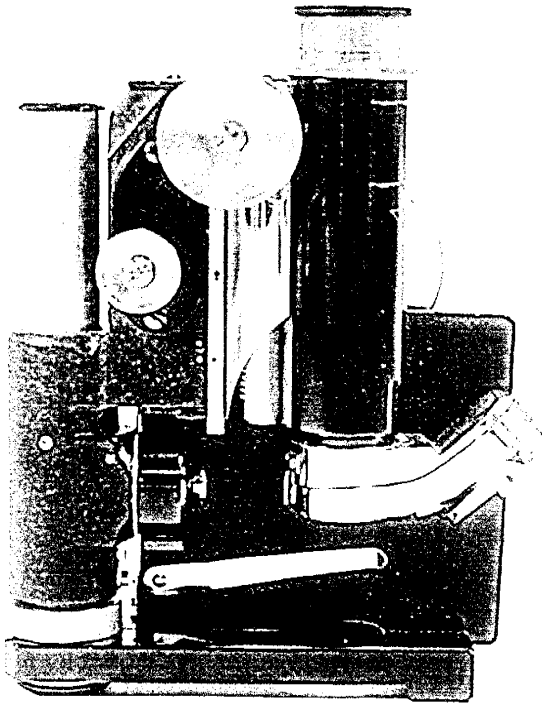
In its smallest configuration the microscope is 159mm high X 118mm wide and 50mm deep and is finished in black crackle enamel, smooth black enamel, chrome and a satin finish. The opened foot form the sides of a triangle of 110mm sides but the angle is 80deg., somewhat wider than the Reichert and therefore more stable. The toes also have a serrated finish. The pillar is 17.5mm in diameter, the rack and pinion coarse focussing knob is 30mm, the fine focus is 18mm and on one side just below the fine focus is another 14mm in di-



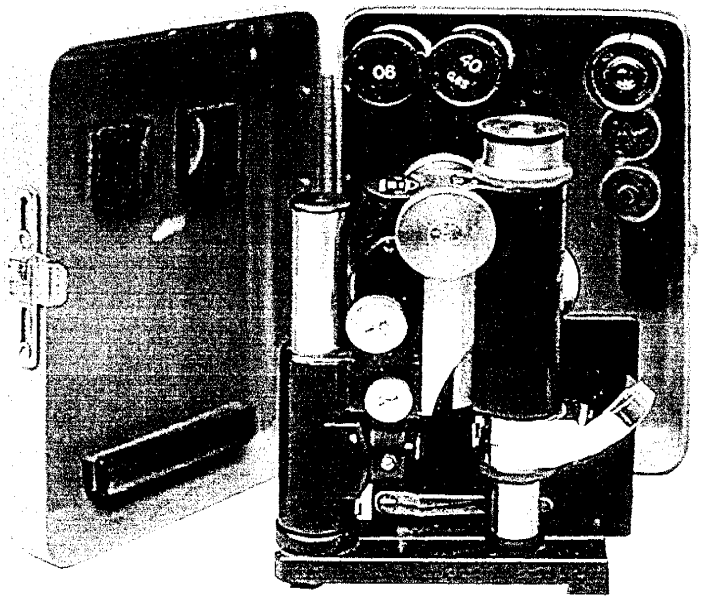
Reichert 'Heimdal"



Tiyoda MKH



Reichert 'Heimdal"



Tiyoda MKH

ameter which locks the stage when in use. There is a 5X eyepiece which stays in the tube when packed. There is also an un-graduated drawtube which when extended to the engraved line gives a tube length of 160mm. As with the Reichert, this instrument has a double nosepiece in a figure 8 pattern and has RMS threads. However, there is no special divided objective as it is furnished with 'normal' objectives. The 10X n.a. 0.30 stays attached to the nosepiece when packed. The stage is 80mm wide X 85mm deep and has two stage clips. The stage rotates 90 degrees for packing. The substage consists of an Abbe condenser mounted on a hinge. Below this is an iris diaphragm which is also mounted on a hinge and below this is a blue ground glass disc mounted in a metal 'bayonet' type flat fitting with a small handle. All of this is identical with that of the Reichert. The plano/concave mirror is 40mm in diameter and is also mounted on a swinging arm.

REICHERT.

1. Metal case.
2. 50 grams lighter than the Tiyoda
3. Has 2 stoppered bottles (clear)
4. Has a divided objective
5. Plain stage with clips
6. Vertical eyepiece tube
7. 90 deg. rotating stage
8. Double nosepiece figure 8
9. V-shaped feet
10. Substage Abbe condenser
11. Substage iris diaphragm with blue ground glass filter
12. Plano/concave mirror on a swinging arm

TIYODA

1. Metal case.
2. 50grams heavier
3. Has 2 stoppered bottles (brown)
4. No divided objective
5. Plain stage with clips
6. Vertical eyepiece tube
7. 90 deg. rotating stage
8. Double nosepiece figure 8
9. V-shaped feet
10. Substage Abbe condenser
11. Substage iris diaphragm with blue ground glass filter
12. Plano/concave mirror on a swinging arm.

At first glance these two instruments appear, and are identical in every way. The differences are really only slight. For example the smooth paint on the Tiyoda is a matte finish whilst it is semi glossy on the Reichert. The Reichert has a divided objective whereas the Tiyoda has kept to the more simple 'normal' objectives. The mirror housing on the Tiyoda is painted black but the Reichert has a chromed finish. The Reichert is slightly lower in height and the feet have a smaller angle of spread. Neither have flat field objectives and optically they are very similar.

It does seem rather obvious that Tiyoda have copied the Reichert in just about every way and they have done a remarkable job. The size and weight of the instruments are almost the same. The substage assemblies are identical even down to the method of holding the blue ground glass filter. The iris diaphragm assembly on both instruments is hinged to allow for a smaller volume when packing in to their cases. Both body assemblies slide up and down a vertical pillar and the stage locking mechanism are identical. One difference is that the Tiyoda has an extra screw fitting to secure the stage in a horizontal position which does seem a bit overdone as the system is quite sturdy without it. Although the author has not yet managed to put a date on the Tiyoda it is probable that it is post WWII approximately 1945-1950 in a time where the Japanese were renowned for copying all manner of products.

So there you have it, two almost identical field microscopes which are quite rare. Both are very well machined and finished and it appears that the original designer, F.K. Reinsch had put a lot of thought and effort into producing the optimum field microscope. Both microscopes produce acceptable results optically but they do suffer from being just a little small. The substage arrangement is tiny and a little awkward to manipulate but with a little practise would become easier to use. However, the original Reichert instrument was designed in an era where horses were the main transport for field naturalists and it seems that in that light they are exceptionally well made.

MICROTOMY NEWS-LETTER IV

by Colin J. Kirk

from The Balsam Post Issue No. 44 July 1999
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The items in this issue include one from Robin Wacker from Germany and a progress report by Victor Diss. I understand that Robin Wacker is a relatively new PMS member and I have started off with a thumbnail sketch.

Robin James Gordon Wacker

Robin Wacker was born in Geneva in May 1929 but his schooling was mainly in Reading, He attended college in Birmingham England and was employed in the jewellery, trade in Hockley, Birmingham for 8 years. He served for 2 years in the Royal Air Force. A one year stint in bacteriology at the Queen Elizabeth Hospital, Birmingham was followed by 8 years at. the Women's Hospital Pathology Department., again in Birmingham. During this time Robin took a 7 year course in Medical Laboratory Technology and qualified with Diplomas in Histology/Cytology and Haematology/ Blood Transfusion.

When he married a German girl Robin moved to Germany and has spent 31 years in the Pathology Institute of the University of Wurtzburg Luitpoldkrankenhaus as a senior chief technician. Although retired at 65 be has spent 4 years part time working with the histology of fish at the Bio-Zentrum of Wurtzburg University. And his hobby is histology! As well as collecting microtomes !

HISTOLOGICAL TECHNIQUES WITH SIMPLE APPARATUS by Robin Wacker

Botanical Material - Botanical material is easy to obtain and the cross section (TS) of leaves such as oleander, mistletoe, box tree and many others make good subjects especially when they are not too old or too young. Cut the leaves across at about. 5 - 6 mm. and place in the fixative fluid e.g. FAA.

Flowers such as daisy, chamomile and other composites make interesting mounts. Choose them when the pollen is expected and place the whole head plus a short piece of stalk in the fixative. The short piece of stalk makes it easier to hold with the forceps. The cross sections of stems are also fine subjects, but choose those areas which are riot too woody as lignin tends to harden a lot in the processing. Examples of suitable stems would be mint and young maize cut across at about 3 - 6 mm.

Zoological Material - Zoological material is harder to obtain however, if tissue can be found it must be fresh for good preparations. Try the slaughter houses for a bit of pig liver, kidney, muscle, or small intestine. You could ask your local butcher for FRESH tissue and explain why you want it fresh for microscopy. Roadkill animals are a sad happening but may be useful for example hedgehogs and rabbits. Hedgehogs often have parasites in the liver and there will probably be fleas which are also useful to a microscopist! Beware of choosing run-over cats and dogs; the owners may be a bit upset and you may become the dissected one! Larger wild animals are usually protected by law and, unless one knows a gamekeeper it is probably best to keep clear of such tissue.

Using a razor blade or sharp knife cut and fix suitable blocks of tissue in 4% buffered or neutralised formaldehyde fixative. A size of approximately 5 x 8 x 10 mm. would be suitable and may be kept in the fixative for a few months. Prolonged fixation tends to impair nuclear staining. If necessary transfer to 70% alcohol. Fish tissues are easier to obtain fresh from the fish market or from an aquarium. Infected or dying fish in an aquarium may be chosen e.g. a Guppy or Black Mexican Molly that is infected or with a tumour. I am presently involved in the histological preparation of the Mexican Molly and other fish with tumours with the Biological Centre of the Wurzburg University.

A reasonable killing procedure for such a small fish, ie. about 3 - 4 mm from nose to tip, is to place the fish with a little water in a beaker and slowly add ice to the water. The fish soon becomes immobile. Leave until thought to be dead then place in ice cooled 4% buffered formaldehyde solution. if not ice cooled and the fish was not dead - torture results!! Fix for about 24 hr. at room temperature then place in a decalcifying fluid. If cross sections are planned then cut the fish into suitable sizes e.g. behind the head and before the tail. The decalcifying fluid I use is that of Gooding and Stewart which is 10% formic acid in 10% formalin (4% formaldehyde) The procedure is to decalcify for 1-3 days with 2 or 3 changes of decalcifying fluid. Wash well in water, and then dehydrate, clear and infiltrate with wax as follows.

Dehydration - This is essentially the same for both botanical and zoological material and is simply a row of alcohols in graded concentrations e.g. 70%, 80%, 90%, 95% and two changes of 100%. With very delicate tissue it is better to start at 40% or 50% alcohol.

One could use an alternative method as follows. With the tissue in a small container leave a little fixative just covering the tissue and keep adding about the same amount of 100% alcohol to it each time, doubling the fluid amount. Finally decant off ail the fluid and replace with two changes of 100% alcohol.

An alcohol easily obtained is isopropyl alcohol or isopropanol and it is not very expensive. Try your local pharmacist. (or order it from NBS Ltd.) isopropanol has an advantage in that it is miscible with wax when hot. The tissue should now be free of water.

Clearing - This is the replacement of the alcohol with a fluid miscible with alcohol and wax. The name is a result of the tissues often becoming "clearer" or translucent through the similarity of refractive index of the tissue and the intermedium. Although isopropanol is miscible with wax when hot, I prefer a true intermedium/ clearing agent. Very good clearing agents are chloroform, methyl benzoate and methyl salicylate (oil of wintergreen). The last two are only slowly removed and replaced from the tissue by the wax. I avoid xylene, toluene and benzene as they harden the tissue if left too long, particularly botanical and brain tissues. There are alternatives such as turpentine, paint thinners lamp oil etc. but they are. usually not so good. Chloroform following methyl benzoate or salicylate is a good alternative to the earlier advised benzene.

Wax Impregnation - Following clearing, (or direct from isopropanol) the tissues are placed in molten wax with 3 or 4 changes of fresh wax.' However, botanical material is critical and an abrupt change can ruin many specimens. I find a useful method is to place tissue in a metal container which has some solidified wax in it and covering the tissue and fluid with fine wax shavings. At room temperature the shavings are slowly dissolved by the clearing agent and gradually impregnate the tissue. This is why I like to use a clearing agent miscible with wax at room temperature. After a day or two move the container to a warmer place for the same length of time, then warm to 60 degree C to finally impregnate for a few days. Replace twice with fresh wax to remove all traces of the clearing agent before blocking out.

Zoological tissues are not usually a problem and can be transferred directly from the clearing agent to the first of two to four changes of wax at 60 degrees C, each change lasting from 1/2 hour to about 2 hours, each change according to the tissue size. Tissue of about 5 x 5 x 10 mm. in size needs about 2-3 hours in wax. Tissue about 10 x 5 x 15 mm. would need 5-7 hours total time. Contrary to many text books, a longer time is usually an advantage and not, as often stated, detrimental. This is apart from when a wax/benzene or wax/Xylene mixture is used as often advised in older textbooks. Such mixtures would harden if tissue is left too long. I have cut a liver which was forgotten and left in a 60 degree C paraffin oven for about nine months. it cut beautifully and the microscopic picture was excellent!

Wax - There are many good waxes on the market and not costing all that much. The problem is usually being able to buy one or two kg. only, and from whence. The best method is to buy a bag of wax from some histology laboratory but, if that is not possible, don't despair simply use the wax from tea lights (night light candles or food warmer candles). Heat the wax until fumes come off, this also drives off any water but take care that it doesn't bum. if wished add a little beeswax to improve the consistency. Heating waxes and adding other wax types or even rubber were methods much employed by most histology laboratories in days before the commercial waxes now used.

Wax Ovens - These are not easy to get for little cash and actually one doesn't need them, they also need much space anyway. Designs and modifications for embedding ovens and microslide drying tables have been published. Electric lamps, or infra-red lamps suspended above wax containers is a handy alternative. One can also use one of the plates used to keep food hot or a small domestic oven, both would need some form of voltage regulation to maintain a more exact and suitable temperature. Even an old clothes iron turned upside down and fixed in place is OK for small objects. Some suggestions are shown in Appendix 2.

Blocking Out (Casting Out) the Impregnated Tissue - First find, or make, suitable moulds in which the tissue can be placed. There are various methods of folding paper, card, or aluminium foil to make a suitable boxy small tins with straight sides or even the small plastic containers used when serving coffee may be used, naturally after they have been cleaned and dried. Leukhart embedding "L" pieces are very handy and are used with a base plate and can be adjusted for various sizes. Leukhart "L" pieces are usually made of brass but they can also be made of aluminium (or brass) angle strip i.e. L shaped cross section. Cut off with a hack saw and smoothed off.

Use a mould large enough to accept the tissue with some space left over and fill with molten wax at about 60 degrees C for the wax of melting point 56 deg. C-58 deg. C. Heat forceps in a Bunsen or spirit lamp flame and plunge into the wax filled mould. This removes the solidifying "skin' and bubbles on the surface of the wax and cools the forceps so as not to bum the tissue. Remove the tissue from the last wax change and place in the mould in the required position with the side for cutting at the base. Most tissues can be lightly pressed into the solidifying wax in the bottom of the mould in order to retain the orientation of the specimen. However, do not do this with very delicate tissues e.g. composite flower heads but just let them sink by themselves with no re-arranging. The blocking out procedure should be done quickly. If the wax gets a solidifying film on the wax or the tissue before the tissue is placed in the wax then this could cause problems later when cutting. A quick cooling has some advantages but I do not advise the method of cooling quickly under water as water may get into the block. Present day waxes on the market (e.g. Paraplast or Paraplast Plus - Ed.) cut well even when just cooled at room temperature. Leave the block for an hour or more after casting/blocking out before attempting cutting; the following day is preferable as blocks do cut better if left a while.

to be continued

MSSC Meeting of 16 June 1999

David L. Hirsch

We often read of the painstaking efforts of technicians who restore works of art including paintings, statuary and other masterpieces of bygone years. Dr. Nayaran Khandekar of the Restoration Research Department of the Getty Institute spoke of the research programs that support such work by determining the materials and methods that were originally used to create the works so that they can be properly restored. One of the results of such work is often the validation of a piece or the discovery that the piece is not what it is represented or thought to be.

Dr. Nayaran described the cutting-edge technology used for this work at the Getty, such as x-ray fluorescence and Fourier transformation of infra-red data. These analytical procedures help determine the pigments and other materials which were originally used. Often, an artifact may survive, but the method of producing the artifact was lost in antiquity requiring detailed forensic processes to reconstruct. It was a most interesting view of what goes on in the research arm of a large modern art museum.

After the lecture, there was the usual lively discussion group and some show and tell.

Stuart Warter exhibited two sundials: a late 1800's model with an embossed gnomon and a square dial on a wood base. The second sundial was American-made, circa 1815 and featured a round dial and a solid gnomon.

Ed Jones showed, for viewing under a microscope, some of the unique slides that he has become adept at making which have names or text formed of arranged micro-objects such as shells, bones, gunpowder or any very small objects.

John deHaas donated to the MSSC a Sher-Tumoco stereo-binocular microscope to be auctioned off to benefit the treasury.

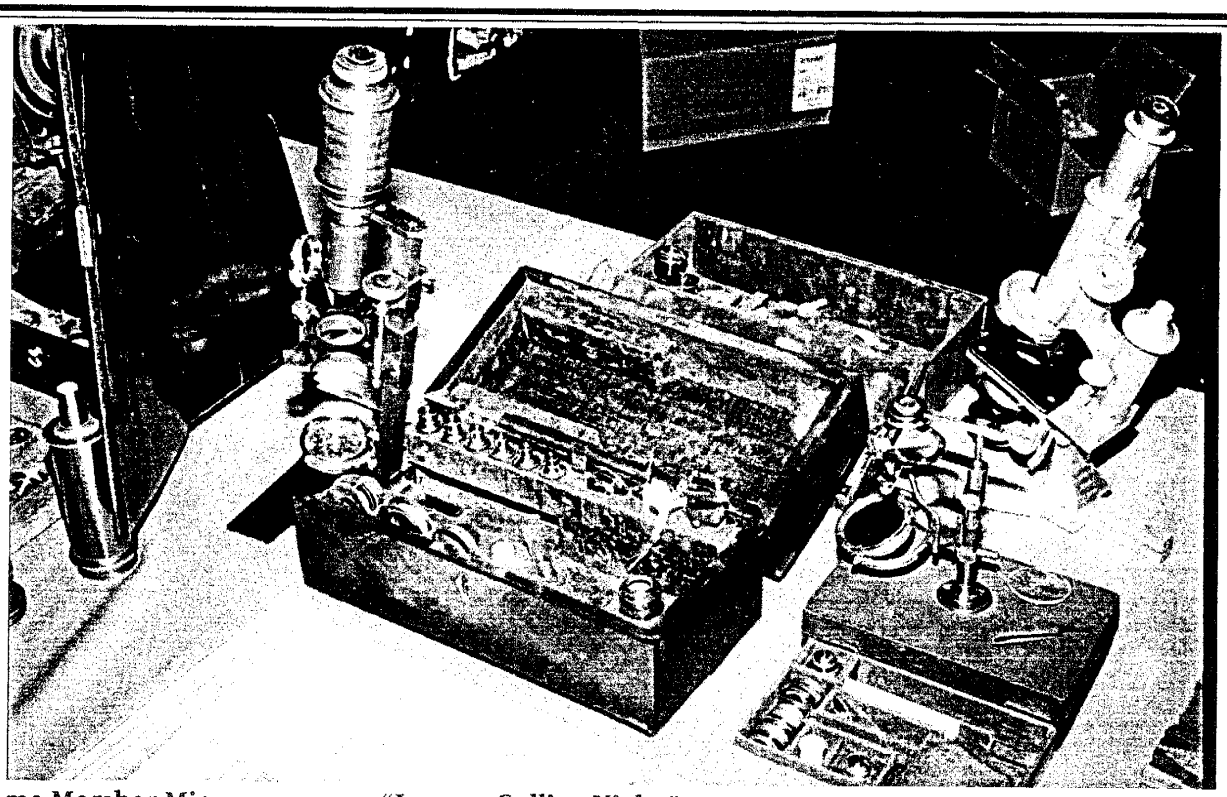
Jeremy Collins Special Lecture

On Wednesday, June 30, we were fortunate to have a special meeting at which Mr. Jeremy Collins, the eminent English authority on historical scientific instruments lectured on the microscopes that have passed through his hands through the years. He illustrated his talk with some excellent slides of some of the rarest and most beautiful microscopes in the world.

As an added attraction, many of the members brought some of their most treasured pieces to discuss with Mr. Collins. It was a splendid and informative evening giving us three, rather than the usual two, meetings in a month.

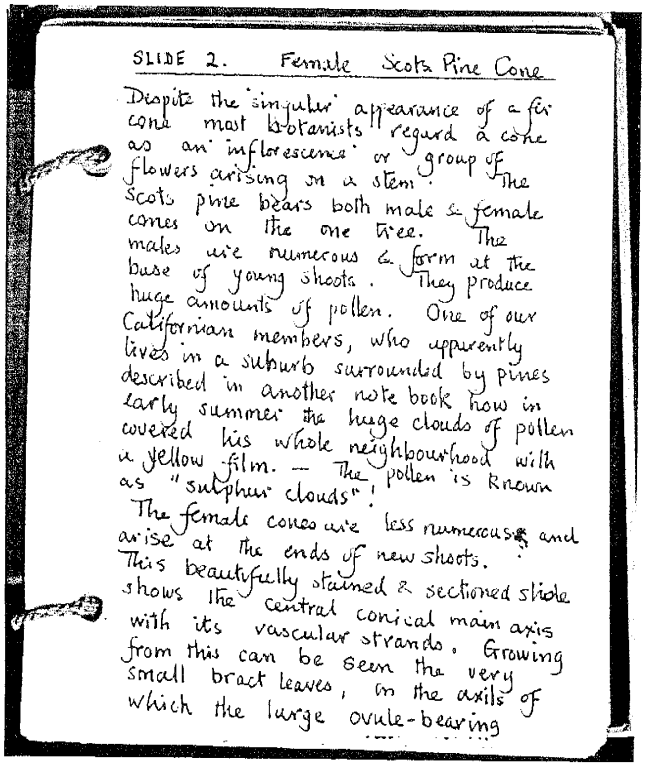
Bad News

Several esteemed MSSC microscopists have not, as yet, graced our treasuries' coffers with their dues for 1999. This oversight has one dire result; the MSSC Journal ceases to arrive in their mailbox. Nuff said.



Some Member Microscopes on "Jeremy Collins Night."

Postal Microscopical Society "Pine Cone Slide" by Sid Hackett with Notes by Arthur North



SLIDE 2. Female Scots Pine Cone

Despite the 'singular' appearance of a fir cone most botanists regard a cone as an 'inflorescence' or group of flowers arising on a stem. The Scots pine bears both male & female cones on the one tree. The males are numerous & form at the base of young shoots. They produce huge amounts of pollen. One of our Californian members, who apparently lives in a suburb surrounded by pines described in another note book how in early summer the huge clouds of pollen covered his whole neighbourhood with a yellow film. — The pollen is known as "sulphur clouds"!

The female cones are less numerous & and arise at the ends of new shoots. This beautifully stained & sectioned slide shows the central conical main axis with its vascular strands. Growing from this can be seen the very small bract leaves, in the axils of which the large ovule-bearing

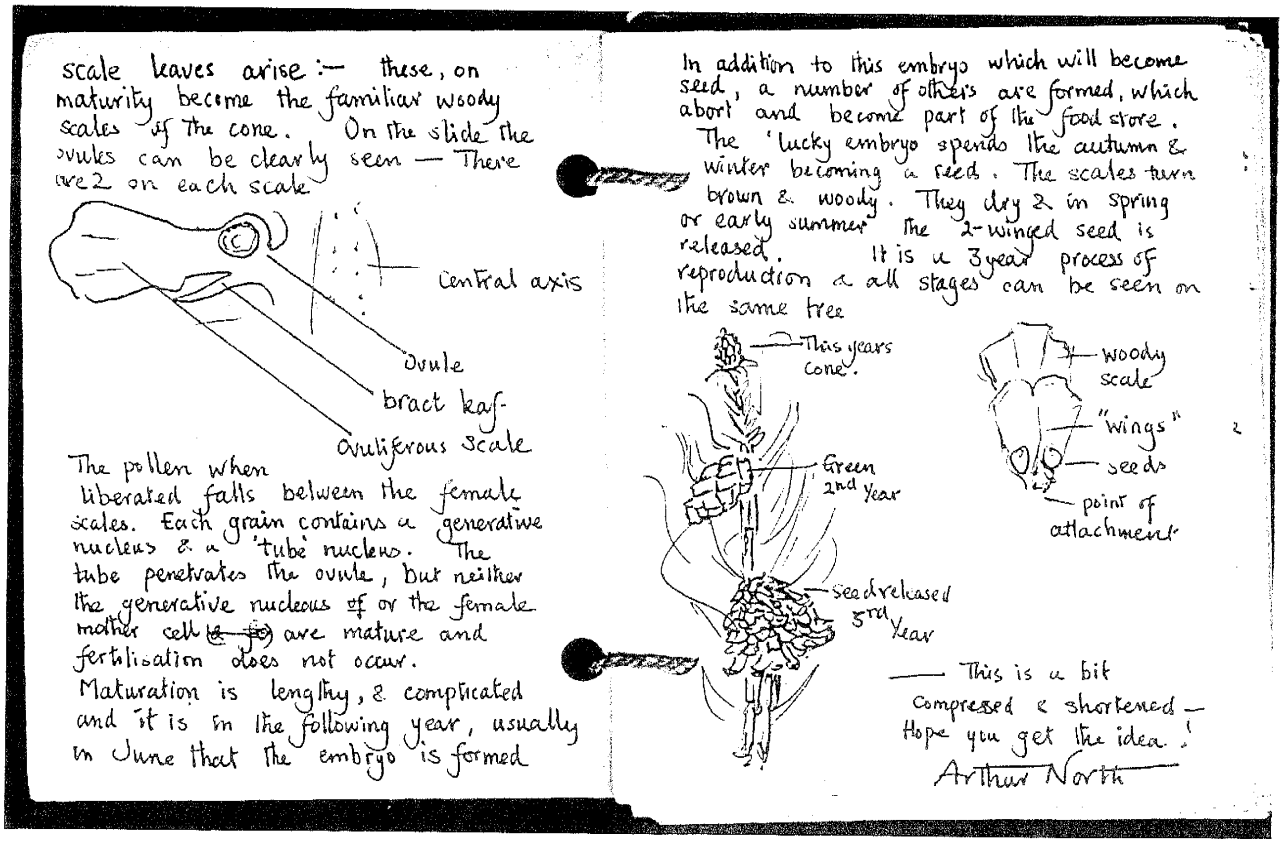
A number of MSSC members belong to the Postal Microscopical Society and, thus, enjoy the excellent slide boxes that pass among the members. The subjects of the slides cover the full range of animal, vegetable and mineral. The female pine cone slide on the facing page is indicative of the quality of the slides, many of which are made by PMS members.

Adding much to the pleasure and education to be derived from each slide box are the notes that members make in the small notebook that accompanies each box. This page shows the instructive comments Arthur North made on the pine slide.

One of our MSSC members, Richard Jefts, makes remarkably detailed and erudite notations, often with his own photographs or drawings. I regret that I did not have a slide box with his notes on hand, since many members have commented on their excellence. I will feature one in the future.

Note that the enlargement on the facing page uses a direct scan from the slide into the computer with no external magnification.

Gaylord Moss Ed.



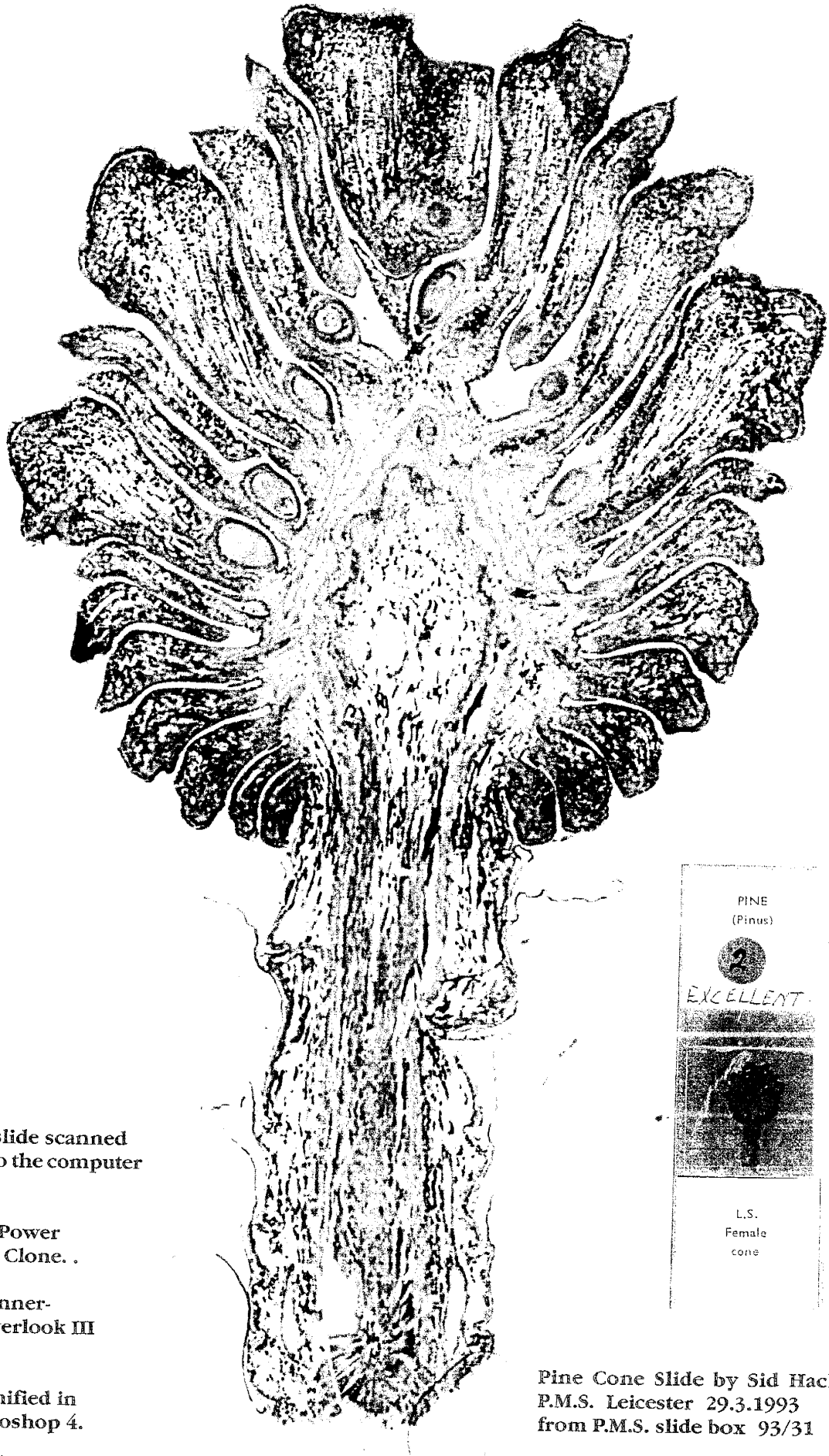
scale leaves arise :— these, on maturity become the familiar woody scales of the cone. On the slide the ovules can be clearly seen — There are 2 on each scale

The pollen when liberated falls between the female scales. Each grain contains a generative nucleus & a 'tube' nucleus. The tube penetrates the ovule, but neither the generative nucleus of or the female mother cell ~~& [illegible]~~ are mature and fertilisation does not occur. Maturation is lengthy, & complicated and it is in the following year, usually in June that the embryo is formed

In addition to this embryo which will become seed, a number of others are formed, which abort and become part of the food store. The 'lucky embryo spends the autumn & winter becoming a seed. The scales turn brown & woody. They dry & in spring or early summer the 2-winged seed is released. It is a 3 year process of reproduction & all stages can be seen on the same tree

— This is a bit Compressed & shortened — Hope you get the idea.!

Arthur North



Pine cone slide scanned directly into the computer

Computer-
MacIntosh Power Computing Clone. .

Flatbed Scanner-
UMAX Powerlook III
2000 dpi.

Image magnified in Adobe Photoshop 4.

Pine Cone Slide by Sid Hackett
P.M.S. Leicester 29.3.1993
from P.M.S. slide box 93/31

BRILLIANT! MR. RHEINBERG

Zane Price

Didinium are pursuing Paramecium with enthusiasm, but their action in the drop of water, as viewed on the video screen, lacks some drama. The translucence of the animalcules fails to provide adequate contrast between organisms and background, even with the condenser diaphragm closed down to produce diffraction. Phase contrast gives greater detail, but contrast remains low, a particular disadvantage for the video camera.

A change of condensers from bright field to dark field increases contrast, but contrast was extreme; detail of the rapidly moving animalcules was minimal, another disadvantage for the video camera.

Adding color to the background, with a tinge of color to the organisms is suggested as a solution to the problem. Better detail and more color would improve the picture. Enter Julius Rheinberg (1896-1942) with his method of optical staining. Of course, by the time preparation is made to use the Rheinberg system for videography, water on the microscope slide has evaporated, and the animalcules have gone to join their ancestors.

Rheinberg color contrast lighting is a modification of darkfield illumination using a standard two lens 1.25 N.A. Abbe condenser with the top lens removed. Low power objectives (5X - 20X) generally provide optimum results, however, a corrected condenser immersed to the slide will yield suitable results with an objective of 0.85 N.A. An objective of larger N.A. can be used if it has a built-in diaphragm, or an appropriate funnel stop is inserted.

Optical staining is produced by using a variation of the classical darkfield stop with selected color filters replacing the central stop and peripheral ring (Fig. 1). The assembled filter ring is placed in the back focal plane of a transmitted light condenser. Most of these condensers have a filter ring for this purpose. Unfortunately the filter retaining ring from various microscope manufacturers differ in size.

Rheinberg made his own filter combinations an experience the modern microscopist has to duplicate. Commercial Rheinberg filter-sets were formerly available from a few microscope manufacturers, but no longer. Such filters may be available on the used microscope accessory market, but this writer has yet to locate any.

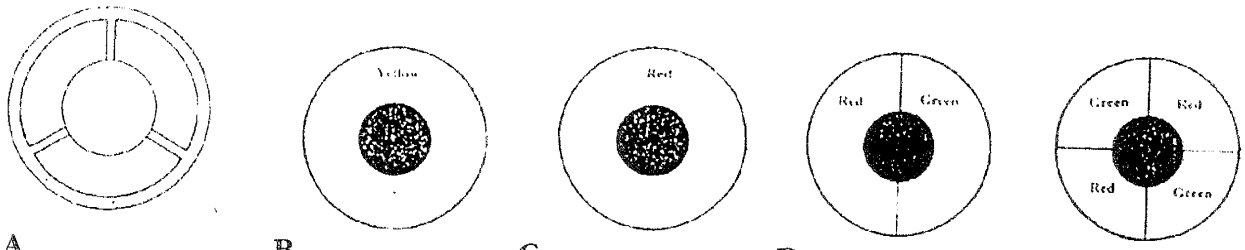
Metal rings or templates were used by commercial manufacturers to hold the selected filter combination but they are difficult for the average microscopist to construct. Photographic templates have been used, but the procedure is time-consuming and special photographic equipment is required; however, once the equipment is assembled, the production of a large number of templates is possible.

An alternate method of assembling filter combinations involves mounting cut filter material on glass or plastic support discs with Permount or other mounting medium. Glass support discs to fit large filter retainer rings must usually be cut from 45 x 50mm cover glass with a diamond or carbide pencil. Plastic support discs can be cut to size with small scissors. Cut filters are assembled on one support disc and covered with a second disc. Care must be taken to avoid bubbles. Circular cover glasses that fit a particular condenser can sometimes be purchased from supply houses. Fitting the filter to the condenser ring is not mandatory; the filter can be placed over the condenser ring or taped in place, but this greatly increases the problem of centering the background filter disc to the objective

Cutting filters of gelatin or polyester to the appropriate size can be troublesome. The most accurate method is with punches of the required size, but obtaining punches of the correct size is usually difficult Custom made punches are expensive, if a number of different sizes is required. Small scissors are effective, but finger prints must be avoided by holding the filter between tissue paper, or with the use of film editing gloves. Fingerprints will alter the continuity of background color, and appear as confusing bright spots in the field of view.

The diameter of the central disc is somewhat critical to ensure a background of continuous density. A central disc too small will allow color from the peripheral ring to enter the objective. A clear peripheral ring in conjunction with a too small central disc will also allow white light to enter the objective. The diameter of the opening in the peripheral ring is equally important. It must match the diameter of the central disc. White light leaking between the central and peripheral discs will enter the objective and produce flare which reduces color contrast between the subject and the background. Leakage of white or colored light can be checked by focusing the microscope on a slide, removing the ocular and examining the back lens of the objective. Light of a color other than that of the central disc should not be visible. Diameter of the peripheral ring is not critical unless the completed filter must fit in the condenser filter ring.

Matching the margins of the two filters without pro-



A B C D E

Fig. 1. A is a standard dark field stop. B,C, D and E are Rheinberg filters. The center stop can be of any color.

ducing extraneous holes that allow stray light to intrude into the field of view can be frustrating. An unequal match between the margins of the two filters can be eliminated by making black opaque washers of appropriate size from high contrast film such as Kodak Tech-Pan 2415, or litho film with the photographic process (Fig. 1). These can be superimposed over the color filters during the mounting process.

A central disc of 15 to 18 mm diameter seems to be the most useful size. However, this diameter is normally specified by the N.A. of the selected objective. A variable darkfield stop, such as the Traviss, or the stacked stops of Baker of Holborn, are useful for determining central disc size, but these accessories, are now found only in collector's inventories.

Color filters suitable for central discs are: red, 29; purple, 35; blue-green, 45 or 45A; dark blue, 49 and green, 58 or their equivalent. Color filters appropriate for peripheral rings are: yellow K3; amber, 15G; orange-red, 25A; orange, 22; red, 29F; purple, 35D; blue, 45A; blue-violet, 49 and green, 58B. Two or more layers of filters may be required for the central stop to obtain a background of desired density. If a total black background is desirable, a disc of black, opaque paper or photo tape can be placed over the central disc. Small sheets of Wratten gelatin filters are available from most photo supply stores. Gelatin, acrylic and polyester filter sheets are available from Edmund Scientific, Barrington, NJ, 08007- 1380.

Rheinberg designed multiple segment filters, which he used for the examination of fabrics and crystals. If fabricating a two color filter is considered time consuming and frustrating, try a multiple color filter. Rheinberg constructed an elaborate quick-change device for his collection of filters, which he thought "bulky," but once in place most convenient (Fig. 2).

The fortunate microscopist who has a rare Zeiss Mikropolychromar condenser is spared the foregoing, character building, vocabulary enhancing process of filter fabrication. Unfortunately, the Mikropolychromar condenser will only fit Zeiss microscopes.

With the technology review complete, it is time to return to the stage, and a reintroduction of the players.

Broken chips of coverglass are positioned on a standard glass slide, and drops of Didinium and Paramecium culture are mixed on the slide. A cover slip is added to compress the fluid, and keep the organisms in the focal plane. Additional water can be added as needed to the edge of the sandwich with a pipette.

A Rheinberg filter with a blue-green central disc and a colorless peripheral ring is selected for recording. A 16x objective with an N.A. of 0.25, a 10x ocular and a 1.25 N.A. condenser with the top element removed make up the optical train. Well-defined Didinium harpooning equally defined Paramecium are clearly visible against a blue background. Roll the video recorder!

References

1. Rheinberg, JH On an addition to the method of microscopical research by a new way of optically producing colour-contrast between an object and its background, or between definite parts of the object itself. *J.R. Microsc. Soc.* Ser II, XVI, 373-388. 1896.

2. Rheinberg, JH Notes on colour-illumination with special reference to the choice of suitable colours. *J.R. Microsc. Soc.* Ser. II, XIX 142- 146. 1899

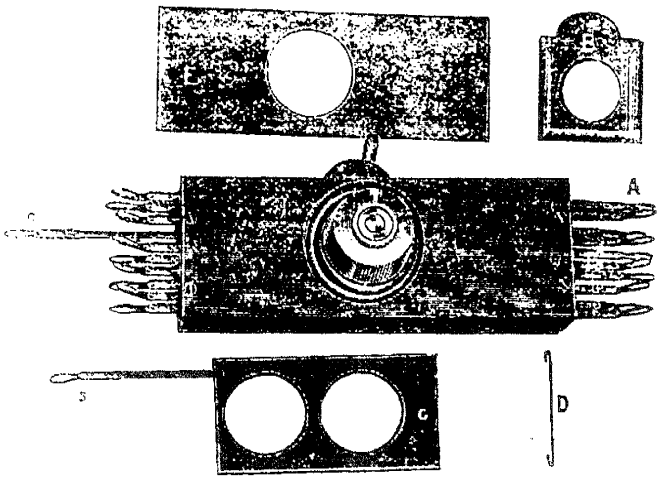


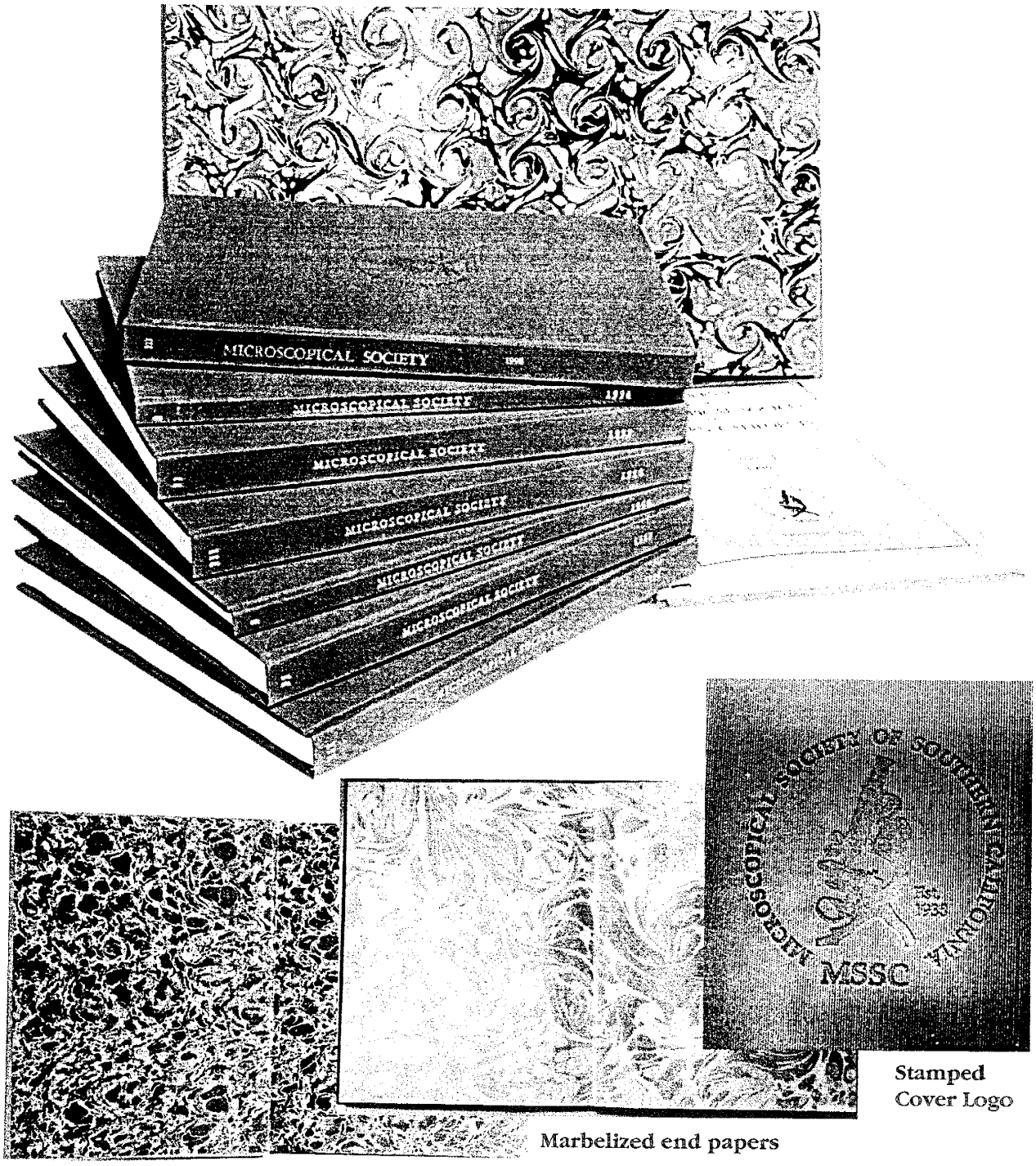
Fig. 2. Rheinberg's multiple filter holder. *Proc.*

Bound Volumes of the MSSC Journal

Bill Worden, one of our members, has arranged with a Beverly Hills bookbinder to bind MSSC Journals for $60 per copy. The quality is excellent, as shown below. Specifications are: hard cover binding of Japanese book cloth with headband; marbled end papers; blind stamped MSSC logo on the front cover and gold stamped year, volume number and "Microscopical Society" on the spine.

Send in your past copies for binding. Any missing issues can be reprinted and replaced for $3.75 each. So far, each member has also chosen to have the four copies of 1996 and the first six of 1997 replaced with the better quality paper used in later issues.

For further information, or to arrange to ship your copies for binding, please contact the editor. Gaylord Moss, PO Box 9130, Marina del Rey, CA 90295. gmoss@mediaone.net



Stamped Cover Logo

Marbelized end papers

Letters

Sir,

I have read with great interest the latest issue (vol. 4 No. 5) of the journal and was excited to see the cover article "WILLIAM WITHERING (1741-1799) by Stuart L.Warter. I have had an interest in Withering for some time especially in the various microscopes that he is supposed to have invented.A while back I purchased a copy of the book 'William Withering of Birmingham' by T.Whitmore Peck and K. Douglas Wilkinson, (1950) only to find almost no reference to his microscopes. It was therefore a real joy to be able, not only to read, but to see several pictures of his microscopes. I congratulate Stuart for his article and I also congratulate all of the authors who grace your excellent pages. Keep up the good work and I look forward to future issues.

Mike Dingley.
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From: tomgrill@arsmachina.com
Date: Sun, 8 Aug 1999 12:50:48 -0500 (CDT)
to: albrite@plasma-art.com
subject: WENHAM Binocular prisms

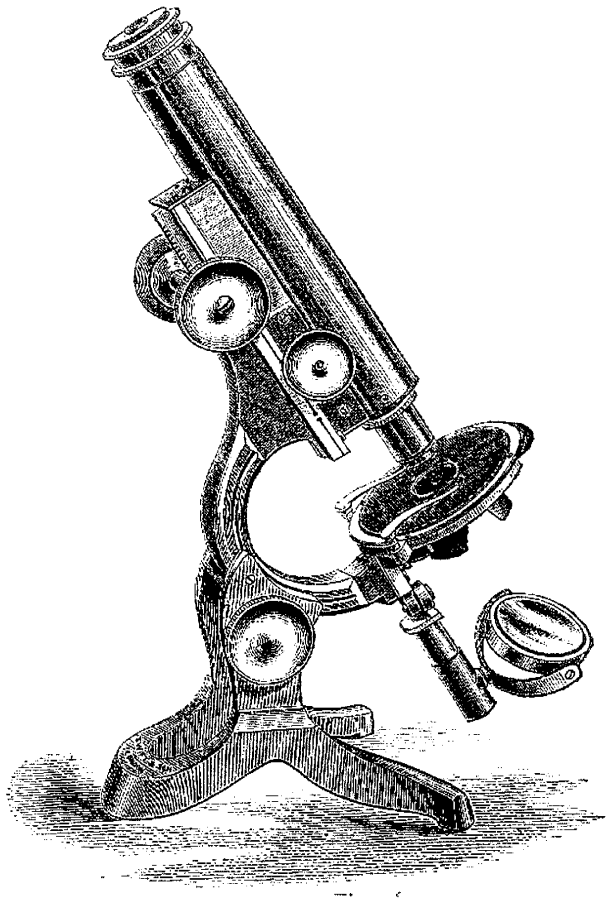
This is just a brief note to let you know that I have had Wenham binocular prisms manufactured as replacements for missing or damaged prisms in Wenham binocular microscopes. I have tried the prisms out successfully in a number of binocular microscopes. They work as well as — and sometimes better than — the originals. One reason they sometimes work better is that they are cleaner (unscratched), and have shaper edges. The prisms are made to the same size and specifications (15 degree deflection) called for in Wenham's original design. They should work in any binocular where the angle of the two tubes approaches 15 degrees.This would be most binocular microscopes.

I hope to have another production run in the near future, and would like to find out who might be interested in acquiring a prism. (No obligation here, of course.) If you think you might want one or several, please let me know. The final cost will depend upon the size of the production run. A short run will probably put the cost of each prism between $200 and $250. A large run would bring the price even lower. The expected delivery will be about four to six weeks after the order is place.

If you have any interest in, please send me an email. I will keep you appraised of the progress. Thanks. - Tom Grill (ARSmachina.com)

PS - At this moment, I have two prisms left from the first batch. They are available at $250 each because the first run was very small. If there is not sufficient interest to make another run, these two may be the only ones available for some time. - Tom

SWIFT & SONS Improved "Wales" Microscope



The Swift and Sons "Wales" microscope illustrated above is like the one shown by Jim Solliday at the June workshop. See p. 118 of this Journal.

Notice the unusual inclination mechanism developed by George Wales which consists of a concentric arm sliding in a radial groove.The advantage of this mechanism is that the center of gravity of the microscope is unchanged with tilt, making it much less susceptable to tipping.

MSSC August Meeting

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

The Microphotography of John Cheslik

In 1943, John Cheslik was already a member of the group that has become the MSSC. When Jim Solliday joined the organization in 1979, John's beautiful microphotography was legendary. Jim says that it was a slide show of John Cheslik's work that convinced him to join the club and to work on his own photographic microtechnique. Jim spent many hours with John learning some of the methods that he uses in the exquisite slide and sound shows that we all enjoy so much. John passed away several years ago, but it is fine to think that his discoveries and art live on in the further artistic and technical developments of Jim Solliday.

Leo Milan is the caretaker of about 150 of the original Cheslik slides that we will be able to see this Wednesday evening. Don't miss this chance to see the works of a master. Many of them are the landscape-like scenes formed by crystal structures under polarized light, for which John Cheslik had a particular artistic talent.

Following the show, we will have the usual member contributions with descriptions of recent work, discoveries, techniques and microscopical acquisitions.

The second part of the meeting is the time to show your own microscopical activities. If you have taken a few slides, made a piece of useful apparatus, found a new technique or a new e-bay treasure or even catastrophe, please share it for the edification and enjoyment of all. Ed.

Saturday Workshop - September 4 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).