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JAMES SMITH, J. J. LISTER AND THE FIRST INSTRUMENT PURCHASED BY THE ROYAL MICROSCOPICAL SOCIETY

by Barry Sobel

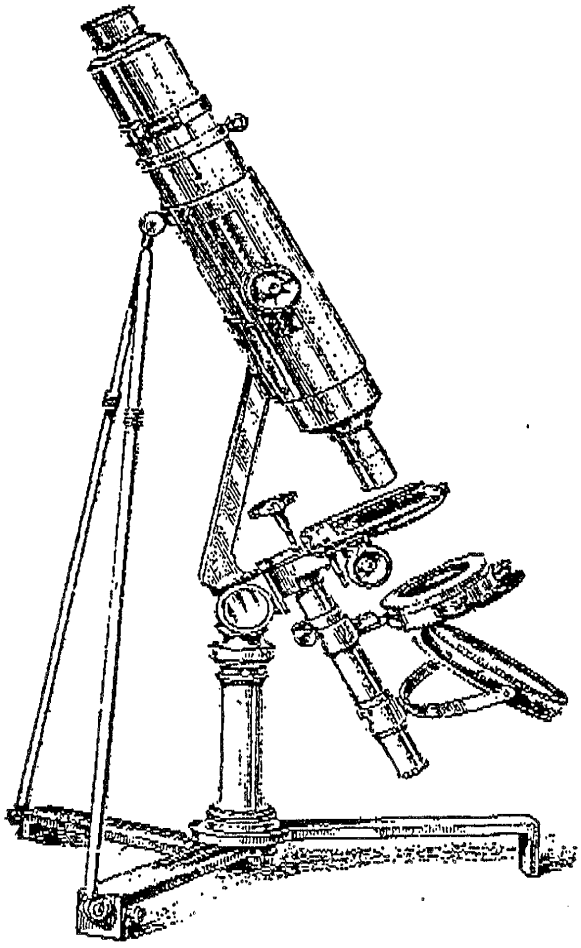

Fig. 1 First Lister-Tulley Microscope with Optics by Tulley and the Stand made by Smith.

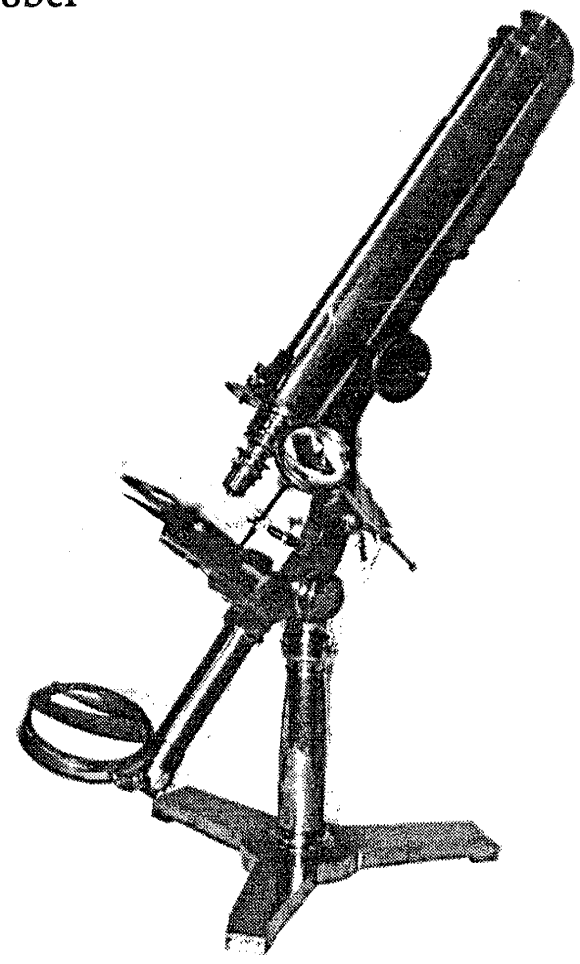

Fig. 2 James Smith's "No. 22" Originally sold to Dr. Thomas Hodgkin

James Smith, an optician and instrument maker, apparently made instruments for retailers working as a "maker to the trade" during the 1820's. Until J.J. Lister perfected the achromatic and aplanatic objective during the first half of the eighteenth century, use of the compound microscope for any serious high magnification work was no better than using simple lenses; in fact, at higher power, compound microscopes were

optically inferior to simple (single lens) microscopes. In 1826, Lister apparently bought his first Smith microscope from Tulley, who employed Smith at the time. This instrument was of a "Jones most improved" design, except for the optical tube which included a lever-screw fine focus and steadying rods, a feature borrowed from telescopes. (Fig. 1). It was not signed by Smith. According to the RMS journal, Lister asked the advice of Bates as to which instrument maker he should use, to make a better model microscope to accommodate his newly designed achromatic and aplanatic objectives. He was apparently advised to see Smith. With Lister's encouragement, Smith began making signed microscopes in 1839 and that year he made just ten.

This type of stand was devised specifically for Smith's newly designed aplanatic/achromatic objectives (which Lister and C.R. Goring had developed). This major improvement in the stand was important because of the need for a more stable instrument for the higher usable magnification now possible. According to company records (see Bracegirdle), Smith made only ten instruments in 1839, and only 13 in 1840. Of these, number 3 went to R. L. Beck (Lister's Nephew and Smith's future partner), and in 1840, number 22 (Fig. 2) to the famous Dr. Thomas Hodgkin (1798-1866) who had described malignant lymphoma only eight years earlier. This sale is documented in Smith's own Journal on the page reproduced in (Fig. 3). In October of 1840, Lister himself took delivery of one of the Smith Microscopes made to his specifications (number 41). The Royal Microscopical Society had formed around that time, and its first purchase was James Smith's Number 43.

The construction of these instruments utilizes a single piece of brass as the limb, connecting the optical body tube, passing through a single compass joint, to the stage and substage mirror support. This construction is now known as the "Lister-limb" and this then is one of the earliest known examples. This was one of many of Lister's suggestions and developments. The original accessories include two of Smith's double objectives which had dual focal lengths which could be changed by removing an outer collar containing additional optics.

Lister also worked with Andrew Ross during the same period of time, particularly assisting Ross in the production of achromatic objectives, specifically, the 1/8 inch (Fig. 4), one of which is included in the accessories of this Smith's No. 22 (though probably not originally included). Indeed, Ross's business was known as "Andw. Ross & Co." which Turner has said really meant

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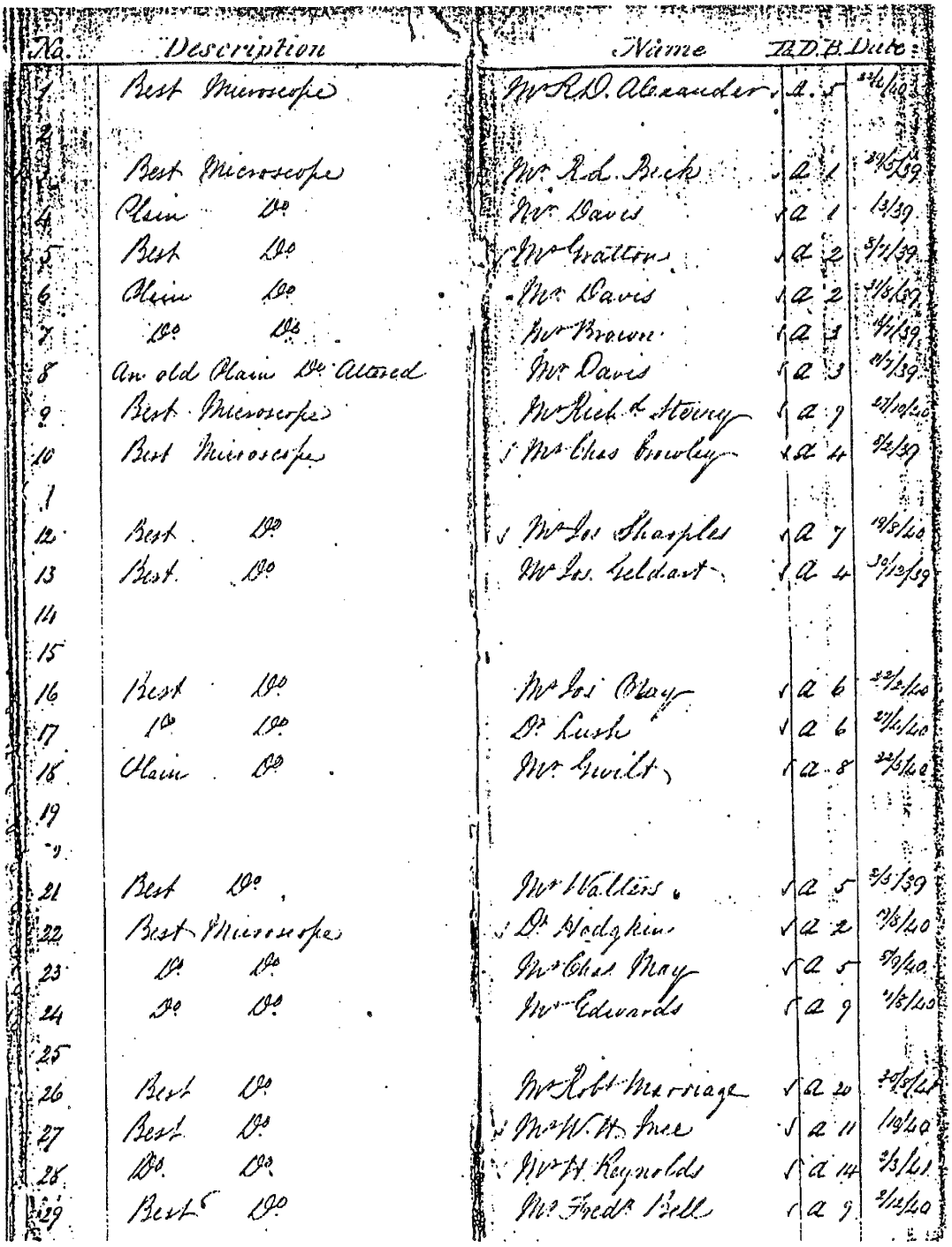

No.	Description	Name	A.	D. B. Date
1	Best Microscope	Mr R.D. Alexander	a.	22/6/40
2				
3	Best Microscope	Mr. Rd. Beck	a 1	3/5/39
4	Plain Do	Mr Davis	a 1	13/39
5	Best Do	Mr Watton	a 2	5/7/39
6	Plain Do	Mr Davis	a 2	3/8/39
7	Do Do	Mr Brown	a 3	4/7/39
8	An old Plain Do Altered	Mr Davis	a 3	6/7/39
9	Best Microscope	Mr Rich & Storey	a 9	27/9/40
10	Best Microscope	Mr Chas Crowley	a 4	8/2/39
11				
12	Best Do	Mr Jos Sharples	a 7	19/5/40
13	Best Do	Mr Jos Feldart	a 4	30/12/39
14				
15				
16	Best Do	Mr Jos Clay	a 6	22/2/40
17	Do Do	Dr Lush	a 6	27/2/40
18	Plain Do	Mr Swift	a 8	22/3/40
19				
20				
21	Best Do	Mr Walters	a 5	2/3/39
22	Best Microscope	Dr Hodgkin	a 2	2/8/40
23	Do Do	Mr Chas May	a 5	5/9/40
24	Do Do	Mr Edwards	a 9	2/8/40
25				
26	Best Do	Mr Robt Marriage	a 20	20/5/40
27	Best Do	Mr W.H. Pace	a 11	1/9/40
28	Do Do	Mr T. Reynolds	a 14	2/3/40
29	Best Do	Mr Fredk Bell	a 9	2/12/40

Fig 3. Smith's Journal listing sale of #22 to Dr. Hodgkin

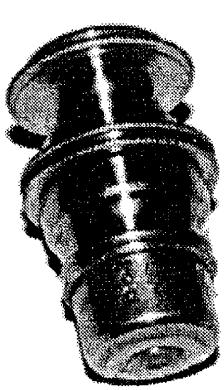

Fig. 4 Early Ross 1/8 objective with correction collar

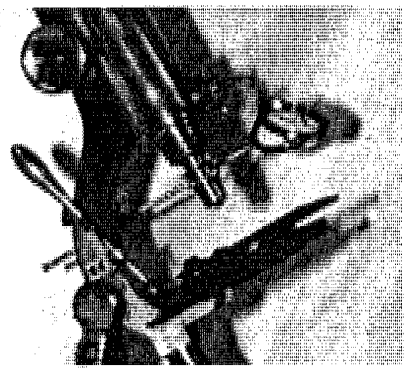

Fig. 5 White Universal Lever Stage

Andrew Ross & J.J. Lister. The Ross objective also illustrates another development of the time (1839) invented by Lister and Ross. As achromatic and aplanatic correction meant greater resolution, even the use of a cover slip needed to be taken into account. To allow this, Ross invented the correction collar, for uncovered, or glass-covered viewing. In use, one would simply turn the collar so that the indicator (usually a screw sliding against a scale) would indicate use with or without the cover slip. This device was so popular, that some makers actually put a "fake" correction collar on their objectives!

When the Royal Microscopical Society was founded, it contracted with the three major microscope makers of the time, Smith, Ross, and Powell, to each construct an instrument for the society. Smith's was the first, ordered on August 19, 1840, and the instrument was accepted by the society on November 30, 1841. The Society Microscope carries the serial number 43, while the instrument pictured in (Fig. 2) is number 22 from 1840. Number 22 (Hodgkin's instrument), has an unusual stage control, known as a White Universal Lever Stage (Fig. 5). It consists of a brass-handled shaft with a ball on its midportion attached to the limb, with its distal end a ball and socket joint controlling the stage, which is moveable in any direction through an arrangement of a dovetail plate moving from right to left, and a another dovetail at right angles guiding motion forward and backward. This arrangement was considered ideal for following a swimming organism as it swam about on the stage in a livebox. This type of stage was formally announced in 1843 in publications by Varley (for a below stage model) and Alfred White for the above-stage variety seen on Smith's model. This type of lever stage was apparently not used for the instrument purchased by the society, which had a more traditional rack and pinion mechanical stage. On number 22, one of the dovetail plates has a rack edge, but the pinion is not present. It is unclear if this was done to make movement by lever smoother, or if the pinion was also used but now lost.

The original accessories accompany number 22 (Fig.6). Coarse focus is by Rack and Pinion, fine is by calibrated lever screw attached to the nosepiece. The draw-tube is graduated in tenths of inches. There are also dissecting instruments (some lacking) and other accessories. The drawers are original but the main case is no longer extant. James was the founder of his firm which in 1847 became Smith and Beck. In 1857 it became Smith, Beck and Beck. When James Smith retired in 1865, the company was again renamed to R & J Beck. The company continued to produce microscopes well into the twentieth century. The later example of this Smith microscope is still in the RMS collection, and is used in the illustration facing the title page of Turner's Great Age of the Microscope. We are all deeply indebted to J.J. Lister, who (even more so than his son the famous surgeon), was responsible for one of the greatest advances in the history of science, the modern achromatic aplanatic microscope. I would be interested in hearing from anyone who knows details of additional examples of Smith's first microscopes.

Accessories accompanying the Smith's microscope No. 22 include:

1. Two 4.5 inch vials, one of 3/16 inch inner diameter, one of 1/4 inch inner diameter
2. A Brass supported "Lister" live-box with glass bottom and sliding glass-ended cap, 4 1/8 x 1 9/16 inches with 5/8 inch deep, 1 1/4 inch diameter chamber
3. An angled dissecting needle on wooden handle, 5 inches long.
4. A U-shaped support attaching on top of the stage.
5. A set of 3 dark-wells which fit into a support which slides into dovetailed slots beneath the stage
The dark-wells include inner diameters of 1/2, 1/4, and 1/8 inch.
6. Original dissecting instruments (missing) apparently included a 3 inch long forceps, a 4 5/8 inch scalpel, and a 4 1/2 inch straight dissecting needle.
7. A 3/32 inch thick 1 5/8 x 3 1/2 inch glass plate
8. A 55/100 inch objective signed: "22" with slide-over 3/4 inch Lieberkuhn which has a screw on cover, inside a can signed: "Jas Smith London 55/100 Inch"
9. Dual focal length objective, concentric type popularized by Smith "(Smith's Quartes)" each barrel signed: "22" in a can signed: "Jas Smith London 15/10 & 8/10 inch"
10. A stop fitting over the lower power objective.
11. A Lister image erector designed to screw inside the draw-tube.
12. A Wollaston type projecting camera lucida
13. Three eyepieces
14. A glass live box measuring 1 1/2 x 2 1/2 x 9/16 inches.
15. A wheel of apertures from 1/4 to 3/4 which dovetails into the slot beneath the stage
16. A stage forceps approximately 4 inches long with compass joint articulation, sliding onto a brass rod at the back of the stage.
17. Nichol calcite prism polarizer and analyzer.
18. A 1 1/2 inch gimballed bullseye condenser which is attached by swivel joint to the limb
19. A gimballed planoconcave below-stage mirror on a sliding collar with tiny handles.
20. The White Universal Lever Stage with brass handle anchored to the limb.
21. Also accompanied by an early 1/8 inch objective with correction collar in a can signed: "1/8 A. Rofs Optician London"
22. Accompanying accessories which are not original, include an unsigned 1 inch objective with larger slide-on Lieberkuhn, and a calibrated Smith & Beck 1/4 inch objective with correction collar in can signed: "1/4 Smith & Beck 6 Coleman St London"
23. Slide clip used to hold cover slip on slide while adhesive is drying.

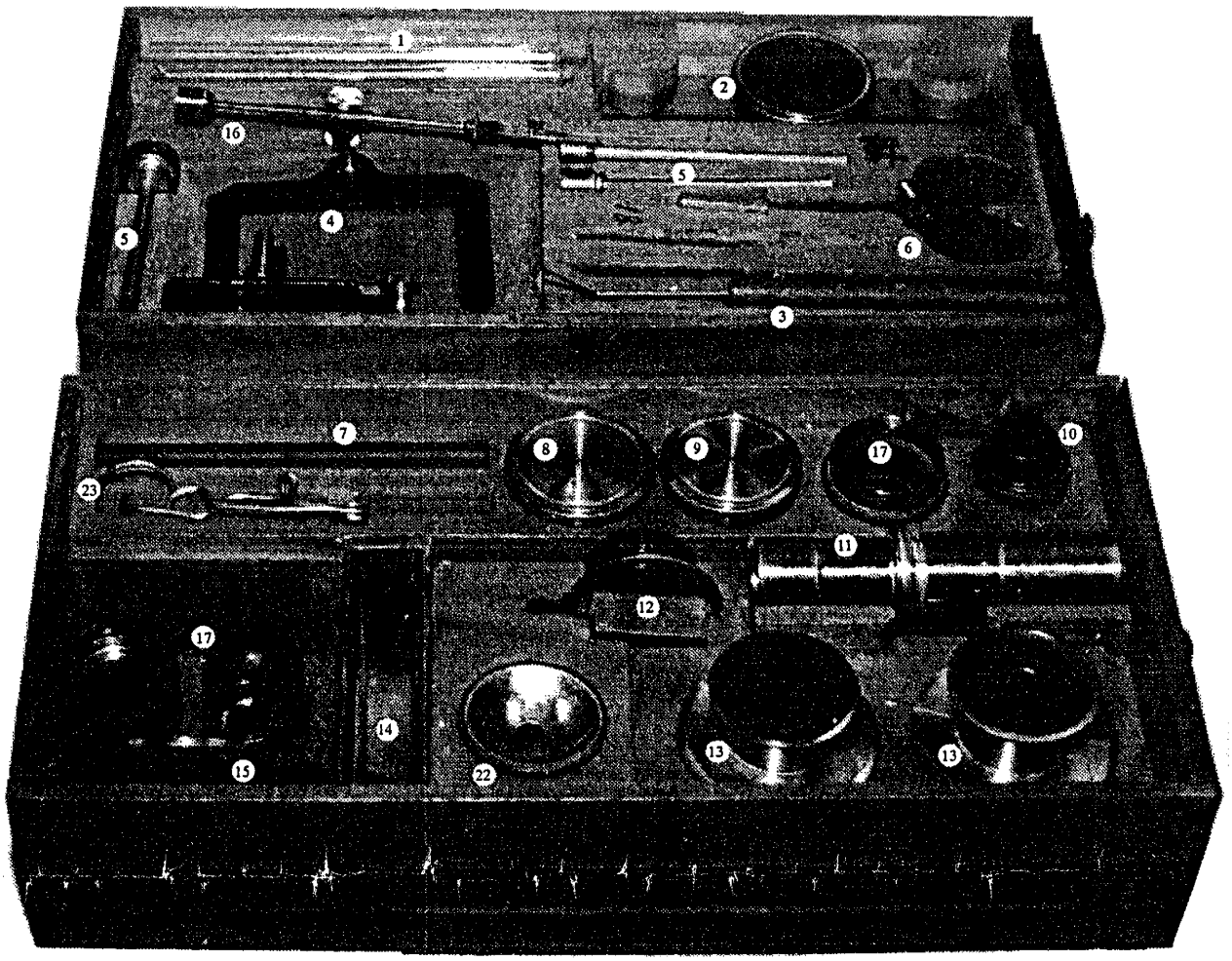

Fig 6. Accessories accompanying Smith Microscope "No. 22"

References

Bracegirdle, Brian. *Notes on Modern Microscope Manufacturers.* 1996. Quekett Microscopical Club. England (Available from Savona Books)

This is a wonderful new book with all sorts of useful reference material including accurate information about serial numbers and even the people who purchased the instruments. It is here that I discovered that number 22 was sold to Dr Hodgkin, and confirmed the exact year of manufacture.

Turner, Gerard *The Great Age of the Microscope.* 1989. IOP Publishing Ltd. Technohouse. Bristol and New York.

This terrific book is a catalog of the instruments of the Royal Microscopical Society with discussions of many of the manufacturers including James Smith, and includes good photographs of nearly all the instruments in the collection.

Clay R.S. and Court T.H. *Early Achromatic Microscopes* by James Smith *Journal of the Royal Microscopical Society,* Sept 1930. pages 292-301.

Nuthall, R.H. *Microscopes from the Frank Collection* 1979. A Frank. Channel Islands, Jersey.

A small but useful catalog of the Frank Microscope Collection. Available from Tesseract. Contains useful historical information about Smith's early microscopes.

MOUNTING INSECTS AND OTHER ARTHROPODS

Practical Work – Ants

by Ernie Ives – The Postal Microscopical Society – England

Ants are so common in my garden throughout the warmer months that the extraction of a few workers will not cause any ecological damage. The same is probably true at your estate. Actually most of my black ants came from the kitchen during one of their periodic invasions inside the house and before I treated them to a dose of proprietary ant killer.

Mounting-wise, ants are a little more difficult than the caterpillars, or at least they are different. Ants are small, have a hard exoskeleton, long jointed legs, and bodies that are quite deep. In fact the body is easiest to flatten laterally while the head is flattest dorso- ventrally (top to bottom). Nature doesn't make things to microscopists specifications.

Ants belong to the order Hymenoptera, the same as the bees and wasps, and are placed in the Formicidae family. Two species frequent my garden, the Black Garden Ant, Lasius niger and the Yellow Meadow Ant, L. flavus. The worker ants, the ones most commonly seen, are wingless and that at least assists processing and mounting. Both types make good mounts, but the transparency of the yellow ant can be used to advantage as will be seen later. For now collect some black garden ants, and kill them by dropping into methylated spirits or other alcohol. Leave for at least twenty-four hours.

Processing

Either the hot or cold caustic methods will work, or even a combination of both. The cold method I use is to put the ants in about 10 ml of cold 20% caustic soda and leave them for 24 hours. At the end of this time, the body contents of the ants will have been removed and the exoskeleton is soft but still very dark. Leaving the ants in the cold caustic for an extended period will remove the colour and the ants will become translucent, but for a quicker result I put the caustic container on my hotplate (at about 55 degrees C) and add about 0.5 ml of 100 vol. hydrogen peroxide (H_2O_2) "Watch it," The (H_2O_2) is a 'foaming bleach'; bubbles will quickly form around the specimen(s) until they are at least partially obscured from sight. The time for bleaching is very variable hence my entreaty to "watch it". Usually it takes about 1 - 2 hours, but much will depend on how long it was in the cold caustic, the temperature of the hotplate, the strength of the caustic and the peroxide and no doubt other variables too.

When the ants begin to lighten in colour, remove one into water and examine it under the stereo microscope. If it is obviously still too dark, return it to the caustic / bleach. If only just a little too dark, remove them all to water for 24 hours, clean any debris with a soft brush and transfer to 20% acetic acid. They will lighten a little more in the acid.

What happens if you go away and forget to watch them in the caustic / bleach? You've guessed it. They become too light - hyaline - glass clear; and full of air bubbles. To try and save the situation, wash them and drop into N.B.S. 'ABO' stain. If you are then prepared to sit and watch, use the stain neat; if like me you cannot spent half an hour or so watching, dilute the stain with 2 parts of methylated spirits and 2 parts water. Staining will take 24 hours or more but that does suit my work schedule of nearly an hour's microscopy after breakfast on most mornings.

I did some ants by the hot processing method to see if it was worth getting all the extra paraphernalia out. Half a dozen ants were taken from the alcohol in which they were stored and put into cold 20% caustic soda in a boiling pan supported in a retort stand ring. A spirit lamp was placed underneath and the caustic gently heated. The usual method of watching for alcohol bubbles to appear from the specimens, and then removing the heat for a short while was difficult to see. Because of the small size of the ants, very few bubbles appeared. However, when I guessed (or hoped) bubbles were appearing, I did remove the spirit lamp for a few minutes. The procedure was repeated four times and then the ants were transferred to water and left overnight before being transferred to 20% acetic acid. At the end of 24 hours in the acetic the ants were nicely clean but still rather dark. Using hot caustic probably saved one day.

With these ants another slightly different method of bleaching was employed. About 0.5 ml of 100 vol. hydrogen peroxide was put in a small tilted plastic container (Fig. 27) and 1 small drop of ammonia added. By tilting the container only a small volume of bleach is required to get a fair depth of liquid. The ants were dropped in and watched. In only a few minutes they were bleached to the required amount. However, the bleach mix soon foams and air bubbles form inside the specimens in the same way as bleaching in caustic soda / peroxide.

Internal air bubbles can be very troublesome. Many will come out by gentle pressing of the body but others will dart from one end of the insect to the other without seeking the obvious exit hole. In these cases some water injected into the abdomen with a diabetic

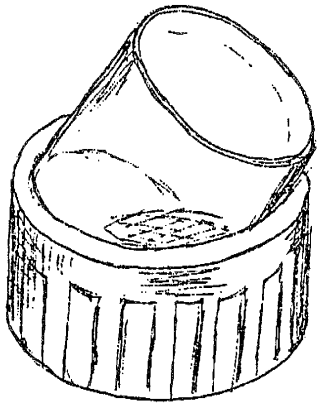

Fig. 27 Tilted Container for bleaching

syringe usually cures the problem - if the needle doesn't damage the specimen.

Eric Marson of N.B.S. suggested a method he found useful with millipedes and centipedes. The general idea is to cause the bubbles to expand and burst out of the exoskeleton by first immersing them in fairly hot water (60 - 80 degrees C) then putting them in cold alcohol and back again into hot water. With my ants it worked with two out of the six. Bubbles in the other four remained and/or went into the leg cavities.

Sometimes ideas that should have come years ago, suddenly hit you. I looked around and saw one of the jars I use for vacuum impregnating my wood specimens was free. I put the ants in water in the jar and exhausted the air, or at least reduced the air pressure in the jar. Results were not forthcoming immediately, but over a period of a couple of hours, and with a little gentle shaking, the air came out of the ants and they sank to the bottom of the water.

One other little tip you may find useful. I knew I wouldn't be able to work on the insects for several days, so instead of leaving them in water which is likely to go bad, I put them in a strong solution of household disinfectant. For the ants I used "Zal" but "Lifeguard" is also successful. About 50/50 disinfectant and water. Even though modern disinfectants no longer contain phenol, the insects still seem to be nicely relaxed when they are removed from it, even after soaking for some days.

Laying-out

I use three different methods of laying-out ants, none of which is entirely satisfactory but are as good as nature will allow when we need a two dimensional specimen. Method 1 gives a dorso / ventral view but the abdomen being taller than wide either turns on its side or looks unduly wide when flattened. Fig. 28A & B. Method 2 shows the side view of the thorax and abdomen but the head is turned 90A. Fig. 28C. The third method is an extension of method 2. The head, together with the front legs which always seem to be attached to it, is removed and set dorsal / ventrally while the body is flattened laterally. Fig. 28D.

Method 1.

(i) Lay the ant on its back in a very little water on a piece of glass microslide (I use pieces about 20 x 26 mm), and spread the legs and antennae. If the ant is softened properly and is nicely relaxed, this should be accomplished easily. If the legs are stiff and want to return to their original position, try returning them to a cold caustic solution for a short while.

(ii) Insert a mounted needle or the tip of a pair of fine forceps between the mandibles and open them so that the mouth parts show.

(iii) Place a strip of thick paper or thin card at each end of the glass, cover with another piece of microslide and clip or bind together

((iv)) Transfer to alcohol 1.

Method 2

(i) Lay the ant on its back in a very little water on a piece of glass microslide and spread the legs as in method 1. Ignore the head and antennae for the moment.

(ii) Flip the legs on one side so they lie alongside those on the other and turn the body on its side at the same time.

You may well ask, "Why not lay the creature on its side in the first place and arrange the legs?" Perhaps I have a cantankerous breed of ants (or maybe it is just the mounter), but when mine are laid directly on their side always one or two of the legs curl and hide behind the body and removing them and laying them out properly seems to take far, far longer then starting with the ant on its back. If your ants are more cooperative, then by all means lay them sideways first - otherwise try my way.

(iii) Arrange the head, antennae and mandibles as above.

(iv) Continue as method 1 (iii) and (iv)

Method 3

(1) Lay the ant in a very little water on a piece of glass microslide. Place two pairs of fine forceps between the head and the body and draw them apart. Normally the head will come away from the body with the forelegs still attached to it.

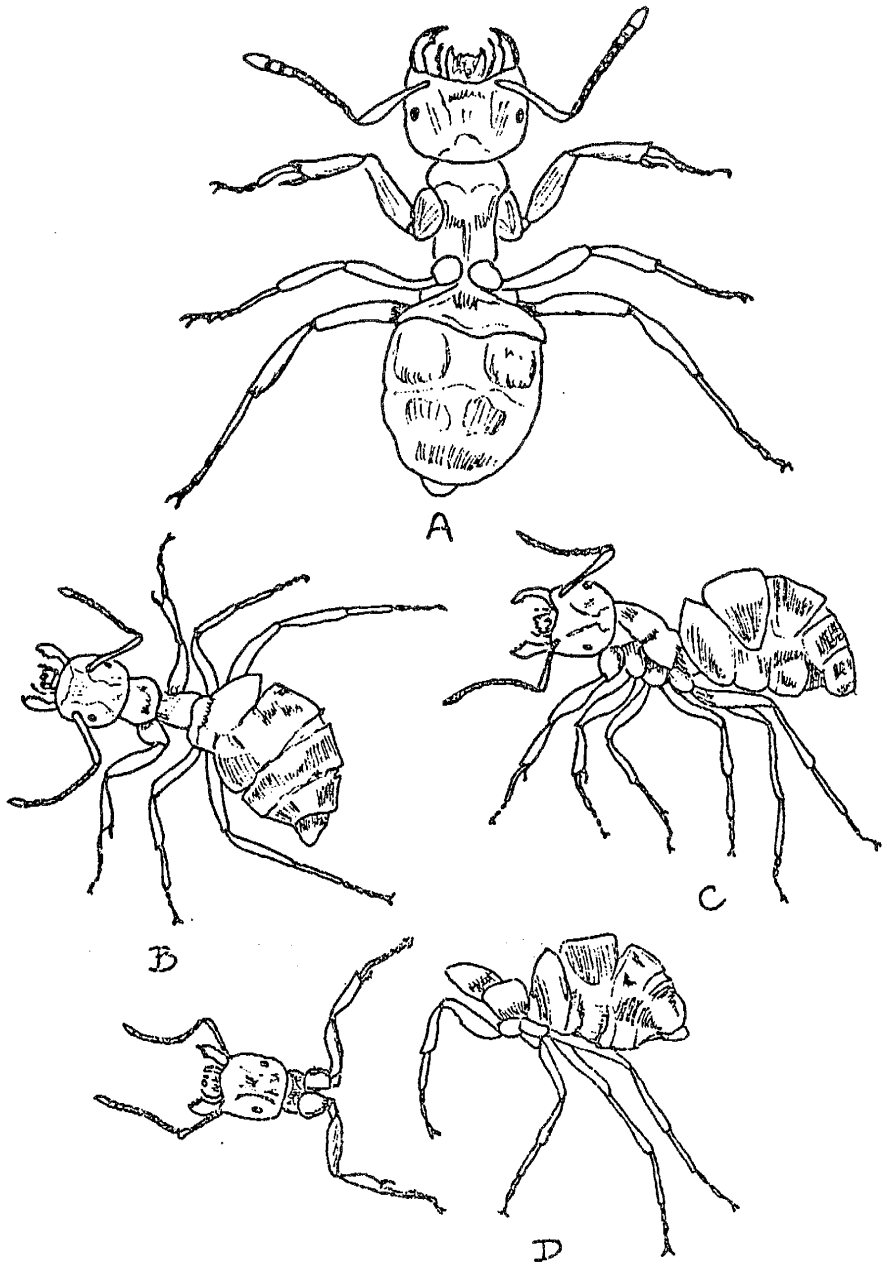

Fig 28 Methods for laying out ants

(ii) Arrange the head, antennae, mandibles and front legs in dorsal view.Arrange the body and legs in lateral view as method 2 (i) and (ii).

(iii) Continue as method 1 (iii) and (iv)

Further processing

After 24 hours in absolute alcohol 1 (isopropanol) transfer to absolute alcohol 2 for a similar length of time. From alcohol 2 move the insect (still clipped or bound between the glass pieces) into a clearing agent and leave for another 24 hours. I now use cedarwood oil - the type intended for clearing; not immersion oil - because it doesn't harden as much as most others and I can tweak the appendages a little if necessary into a more suitable position when mounting. Citroclear, Xylene and various other clearing reagents could be used.

The time in all these reagents can be shortened by half (perhaps more) if you are really in a hurry. Conversely, they may be left in any of the reagents indefinitely if necessary.

Mounting

Set a clean microslide on the mounting table / block / card, whichever you use. Where the specimen is in one piece i.e. when using methods 1 and 2, the specimen / glass sandwich is removed from the clearing agent and a drop of the liquid allowed to fall on to the centre of the microslide. Open the glass pieces and

slide or lift the specimen into the drop on the slide. Arrange as required, and then take a snippet of kitchen tissue and soak up the majority of the clearing agent.

Replace with a suitable size drop of mountant. When we laid out the ant initially between the microslide pieces, we didn't squash it completely flat. We added thick paper or thin card spacers to prevent this happening. Completely flattening the ant may well allow you to use higher powers on individual parts but it also introduces more distortion of the general shape and often causes the head capsule to crack. For high power work, it is better to dismember the individual parts and mount them separately. Not having completely flattened the ant does mean that the specimen is still rather thick. A cover placed directly on the balsam covered ant will tilt one way or the other. To overcome the problem, add spacers under the edge of the cover slip.

Spacers

Having tried a variety of materials for spacers, I now only use paper or thin card similar to that used between the glass pieces when laying-out the specimen. To keep the appearance neat, discs of the paper are cut about 2 mm in diameter using the smallest hole on a six-way leather punch. Discs of various thicknesses are kept separately in cover slip boxes label led, 'Stamp Book Card', 'Laser Printer Paper' etc. which to me is as clear as having a definite thickness stated. Care has to be taken selecting slightly thicker card, because much 'birthday' type card material will delaminate into two or more thicknesses when cut with the punch. For the ants, I used spacers cut from laser printer paper which is thicker than normal typing sheets and stamp book cover card depending on what had been used in the glass sandwich. The laser paper was folded several times so that four or more discs were cut at each punch; the card could only be doubled.

Getting back to the mounting. 13 or 16 mm covers are suitable for the ants and my mounting block has circles of this diameter marked on it. Three paper discs are then equally spaced around the circumference of the cover diameter so that half the disc is under the cover and half is outside. Later, when the mountant is dry, the outer half is removed along with the surplus balsam and the half under the glass is covered with the ringing cement so the spacers are not really seen.

When the spacers are in place, the cover is carefully lowered in position and more mountant is added if required, to leave a goodly fillet of balsam around the rim of the cover. I number the slide with a diamond pencil and make the label at this stage but do not affix it until the slide is cleaned and ringed. You may have other arrangements that are just as suitable. The slide is now set on the hotplate for a few days and, if no vacuoles have appeared, it is put in the drying oven for a month or so to harden. Do remember, that there is a comparatively thick layer of mountant which will take longer to harden sufficiently than does a thin section slide.

The system for mounting the ant that is in two parts is slightly different. Again the insect parts are arranged in a drop of the clearing agent which is then removed and replaced by a small drop of mountant - enough to just cover the specimen. Spacers are added as before but are only stuck in place with a touch of mountant. The balsam area is now covered with a bottle cap or watch glass to keep off the dust, and placed on the hotplate. Next day, a further layer of mountant is added and the cover put on.

Why the difference? With two or more insect parts, free to swim about in the mountant when the cover is put on, they are sure to move out of the positions you so carefully placed them in. Allowing the mountant to dry around them before covering keeps them in place 90% of the time. There are a couple of disadvantages. If too little mountant is used to cover the specimens during the initial drying, air gets into the parts; if too much is used, the parts swim around anyway. Getting rid of the air is not easy. Prodding sometimes helps but often damages the specimen. Adding a drop of Xylene sometimes helps but at best these are desperate measures to recover a prize specimen. Parts that have swum out of place can be returned by softening the mountant with Xylene (patience!) and gently moving the parts back. The key to success with this is to make sure the mountant is soft enough for all parts of the piece to move. Its easy to move the biggest part and leave appendages behind!

What about the yellow ants? That's another story. Some years ago, I was shown an old P.M.S. slide where the internal muscles had been stained with lignin pink which showed them well under plain brightfield lighting. I've been trying, without success so far, to duplicate this. I have also been trying to find an easy way to process yellow ants so that the internal muscles show under polarised light. If you have any suggestions, please contact me at 63 Church Lane, Sproughton, Ipswich, IP8 3AY.

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WANTED

Pair of 20 X wide field eyepieces.

Gary Legel
1306 Sheppard Drive
Fullerton, CA 92831
(714) - 870-0439

MEMBER PROFILE

Steve Craig

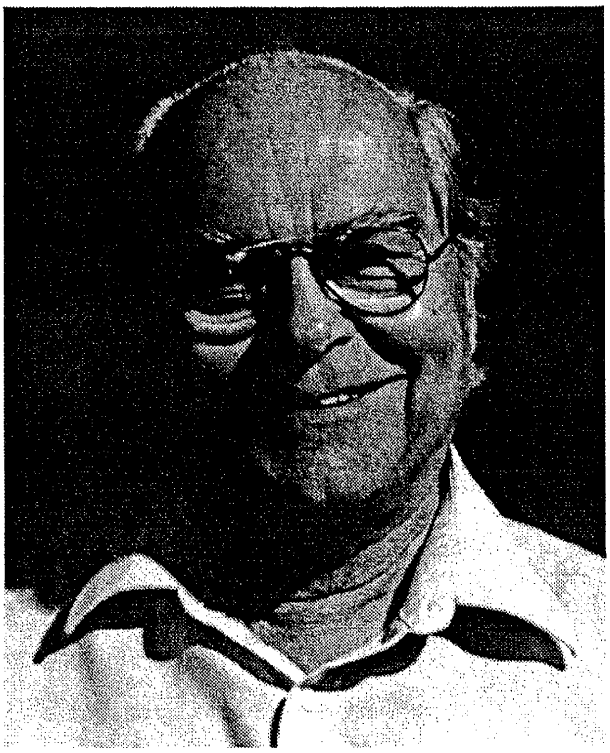

Photo by Vitt

Steve Craig

I was born on May 13, 1918 in Japan of missionary parents of the Plymouth Brethren, an evangelical protestant religion. Most of the parishioners were Japanese. My father, who had emigrated from England, was also a plumber and a CPA; he set up the YMCA accounting system in Japan. I had one brother who was born in 1914, and until I was 10, the family lived in Japan at Tsurumi about 10 miles South of Tokyo. I have many memories of my childhood in Japan where I learned conversational Japanese with my Japanese friends on the playgrounds. I had quite a few other foreign friends at school although my home neighborhood was mostly Japanese.

I remember the great Kanto earthquake on September 1, 1923. It went on for a long time and my brother and I had difficulty crawling across the front yard to the house. Fortunately, my father had an American style house nailed together which stood up when most of the neighboring Japanese houses assembled with fitted non-nailed joints fell down. I remember an apartment house down the street that collapsed completely. Severe damage was everywhere; the use of charcoal fires as the only source of heat was responsible for the burning of many homes. My family and all foreigners with intact houses offered refuge to our homeless Japanese neighbors.

On the day of the earthquake, which happened at noon, my father was at a meeting in Tokyo and just missed being in Tokyo station which was destroyed. He had a hard time getting home, borrowing a bicycle and carrying it through rivers with downed bridges. The details of the tragedy provided Dad with much future material for his ministry.

When we came back to America, first to New Jersey and then to Pennsylvania, which was my mother's birthplace, it was quite a culture shock for my brother and me. In Japan, it was not customary to say or do anything to hurt others. But in the US, we were strangers who talked funny and were constantly asked questions by teachers about Japan. Normally kids get lots of good natured teasing from their companions, but if they have a weak spot, as we did, the hazing can be severe. This led to many fights. Often, we were able to hold our own because we cooperated and both had learned some judo in Japan. Sometimes an opponent after taking a punch at one of us was surprised to find not the expected punch in return, but his hand grabbed and himself flying through the air to land in a heap on his back.

After a couple of years on the east coast, Dad, who was 11 years older than my mother, retired to California. There he continued his ministry among the many Japanese in Oakland, California. My brother and I, having learned our lesson in New Jersey and Pennsylvania, kept quiet about our origins in Japan. In Oakland, I went to school from the 6th grade through high school where I was able to take machine and electric shop courses along with the regular curriculum. One influence on my life was a Japanese engineer who manufactured toy electric trains while we were in Japan. These were beautiful, with elaborate castings for the engine parts. He made them to run on US width tracks and sold them in a Tokyo department store. He helped us to build crystal sets and showed us the elaborate train set that he had in his own lavish home. This Japanese engineer's kind help was a definite influence on the interest that my brother and I developed in mechanics, electricity and science in general.

Also, we had a cousin in New Jersey who worked for Lionel trains. He invented "auto switching" and other things for Lionel. We had a big train set in California, which furthered our interest in electricity. We were very fortunate, as too many kids do not get the motivation that my brother and I had.

After graduating from high school in 1938, I went to an electronic trade school and began to work in radio service shops. I had been active in ham radio in high school and continued afterwards with a radio ham license and even had a ham radio transmitter in my

1926 Chrysler 2-door sedan. I also continued my high school interest in photography in an Oakland photo club. I still have my first camera, an ANSCO Memo half frame 35mm that I bought used for $10. It is now worth around $120. I converted a gift view camera to an enlarger and developed and printed in my own dark room.

In 1940, a friend of the family, who was head of the photography department at Shell Oil in San Francisco, heard that there was a job opening at Kodak in San Francisco. I was hired to help install the first Kodachrome processing lab west of Rochester, and was thus trained in processing film. We were given 10-20 rolls of 16 mm color film and told to shoot anything that we liked, but to make sure that the exposures were correct. This was the material that they spent months on to get the quality up in the processing lab before accepting any customer films. I borrowed a 16 mm camera and had a grand time photographing everything in sight including all my family. This was at a time, 1939-1940, still in the depression, when only the very wealthy could afford movie camera film. I watched them build the Oakland Bay Bridge, and on opening day, I shot a movie out the windshield of the engineer's cab of the train running across the bridge, and then another shot of the bridge from the ferryboat underneath with a train running overhead. The Kodachrome color is still perfect today in these pictures. I have two large reels of film that Kodak gave back after running their chemistry control tests.

The draft was coming along and, in 1941, I was sent to army boot camp in Texas where I signed up for radio and special electronics. Then I went by night train to North Carolina for a crash course at a radar school. At the end of the course, they picked four of us to be instructors. The Colonel said that we instructors would be there for two years. I had told my girl friend, Millie, that I did not want to get married until after the war. Now, I wrote her in California that since I was going to be an instructor for two years, "let's get married." I could not get away, so Millie took the train to North Carolina to get married on October 18, 1942. This was the first time that she had been out of California. The wedding was scheduled for Friday evening; I had a 3 day pass for Friday, Saturday and Sunday. The worst storm in decades hit just when Millie arrived in Washington D.C., stranding her in a flood with no transportation running. There was not even civilian communication available, so I went the rounds of the bus and train stations, Friday, Saturday and Sunday, but no Millie! My army friends joked that I had been "stood up" although they knew it was the weather. She arrived Sunday afternoon on the first train to leave Washington for Camp Davis North Carolina. It was so late that the restaurant where I had planned a fancy dinner was closing soon, so we decided to eat first and have the wedding afterward. The wedding guests had to get back to camp, so the pastor of the church found strangers who would stand up for us and we were married. The next morning I was back at camp. As an instructor, I got a marriage allowance and was able to live off base, about 30 miles away. For the next 2 years I taught radar for anti-aircraft artillery and in the process, learned about analog computers with their sine and cosine potentiometers and other analog device. The radar fed the computers which controlled 90 mm antiaircraft guns.

Practice firing was against targets towed by women pilots in Piper Cubs. This was dangerous for them because sometimes the radar would lock onto the tow wire and shoot the tail off the plane. Eventually the targets were towed by radio controlled drones, which solved the problem. Afterward, I went to Fort Monroe, Virginia for training in coast artillery radar, then to Fort Sill, Oklahoma for anti-mortar radar which could pinpoint a gun from radar fixes on the trajectory.
I left the army in November 1945.

I then got a job at the Berkeley Scientific Company in Oakland. They were developing new electronic products in 1945 and 1946. One of the successful products was a decimal counter with 0-9 neon tubes cascaded to make a universal counter. They worked to increase the counting speed. I became shop foreman and did packaging design. I developed a method of assembly which had a sandwich with bored holes for wires and parts. They gave me a bonus and tried to get a patent for what was called the "Craigmount." Even after the transistor was invented in 1948 and printed circuits were in use, they continued to use the "Craigmount" for 5 more years because it was more reliable.

Although this was a great job, I still had the motion picture bug. Dr. Irwin Moon, whom I had met before the war visited us in Oakland. He had previously mentioned that he planned to start a movie company to use scientific facts to validate religion. I showed Moon the "Craigmount" and when he said that he was getting started with his movie company, I asked him for a job. Thus I quit my good job with Berkeley Scientific and moved to Los Angeles. Moon had gotten a grant from the Moody Bible Institute in Chicago to pursue his idea that there was so much evidence for divine design in nature that he wanted to use it as a stepping stone for preaching the Gospel. His first film was about facts of nature that gave evidence for supernatural design. Such things were: how do birds fly all the distance from Antarctica to Hawaii and what is the homing mechanism in pigeons. We used documentation of things like these to convince people of the existence of a divine designer.

There was only a small group of us working and I had to learn techniques like time-lapse and microscope photography. One of the first stories was that of the grunion, the fish that lay their eggs on California beaches on the highest wave of the highest tide and then hatch on the highest tide 14 days later. How do they time things so perfectly?

We had to learn how to first catch the grunion eggs and them keep them alive for continuous time lapse

photography until they hatched 14 days later.We found that a drop of balsam would keep them in place before the camera. Fresh salt water dripped on them kept them alive.We had marvelous photos of just when the heart started to beat or the eyes develop. We found that shaking in water did not cause them to hatch, but add sand to the water and with that abrasion, they hatched on schedule. This involved many nights waiting on the beach in Malibu which was rewarded by the night when a receding giant wave left the unbelievable sight of the beach completely covered with silver grunion.

Another memorable film was of bats, with their eyes blindfolded, banking vertically to fly through wires strung on a grid across the room too narrow for them to pass through horizontally. When their mouths were tied shut, they did not fly, but just flopped around on the ground. We did about 12 films that were duplicated in 10 foreign language. We made short versions for schools in which the religious aspect was downplayed, as Moon felt that the evidence spoke for itself. Of course, there was lots of controversy with evolutionists, although some of the films had no biblical references but just showed facts of nature.

Although this was very interesting work, the pay was not enough for a growing family of eventually 7 children. Therefore, I worked for several film studios as a sound man, since they already had too many cameramen, my first choice. I worked for the Desi Lu Studio, the Dick Van Dyke show,Andy Griffith Show, Lucy show and others. I enjoyed the chance for further education in film technology and learned many crafts.

Finally, I had to leave the studios to spend more time with the family. Studio work was always from 5-6 in the morning until 7-9 in the evening. It was cheaper for a studio to pay overtime than to have another shift.

I then got into making commercials which gave more time flexibility. I went to a non-union studio and got jobs overseas doing sound and camera and lighting with a small crew. I enjoyed traveling, making documentaries with occasional time off for sightseeing. Eventually I did freelancing, going overseas for other companies, to Japan, Australia and India including 17 overseas trips and 3 trips around the world. 1979 was IMAX on the Great Barrier Reef. In 1985 I went to one of the most remote jungles on the planet, Iranjara in Indonesia which can only be reached by 2 small plane legs and a final helicopter trip to a clearing in the jungle to people who were cannibals until recently. The people still have 120 foot high lookout platforms in trees to warn of attacks by warring neighbors.The men wear only a gourd. When the helicopter lands, protocol is that every person there must be greeted by the right hand.This trip was the most hair raising experience of my life; unpredictable, constantly bad weather made even getting there dangerous.

Since the hectic traveling days, I have been working with local film crews. A Crest toothpaste commercial took four days in Boston. One of the interesting projects for the X-Files TV program was to photograph a group of spiders bunched and then spreading out. Although I got boxes of small spiders from an entomologist friend, they would not cluster together as they were too active. Carbon dioxide would just stop them in their tracks. The solution was finally to put them in a plastic box with a cold section in the center. They would bunch in the cold area and then move out as it warmed up. Another interesting project was to photograph winged termites emerging. They would sit in place exercising their wings, then fly straight up a short distance before flying off horizontally.

I am still doing some freelance work such as video segments for producers of advertisements and television specials. For facilities, I have a well equipped electronics, video, cine and microscopy laboratory with darkroom and machine shop attached.

In addition, Millie and I enjoy having foreign students in our home for up to six months at a time in a "homestay" program for the English Language School (ELS) of Santa Monica which provides a crash course in the English language for foreign students. Since 1985, we have had 103 students from countries all over the world stay with us. We enjoy getting to know something of the culture and personalities of students from Japan, Switzerland, Finland, Spain, Brazil and many other countries.

Millie and I are also busy with all the activities of our 7 children and 13 grandchildren who are spread all the way from Chico, North of Sacramento, to Long Beach in the South.

I enjoy our microscopical organization, for which I was the program director for 7 years and for years afterward videotaped the monthly meeting speakers. Also, for some years, the workshop has met monthly in my yard with the lab available for demos. Millie not only tolerates the rowdy gathering, but provides coffee and refreshments.

MINUTES FOR THE MSSC MEETING OF WEDNESDAY, JANUARY 15, 1997

With Notes on the Rational Past Scientific Instrument Show of Saturday, January 25

by Dave Hirsch

About 30 people, including guests, attended the MSSC meeting of 15 January, 1997. The meeting was launched by our guest speaker, AL SHINN, who showed us how to construct a brass 'microscope' in the manner of those produced by ANTONI van LEEUWENHOEK of Delft (1632-1723). For more information on Mr. van Leeuwenhoek, the following sources are offered:

* *Encyclopedia Britannica*, Pre-1970 editions
* Bracegirdle, B., *A History of Microtechnique*, London, 1978
* Dobell, C., *Antoni van Leeuwenhoek and his 'Little Animals'*. London, 1932
* Zuylen, J. van., *'The Microscopes of Antoni van Leeuwenhoek'*. *Journal of Microscopy* 121 (1980), pp.309-328

THE SALES TABLE. Outside of the Leeuowenhoek microscope kits being offered at $50, a microelectronics slide set consisting of eight well made prepared slides were offered at $25.00 per set, by RON MORRIS. As usual, A number of pertinent technical publications were available as freebies.

You don't have to travel to Filene's Department store in Boston, Mass. to find 'boggins'. Come to the MSSC workshops held on the first Saturday of each month on the spacious patio of the Steve Craig Estate. Learn microtechnique. Find out what's new in the Microscopical Mileau. Enjoy a good cup of coffee and a fine array of comestibles. Browse through a plethora of microscopical supplies, technical books, etc., cramming the sales tables. Mix with a fine bunch of microscopically motivated men and women. Should any of you Corresponding Members be in this neck of the woods, drop by and say, "Hi!"

SHOW AND TELL. Carrying on the tradition of the late JOHN CHESLUK and others, LEO MILAN exhibited color enlargements of crystals, which he prepared. The samples were viewed at 20X or less, using cross polarized illumination under first order red. The enlarged photographs include hippuric acid, a mix of benzoic acid and urea, and an organic compound called 'sea legs' which was used by old time sailors to prevent seasickness. Todays' sea travellers use compounds such as Dramamine. Leo used an electric stove, carefully heating each compound, which was then allowed to cool. Because of the toxicity of the materials, the heating and cooling were done under a ventilating hood.

Twenty three years after our Pilgrim Fathers stepped on that rock in Plymouth, Mass., a German Jesuit, ATHANASIUS KIRCHER (See Pres. Vitt's' article in the January issue of the MSSC bulletin) wrote a book titled, *MAGNES*. An authentic, well preserved, second edition of that leather bound book, printed in Latin, was shown by proud owner, ALLEN de HAAS. Although historical microscopy was not alluded to in the Rev. Kircher's tome, he went hell bent for leather on the contemporary aspects of magnetism; animal magnetism, that is. The suspicions and superstitions of the seventeenth century were dramatically revealed in the book. The term: Electromagnetism also appeared at that time. Also, we must commend Allen on his fine article appearing in the January issue of the bulletin titled: "A Method for Obtaining Achromatic Critical illumination"; an excellent example of original thought.

Instrument Show. Just like it happened last year, a violent downpour, courtesy of Jupiter Pluvius, greeted the attendees of the second annual Scientific Instrument Show, sponsored by ALLEN and BOBBIE ROBERTS of THE RATIONAL PAST. Outside of wet clothing and squishy shoes, the interest of those in attendance went undampened. This well attended show was held on Saturday, January 27, 1997 at the former Helms Bakery facility. Several MSSC members had sales tables, including RICK BLANKENHORN, ALLEN de HASS, ALLEN AND BOBBIE ROBERTS. All told 22 MSSC members attended the show.

LARRY ALBRIGHT went home with 3 children's microscopes and other goodies. KEN GREGORY bought a pristine Varick microscope in a well equipped case. Scientific instruments in general seemed to be pricier than ever, but that didn't stop determined collectors with deep pockets.

The Microscopical Society of Southern California had a Membership table manned (or should that be personned ?) By DAVE HIRSCH, LEO MILAN, GAYLORD MOSS, and GEORGE VITT. Membership applications were distributed to interested parties. Several unique items relating to MSSC activities were demonstrated to the show visitors. Especially noteworthy, was the number of visitors who stopped by to congratulate us on the launching of the new society.

You probably wondered about the assorted rocks which are fastened to the side wall of our meeting place in the gymnasium of the Crossroads School. To us academic types, the rocks may appear to be a collection of unlabelled petrological specimens. Actually, the Crossroads school students use the rock studded wall to practice rock climbing. Perhaps some petrologically oriented MSSC members can label the rocks.

MY RUSSIAN STEREO MICROSCOPE

Or How the End of the Cold War Provided Me with a Magnificent Microscope!

by Ronald F. Morris

I recently picked up an instrument of very high quality, albeit low price. Usually, the two never seem to mix, especially when dealing with precision optical instrumentation.

It is called the MBC-10 stereoscopic microscope distributed by LOMO- the Leningrad Optical-Mechanical Joinery. It was made under contract in a state plant in Lytkarino, in Moscow. In England, it is known as the MBZ-10 by Zenith. Some models were also made in Mashpriborintong.

The scope itself is very rugged, with a dark gray crackled finish. (Fig 1.) The main distinguishing feature is that it has no zoom objective lens, but like in the best tradition of Wild-Heerbrug, and others, it has 5 fixed pairs of objectives that can be rotated into place via two large black knobs on either side of the main scope body. This is known as a Galilean drum arrangement, (Fig. 2), which allows for very good resolution and a sharpness unavailable with a zoom system. The objective powers are: 0.6x, 1x, 2x, 4x, and 7x. With 2 different ocuiars -8x and 14x, this gives a wide range of possible magnifications. With the optional 2x multiplier objective, total effective magnification up to 200x is possible.

A low-voltage, focusable spotlight (Fig. 1) comes with it, which can be used on a flexible arm for reflected light above the specimen, or, for transmitted light, the lamp housing can be inserted in the base of the scope and used with a swiveling mirror. The entire substage base can be removed if the mirror is not needed, which reduces the overall height of the instrument by about 2 inches.

The scope is very modular, with many accessories such as a mechanical stage ($75), a camera attachment system that uses prisms between the scope body and headpiece ($250) (Fig 3), an incident illuminator ($200). The Zenit 122 35 mm camera with Pentax-type screw thread attachment is also available for around $125.

It comes with a lot of accessories (Fig 4): 2 sets of eyepieces, a spare 8x measuring eyepiece fitted with a scale reticle , plus an extra grid reticle. 4 spare low-voltage lamps, a green filter, dustcover, plastic armrests for both sides of the base, reversible black/white base plate, stage clips, variable AC power supply, and a clear glass baseplate.

The Zenith MBZ-10 current English price is around 200 to 400 pounds Sterling range. The base model price in the U.S. varies in the $600 range. Fully equipped versions can be over $1000.

The construction quality of the LOMO-Biolam scopes is excellent. Most metal parts are cast machined dura-aluminum, steel, and brass, with phosphor bronze for the moving bearing parts. This is all based on the East German heritage from Zeiss-Jena set during the 1940's, and passed on to two generations of Russian LOMO employees.

LOMO scopes have the fit, feel, and finish similar to the various Zeiss-Jena microscopes I have seen and owned in the past.

I became very interested in the history of LOMO, and researched and wrote the next article.

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HISTORY OF THE RUSSIAN LOMO - BIOLAM OPTICAL MANUFACTURING ORGANIZATION.

The history of LOMO, or "Leningrad Optical-Mechanical Joinery" is tied closely with the East German firm of Carl Zeiss Jena, which had manufacturing plants in Eastern Europe, and St. Petersburg, Russia up to World War II. LOMO's microscope division, then known as the "Progress" Company, was started in 1936 with designs and technical help from Zeiss-Jena. In fact the early "Progress" scopes show a strong striking resemblance to the Jena scopes of that time period.

Many of the Zeiss-Jena optical instruments were made to support the Nazi war effort, with products such as U-boat binoculars, submarine periscopes, sights for the feared 88 mm anti-tank guns, and massive optics including a 200 mm naval binocular that weighed 1200 pounds! Even General Rommel and his Panzer tank forces were equipped with the famed Zeiss-Jena binoculars.

The remote Zeiss-Jena manufacturing plants outside of Germany were important because the Allies were heavily bombing the Zeiss-Jena factories in Germany, which often made their products with the city of manufacture clearly marked on them, with the "air of German invincibility" of the time. Their arrogant ways proved valuable to the Allied air commanders, who used the information to plan bomb strikes!

The Zeiss-Jena plant was spared major bomb damage, and remained operational up until 1944. Concentration camp labor was often used by the Jena factory, and their binoculars were thrown over the fences of the camps to the liberating Allied forces soldiers, who took them home as "war trophies". In fact, a pair of Jena binoculars supposedly used by Hitler, and by Rommel were featured at a high price at auction recently.

Continued on page 36

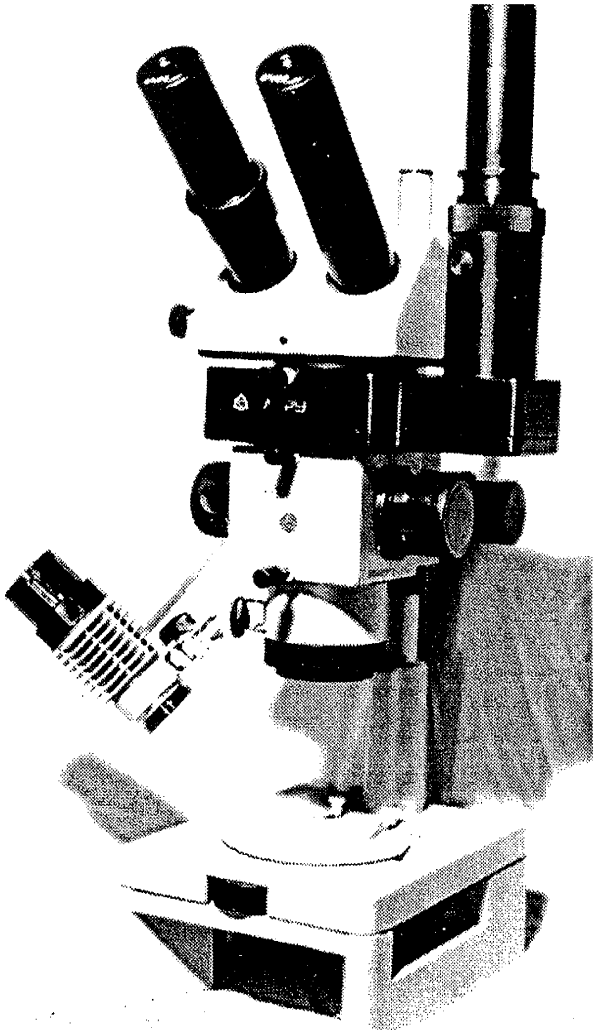

Fig 1. Ron Morris's LOMO MBC-10 Stereoscopic Microscope

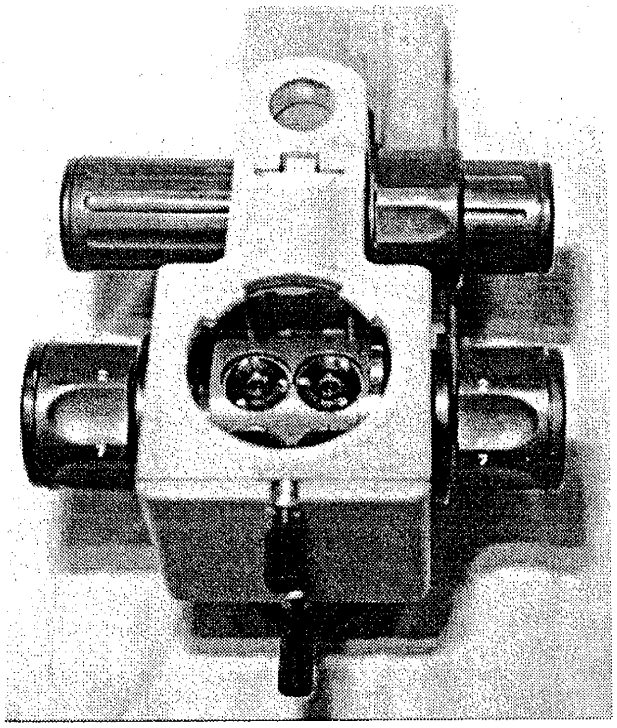

Fig 2. LOMO Galilean drum arrangement with 5 fixed pairs of objectives. Note easily separable modular drum section.

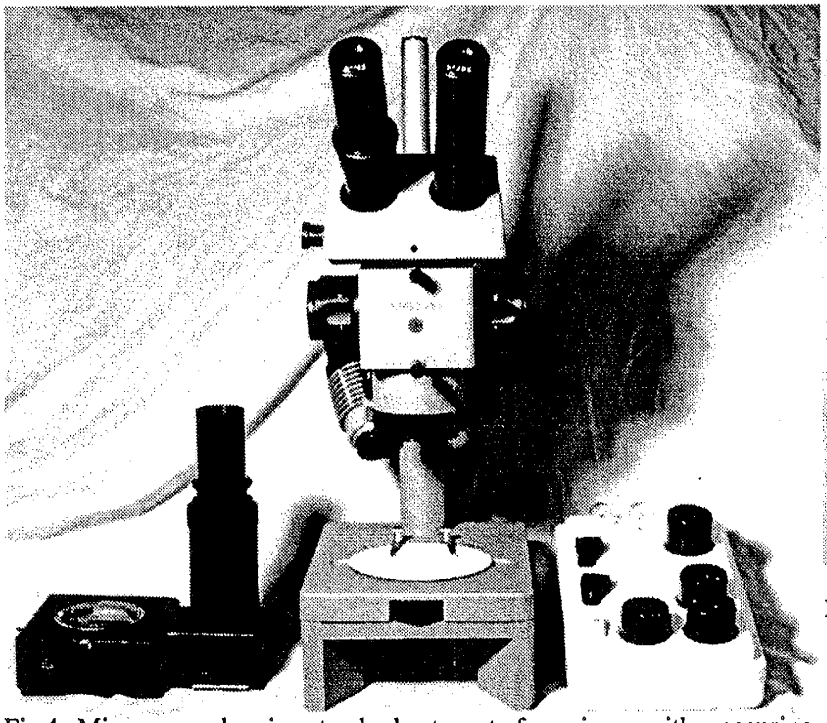

Fig 4. Microscope showing standard extra set of eyepieces with measuring reticle eyepiece and extra viewing eyepiece for optional camera attachment shown. Also, note reversible white/black baseplate and removable substage base for transmitted illumination.

Fig 3. Sliding prism camera attachment

After the surrender of Germany, and the end of WWII, the Russian military forces occupied Jena, and other cities of what was to become the GDR, or the German Democratic Republic (East Germany). By April of 1946, the Russians had seized and evacuated most of the remaining engineering and technical staff of the Zeiss-Jena plant, and nearly 90% of the factory tooling and machinery, which was shipped to Leningrad and Moscow. The Contax camera factory was also seized, and most of the factory and some workers taken to Kiev.

It is most probable that the Russians were emasculating industrial Germany in direct retaliation toward an enemy country that had severely decimated Russia's population.The siege of Leningrad had lasted 872 days, destroyed nearly all of Russia's industry, and killed nearly one-fourth of the city's population.

Also, the Russian fear of future conflict with the Western NATO PAC countries made moving the major optical instrument production facilities deep into the Russian heartland that could be more easily defended, a logical strategic step.

With the help of the captive German engineers and technical staff, over the next 8 years a new Russian workforce was trained in the best German traditions of craftsmanship, work ethic, and quality. In 1953 and 1954, the German captive workforce was repatriated to Germany where they re-started up the East German Zeiss Jena plant,this time under the name "Aus-Jena". However, some of the Germans opted to stay in Russia with the LOMO factory.

Soon after, ties with the East German Zeiss Aus-Jena factory were re-established with advent of the cold war, further strengthening the LOMO organization. They became the largest producer of optics in Russia, with employment peaking out at 30,000 workers, with one central design bureau, and 4 manufacturing plants in Moscow and St. Petersburg (Leningrad), Russia,and several state-run contract plants.They produced many items for the Soviet military including submarine periscopes, artillery and tank sights, tracking telescopes, and camera systems for satellites. They also cast and ground the largest telescope mirror in the world at 6 meters in diameter. Up until a few years ago, the LOMO factories were some of the most secret plants in the former Soviet Union.

With the collapse of the Soviet Union, and the resulting decline of internal military customers and "puppet" state customers, many of the products that LOMO produced were rendered obsolete almost overnight. Their microscopes, however, had been widely accepted in many third-world countries, with a very wide variety ranging from low-cost teaching and hospital lab microscopes, and operating room stereoscopes second only to Zeiss.

The Russian firm is very lucky to have found a large commercial niche for their microscope products, which compete with the Chinese models on the low-end of the price range, but on the high end market with the German Zeiss and Leitz models. The LOMO Russian scopes are nearly a third of the cost of equivalent current German products. The quality is in the tradition of Jena, with a lot of attention to detail. Hand-craftsmanship and extras like fitted wooden cases, thick baked enamel finishes, anti-reflection black, hard chrome finishes on eyepieces, centerable Abbe condensers-even on student model scopes, true Koehler illumination that is fully adjustable, phosphor-bronze bearings, very stable and roomy stands, and tough steel and brass construction.

The logo for LOMO is a Cyrillic L, or "inverted-V", which represents the spire of the cathedral inside the Peter and Paul fortress in St. Petersburg. The spire is topped with the symbol for St. Petersburg- a sailing ship, since it's geographical location is on the Gulf of Finland, being built by Peter the Great as a gateway to the West for trade purposes. It was the only Russian city at the time with close proximity to Western Europe, and the center of Asia shipping traffic.

LOMO today has approximately 1500 employees in the microscope division alone, with several hundred of them scientists and engineers, many of them holding top positions in some of themajor Russian universities and institutes, including the famed Leningrad Optical Institute.

As of the mid 1990's, the military optical goods production had fallen to only about 18% of LOMO's total output. Among their other commercial products are cameras, medical endoscopes, telescopes, precision measuring equipment, gyro-stabilized binoculars, and spectrometers.

References:

U.S. Department of Commerce, foreign defense contractors database.
Russian trade and business connections- Image Alpha Ltd.
LOMO North America, Ltd.
Zeiss Historica Society Journal.
Carl Zeiss Inc.

WORKSHOP of the Microscopical Society of Southern California

by: **George G. Vitt, Jr.**
Date: **Saturday, 1 February 1997**
Location: **Steve Craig's Lab,** 29 persons attended.

Good News: We are glad to announce that this was the best attended Workshop in our history - and one of the most satisfying! **Bad News:** At this rate, we will soon run out of space and, since there will be too many things to report, these minutes will become entirely too voluminous. For all these reasons, such good attendance must stop immediately!

1. **Ron Morris** exhibited and described his newly acquired Russian stereo microscope made by LOMO, Mod. MBS -10. His scope was equipped with a prism-switched beam splitter phototube, a base for trans-illumination, sets of eyepieces, and a cased Jena microscope cleaning kit. The Russian instruction manual supplied with the instrument had been translated (into English) by **George Vitt.** Ron gave a brief history of LOMO (see his detailed article in this issue of the Journal). This is an impressive piece of excellent optics, in a very sensible mechanical design, at a reasonable price. A general discussion followed: **Alan de Haas** stated that early (c.1970) Russian lenses in objectives and oculars were **radioactive!** They can be identified by the greenish tint to the glass. **Stuart Warter** said that the mainland Chinese had bought out the remaining stock of some discontinued models of LOMO microscopes, and had refurbished them to American standards, but that this work had been poorly done. He warned that, if one were to buy these Chinese microscopes, that there would be no spare parts nor customer service since, when this lot was gone, there would be no more. Ron had a photomicrograph of his, of a 486 microchip, published in the prestigious *IEEE Journal of Solid State Circuits*, Feb.1997 issue, as part of the report of a U.C. Davis (CA) research project. Unjustly, Ron had not been given credit for the photo!

2. **John de Haas** brought a large supply of dyes and chemicals, for use by MSSC, that had been donated to him by the Garden Grove Hospital (CA) Histology Lab. He then announced, with pardonable pride, that he had received as a gift from his son , Alan, a Zeiss #3 (III), c.1903 microscope.

3. **Ernest Meadows,** an industrial designer par-excellence, came to the Workshop as a guest and left as an active member of MSSC. Welcome aboard Ernie! He had bought a microscope for his 11 year old grandson from Max Erb, and wishes to educate this young man in microscopy.

4. **Gaylord Moss** read a most charming and complementary letter recently received from **Fred Loxton,** Editor of the *Balsam Post*, which records the proceedings of the Postal Microscopical Society (PMS). Gaylord then reported on a letter received from **Herbert Layfield** of Whittier, CA, an MSSC member, who has a rare and large collection of botanical microfossils, obtained from "Coal Balls", and prepared as mineral thin sections on microslides. He wishes MSSC to evaluate this most unusual collection. Mr.Layfield referred to a Tech Note on Coal Balls (actually, there were two) written some time ago by **George Vitt:** *TECH NOTE 48, "Plant Fossils, Coal Balls and Replicas, Part 1*, Oct.1995, and *TECH NOTE 49, "Paleontology, Coal Balls and Replicas, Part 2"*, Nov.1995 - as published in the defunct LAMS *Objective*. These described the collection and preparation of botanical microfossils from "Coal Balls" via multiple-peel polymer lacquer film replicas, which enable multiple 'thin sections' to be extracted easily from the same sample, obviating the most tedious and exacting task of grinding thin sections.

5. **Jim Clark** absolutely outdid himself in his presentation and demonstration of several precision miniature machine tools made by Sherline Inc., of San Marcos, CA, whom he represents. Everyone expressed keen interest in the capabilities of the highly versatile miniature lathes and milling machine which he brought to the workshop. Jim showed a large number of accessories: 3 and 4-jaw chucks (reversible jaws), Jacobs chucks, precision collets, rotary table, thread cutting gears, tool posts, live centers, fly cutters, boring tools, etc. For instance, in a minute, the lathe can be converted to a vertical milling machine! Jim machined some pieces and brass chips flew! By using electronic feedback motor speed control, the driving motor speed does not change appreciably with varying load of the cutting operation. These tools have to be seen to be fully appreciated. As a climax, Jim displayed a 1-cylinder steam engine that he had built with these tools - the perfect little engine is **only 3/4" high** - and works like the real thing. It seemed to be utterly frictionless! Prior to all this, Jim reported on the annual *North American Model Engineering Exposition*, held at Wiandotte, MI. It was here that an 8" long model of a Rolls Royce Merlin engine, with supercharger, was exhibited and run on gasoline. The model took 6,000 hours to construct. Jim also brought for sale an Olympus Mod.KHC binocular biological microscope with integral vertical illuminator, and at a bargain price.

6. **Leo Milan** showed photomicrographs he had made of wood sections made by Ernie Ives of the P.M.S.,

and arranged Radiolaria. For 2-3 years, Ernie has been conducting highly successful experiments for developing the optimum technique of using his new and very weighty microtome for cutting wood sections. Leo then described the analytical work that had been done on the highly publicized "Mars Meteorite". It had been formed 1.8 - 3.6 billion years ago, fell to Earth 13,000 years ago, and was discovered 13 years ago! Leo also noted that this year marks the 100th Anniversary of CALTECH, his dear old alma mater, which showed in their recent publication a picture of Leo and his wife on their recent trip on the Yangtze river .

7. **Jim Solliday** described his having taken **John Field** and **Klaus Kemp** to a diatom-rich location in Palos Verdes, CA. Jim then passed out plastic 35mm film containers filled with uncleaned samples of Palos Verdes diatomaceous earth, that **Ed Jones** had prepared. Jim said that these should be boiled in water (to get rid of the salt), then boiled in hydrogen peroxide, then boiled (OUTDOORS!) in dilute hydrochloric acid (commercial 'muriatic acid'). (He did not elaborate on the separation technique.) Jim then showed a Zeiss Mod.Vb microscope that he had obtained at the recent *Antique Scientific Instrument Show* at the Helms facility, and a No.VII student scope c.1870-90, with its sleeved substage iris, and swinging mirror that can be positioned above or below the stage.

8. **Ken Gregory** displayed his cased pristine French Varick microscope which features a draw tube, glass stage, draw tube coarse focus, fine focus, and a full substage. He got it at the recent Helms show. The rear of the base was finely engraved, in French script, with the maker's name and other data. The microscope came in a very fine, compactly fitted mahogany case. He also displayed his Zeiss Va scope with racked substage condenser for oblique illumination - all in excellent condition.

9. **Stuart Warter** displayed a B&L c.1885 microscope, no serial number, which he obtained at the Helms show. It is a tall monocular scope with nickel plated draw tube, sub-stage diaphragm disk, swinging mirror for direct illumination of the stage (a Gundlach design), and with a non-original 4mm lens. The fact that there is no fine focus indicates that it may have been meant for use mainly with lowpower objectives suitable for student work.

10 **Dave Hirsch** announced that MSSC now has 89 paid-up members and is definitely 'in the black'. Dave then displayed a Swiss "Star" jeweller's lathe c.1890 to which he had added a modern brush motor with geared speed reducer, and an electronic speed control box. The unit came with a set of collets, and packs into a portable case. He had found this instrument in an Edinburgh furniture store!

11. **Izzy Lieberman** extolled the many-faceted talents, activities and achievements of our new member, **Ernie Meadows**. He then described what had been set up in **Steve Craig's** lab: the tip of a ball point pen in the process of writing on a piece of paper, as observed under a microscope and displayed on a video screen. For those who may not be aware of it, Izzy has been a very prolific contributor to the commercial development and perfection of the ball point pen technology and the special inks associated with it. As the featured speaker at our regular February meeting, Izzy will explain more about this fascinating subject and will illustrate with slides and video.

12. **Richard Jefts** announced the existence of a transcript of the talk given recently to MSSC by the renowned **Klaus Kemp**. He then gave us a piece of interesting news: the purchase of quite a number of chemicals, especially in multi-pound quantities, is reported to the data base of the Federal govt! This seems to be a necessary step to the uncovering of manufacture of illegal drugs.

13. **George Vitt** displayed and described his Zeiss stereo microscope c.1980. It has essentially the same optical system, using the Galilean drum mounted pairs of doublets between the objective and the Schmidt prisms, as the Russian stereo scope Mod. MBS -10 which was brought and described by **Ron Morris.** The similarities were quite evident when the two instruments sat side-by-side.

14 **Larry Albright** showed an unusual small 'toy microscope' which has a standard type of adjustable mirror at the bottom. Above this mirror is a vertical tube with fixed circular limiting apertures at top and bottom. Directly above the tube is a specimen stage with clips, and a small magnifier to view the specimen - in the manner of a dissecting microscope arrangement. Larry also showed a German "Klemi" microscope with coarse draw tube focusing and fine focus achieved with a rotatable ring at the draw tube. He then announced that the renowned author and microscopist, Brian Ford, will most likely give a talk to MSSC sometime in the future, when he is next in the U.S.

15. **Larry McDavid**, who is also an amateur astronomer with a FULLY equipped home model shop (Bridgeport milling machine, etc.) - specializing in precision optics and mechanics - expressed his desire to learn microslide preparation, and that he is looking forward to such instructions and hands-on experience at future meetings. He expressed his love for forum-type meetings, citing the MSSC Workshop as the perfect example! Thanks Larry. He then displayed and described the design principles of "crash sensors", based on the "Rolamite" concept of a zero-friction rolling mass, and showed three variations on this theme. He then showed a "crash sensor" used on Hondas, which uses a mass, a flat 'spiral' spring and a precision air damper comprised of a thin flat plate resting against a flat surface which has a precision air inlet hole. Larry noted that cantilevered-mass type of accelerometers, built on a silicon microchip, while they have been

extensively described in the popular press, cannot yet meet the critical requirements for commercial auto crash sensors. (Note: this microchip was described by **George Vitt** in TECH NOTE 6, *"Micro-machined Acceleration Sensor Makes its Debut"*, August 1991). Larry then passed out information on an interesting WEB site which is devoted to the exchange and dissemination of information on scientific instruments. It is named "RETE" (a part of an Astrolabe) and is situated at Oxford University (UK). The addresses are: For questions to be answered (please, NO sales pitches!) - rete@maillist.ox.ac.uk; For a list of subscribers or a list of commands, send a message to majordomo@maillist.ox.ac.uk - with the message "who rete" or "help", respectively. As a closer, Larry displayed a "mystery object": a 100 year old piece of technical glassware partially filled with water and sealed. It was, in fact, a device to demonstrate the 'water hammer' principle, based on the formation of a partial vacuum (that can destroy your home water pipe system in no time flat)!

16. **Don Battle** announced that there had been an interesting program on the TV Discovery channel, that dealt with the use of Balloon bombs by the Japanese during WWII, as described in a recent MSSC article by our **Leo Milan**.

We wish to thank both **Steve and Millie Craig** for their marvelous hospitality and refreshments! After the meeting, ten members gathered at Coco's for food and conversation.

ERRATA #1
The following incorrect statement appeared in the Workshop Section of the Bulletin of the M.S.S.C., Vol 2. No. 1. p. 13 "...a history of said shroud and the part that Walter McCrone played in its investigation using tape lifts for pollen analysis and carbon dating. The tape lifts indicated pollen from the Middle East. Unfortunately, his samples have gone astray." In actual fact, neither Walter McCrone, nor the McCrone Institute, had any connection whatsoever with said 'missing specimens'. It was, in fact, some private individual, with no connection whatever to the McCrone Institute who, over 20 years ago, was independently involved with the investigation of specimens which he himself had gathered and which, subsequently, had allegedly gone astray. Our sincere apologies to Mr. McCrone for this misstatement of fact.

ERRATA #2
In the previous Bulletin, Workshop section, Frank Barta entry: The word 'psychology' should have been 'cytology'. This was a ridiculous subliminal typo error!

DESIGN OF A STEPPED MAGNIFICATION STEREO MICROSCOPE SIMILAR TO RON MORRIS'S LOMO SCOPE OF PAGE 34 - from *Optical Engineering*;

In the January 1997 issue of *Optical Engineering*, published by the SPIE-The International Society for Optical Engineering, Vol. 36 No. 1. there is an article entitled, *Design of a High Resolution Stereo Zoom Microscope*, by: A.S. Murty, K. Aravinda, T.V. Ramanaiah, R.L.V. Petluri, V.V. Ramana Murthy and G.R.C. Reddy of Bharat Electronics in Machilipatnam and the Regional Engineering College in Warangal, India.
The design they describe has two different configurations, one with a zoom lens and one with a rotating Galilean telescope magnification changer like that of the LOMO stereo scope described in **Ron Morris's** article on page 34 and of **George Vitt's** Zeiss scope mentioned on page 38.
The Murty et al. design uses the fact that when a telephoto lens having one positive element and one negative element with air space between the two components equal to the difference in the values of their focal lengths is attached to a photographic lens, the overall focal length of the optical system will increase without shifting the original image plane of the photographic lens. Using this principle, they designed a stepped magnification stereo microscope consisting of a main objective, a 'magnichanger,' a binocular objective and the eyepieces. The 'magnichanger' is an assembly of different Galilean afocal telescopes with different magnifications in a rotatable barrel. The barrel is introduced in the microscope between the main objective and the binocular objective. By rotating the drum on its horizontal axis, one of the Galilean telescopes comes into the optical path of the system, which changes the system magnification. By rotating the drum to reverse the telescope, they obtain a different magnification. They used two telescopes to obtain four magnifications and obtained a fifth magnification with no telescope in the path. The characteristics of the stepped magnification stereo microscope are shown in the table below.

Magnification	FOV (mm)	Exit Pupil Diameter (mm)	Resolution (microns)	Depth of Focus (microns)
5X	40	2.4	14	±11
10X	20	2.4	7	±6.3
16X	12	2.4	4	±3.6
25X	8	1.8	3.6	±3.0
50X	4	1.0	3.5	±3.0

The stepped stereo microscope and stereo zoom microscope were both manufactured. The zoom scope has similar performance. The SPIE paper shows MTF curves as well as great detail of the optical and mechanical design of both microscopes.

February Program
Wednesday the 19th 7:30 PM
at the Crossroads School

The History and Manufacture of Writing Instruments and the Associated Use of the Microscope.

Our featured speaker will be long time member **Izzy Lieberman** who will tell us about his extensive experiences in the research and manufacture of inks. Izzy has a BS from Princeton and an MS from UCLA in Chemistry. He was at Papermate starting in 1953 then went to Scripto before becoming a consultant, eventually consulting for almost every ball point manufacturer in the U.S. Izzy continues his research to this day, formulating special inks for many manufacturers. Izzy will begin by describing the history of ink writing before the development of ball point pens and later instruments. Topics will include:

A. Early inks and devices including quills, steel nibs and fountain pens.

B. Ball point pens.
1. History of development
2. Early problems and how they were solved.
3. How the various parts are manufactured.
4. Chemistry of inks.

C. Later Developments
1. Fiber tips.
2. Extruded tips.
3. Roller pens.

Some of the desirable characteristics of ball point pens and inks that have to be considered are:
1. Good clean bright color
2. Easy startability.
3. Smooth and uniform writing.
4. Good writeability on smooth or slippery paper. (grease writing).
5. Lack of ink buildup around ball. (gooping).
6. Permanence to fading. (light fastness).
7. Little or no bleeding under water. (Water fastness).
8. Long shelf life. (3-5 years)
9. Rapid drying on paper. (No smearing or transfer after 30 seconds)
10. Ink viscosity of about 10,000 cp.
11. Ink ph of 5.0 to 8.0.
12. Ink to be non-corrosive to point, ball or tube.
13. Ink to be a Newtonian fluid. i.e. same viscosity at different shear rates.
14. No point bleeding of ink.

This promises to be a most fascinating lecture, and one that members have long asked Izzy to give. Those of us who have seen previews showing rolling balls laying down ink videoed through the microscope are especially intrigued.

Editor's Notes

One of the things that The Society has not gotten around to is sending out a list of members. We now have a paid membership of 89, with an additional 16 bulletins going to other societies and special honorary members. One of the perceived purposes of a membership list would be to enable others, particularly corresponding members, to have a means to find and contact others of like interests . Several members have suggested that before we send out a membership list we should establish an identification code that would indicate areas of expertise or interest to be included alongside each name. This would require some polling to get this information, however, it seems like a useful idea to me and I would appreciate any input as to what topics should be included in such a code.

The diversity of interests is large: some members collect antique microscopes for their beauty and history. Others have new microscopes, the best they can get, merely as a tool for their work or hobby to look at things. Some are interested in studying very particular objects such as diatoms. Others look at the technical aspect of the optics alone to refine the capabilities of the light microscope.

The specialization can get quite narrow, for instance collecting not just antique microscopes, but only those of a particular maker. Some are fascinated not by the microscopes, but by the slides themselves, either making them or collecting beautiful new or antique specimens. Others specialize in literature of the microscope. Of course, most have a combination of interests.

In order that everyone will usually find something interesting to them in each bulletin, the aim is to have a variety of topics in each issue. The greater the diversity of members who submit articles, the better this will be achieved. I very much appreciate the kindness of the members of the Postal Microscopical Society and its Editor, **Mr. Fred Loxton** in allowing us to enrich our bulletin by sharing some of the PMS articles that contain "hands on" information such as **Ernie Ives'** article on ants in this issue.

Although we all have our particular favorite things, perhaps specializing in some narrow area, the workshop "show and tell" sessions are remarkable in showing how much we do find the same things intellectually stimulating. As **Larry McDavid** mentioned during the workshop, it is a unique experience to have 20 (or 29 this month) people sitting around sharing something somewhat technical that interests them, and finding that it holds the attention of everyone else in the group too. Perhaps it shows that people who choose to be involved in any aspect of microscopy are curious about any sort of science, device or issue related to the working of the physical universe. It sure makes for a grand, entertaining morning once a month at the **Steve and Millie Craig estate.**

Gaylord E. Moss