Bulletin of

THE MICROSCOPICAL SOCIETY OF SOUTHERN CALIFORNIA

Volume 1 Number 4 December 1996

THE ROCKING MICROTOME

A Precision Instrument Suitable for Amateur Construction

by A. Loro

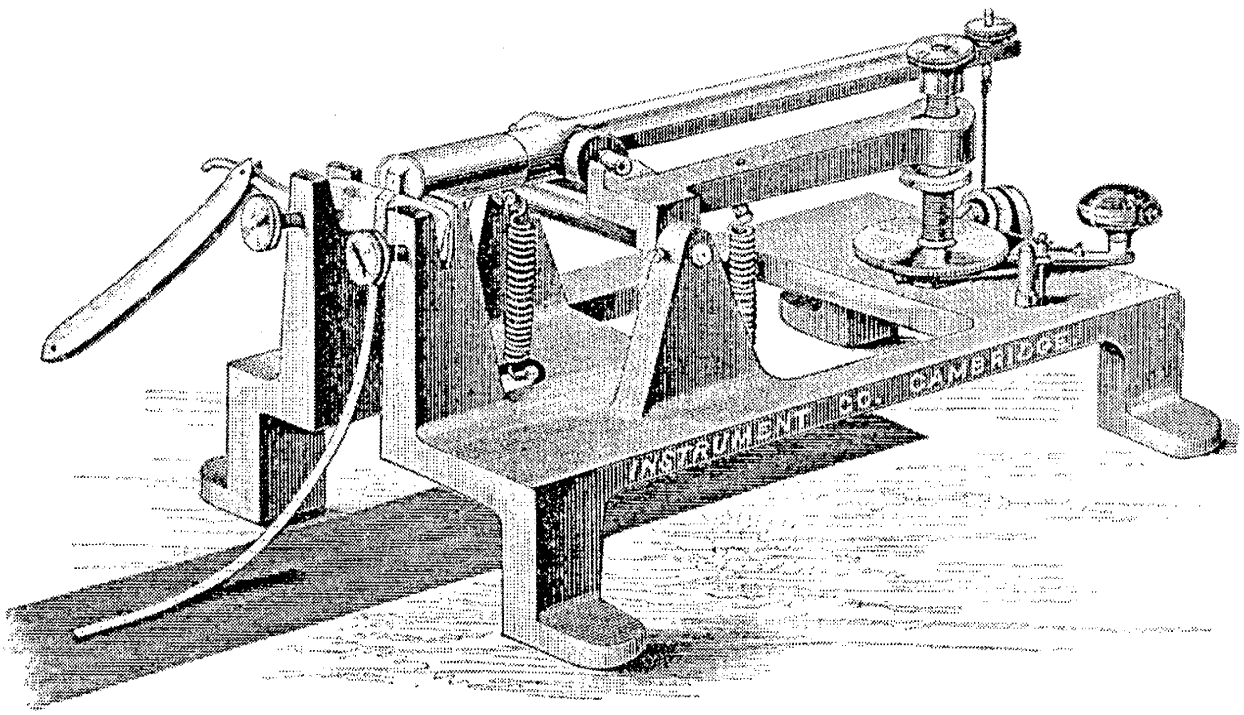

Fig 1. The Original Cambridge Rocking Microtome

Most microtomes rely on accurately machined ways and bearings to achieve the necessary precision to cut sections in the low micron range. The Cambridge Rocking Microtome, designed by Horace Darwin (son of the eminent Charles) in 1885, was a notable exception. It depended entirely on kinematic design principles which do not call for precise dimensional fit between components, only that they be held in contact during operation (Ref.1).

ROCKER DESIGN. Most details of the original Rocker construction are very readily seen in the old woodcut of fig.1 (Ref.2). The rocking arm (top) carries the embedded sample, mounted on it's end, past the fixed razor. A fixed axle on the rocking arm rests in two V- notches on the top of the feed arm casting. A second pair of V- notches on the underside of the feed arm casting rest on an axle firmly attached to the base casting. A feed screw, threaded through the end of the feed arm, rests it's lower end on a peg in the base casting. The assembly is held together simply by two return springs which pull down on the two arms.

The actuating lever, which is operated by swinging back and forth through a fixed arc, has attached to it a string which runs over a pulley. It pulls the far end of the rocking arm down to raise the sample above the razor and allows it to return by the action of the return spring for the cutting stroke. The lever, which pivots on the peg, also carries a pawl which engages a notched wheel on the feed screw, providing the necessary feed during each cycle. The length of engagement of the pawl, which controls the section thickness, can be adjusted by means of a cam which holds the pawl out of engagement when not required. I have never examined a Rocker first hand, so have to rely on published descriptions and pictures, which do not make it clear at exactly what stage of the cycle the feed occurs. Bracegirdle states that the 1900 version had provision for backing off the sample to clear the razor on the up stroke but gives no mechanical details (Ref.3).

The action of the feed screw is to lift the feed arm causing it to rotate on it's bearing thereby moving the rocking bearing towards the razor. Hence the thickness of the section is equal to the amount of screw feed times the reduction ratio of the feed arm i.e. the separation between the two bearing axes divided by the length of the feed arm, from rotation axis to feed screw.

The Cambridge Rocker has appeared in several versions throughout it's long service history but always preserving Darwin's design principles which resulted in high precision and rugged long life without need of precision of manufacture. It is reported that Darwin used to demonstrate these virtues by calling up raw castings from stock, assembling them with the springs and cutting sections with the unfinished microtome. It is known that many Rockers have been in constant use for 60 years (in 1954) without ever being overhauled or repaired and without loss of their original precision. I am sure there must be many still in use today.

Although originally designed to produce paraffin sections down to 2 microns it was eventually developed to cut sections of 0.025 microns for the electron microscope (Ref.4)

BUILDING A ROCKER. When I wanted to build a microtome, the Rocker seemed like the obvious choice. Experience has shown that it was a good one. The microtome I built (Figs.2 & 3) is just one of the many possible versions that combine the essential design features for high precision with the use of readily available materials. It is pointless for me to give exact dimensions and instructions since any do-it-yourselfer worth his salt is sure to come up with his own version, but a general description of what worked for me may be of some interest.

DESIGN DEVIATIONS. I elected to avoid the

MSSC BULLETIN

December 1996 Volume 1 Number 4

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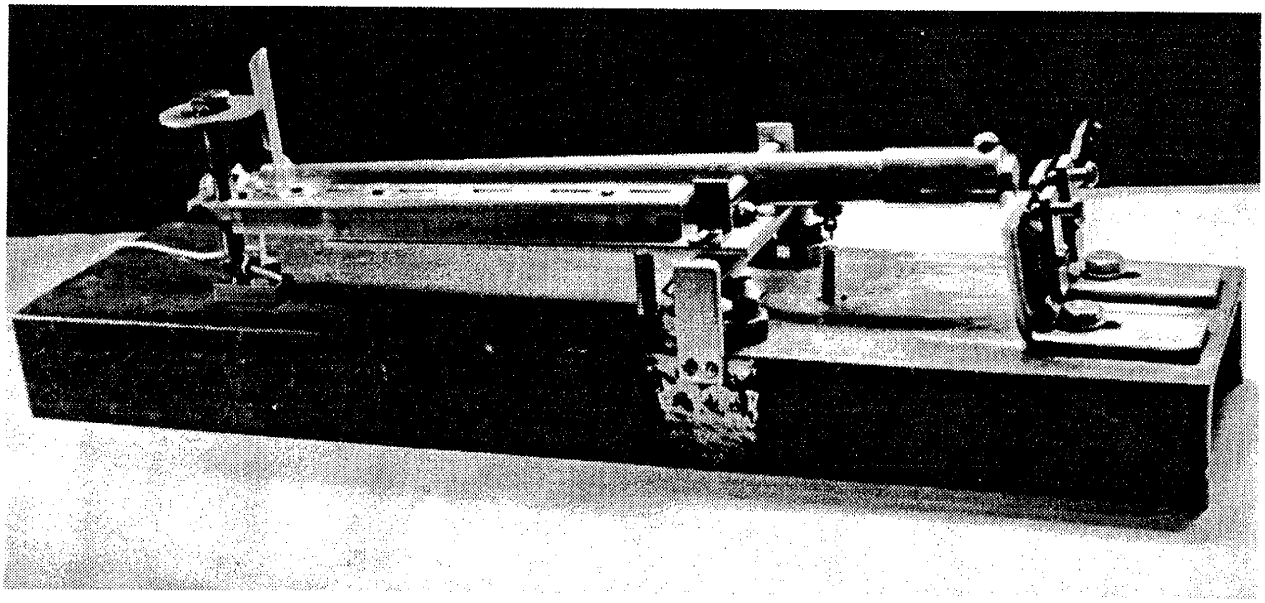

Fig. 2. My Rocking Microtome

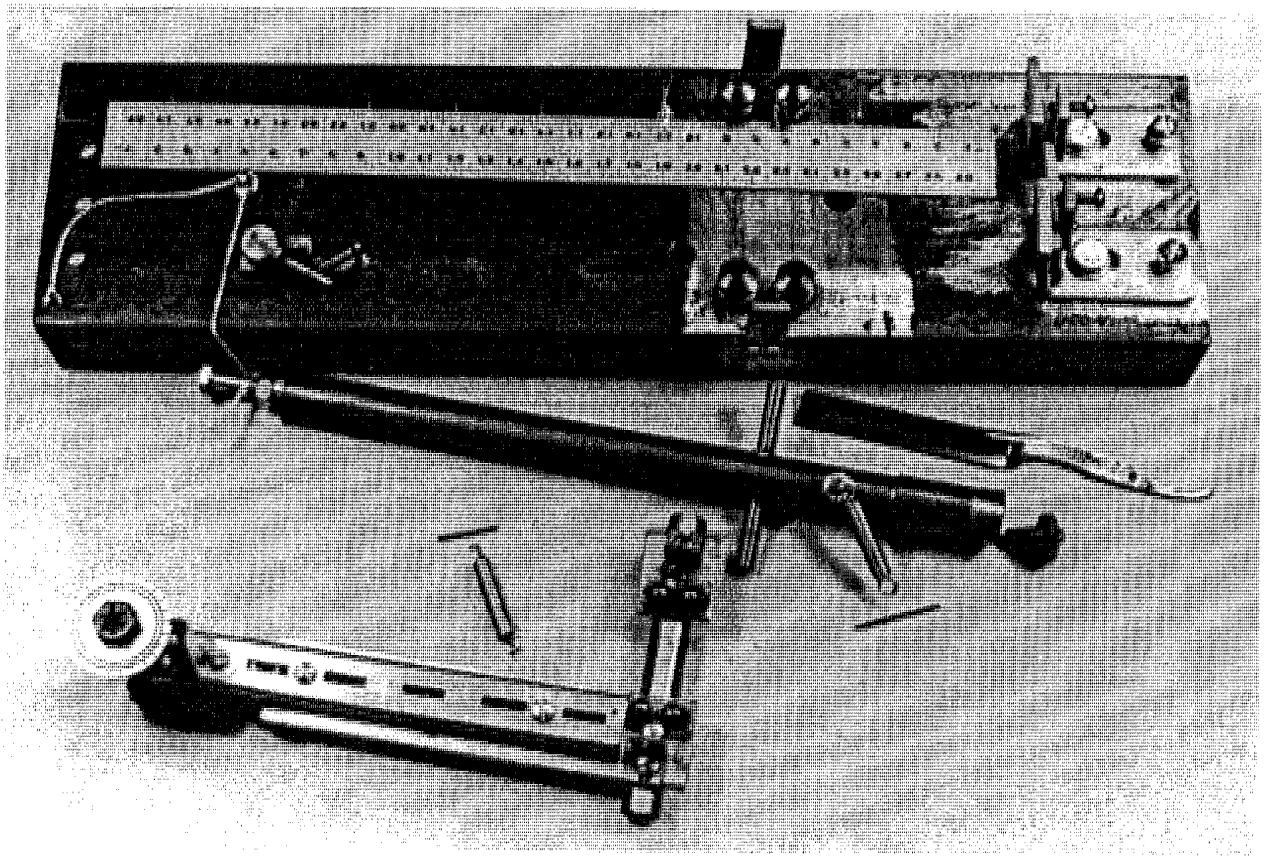

Fig. 3. The Components

mechanical complexity of the non-essential automatic feed. This somewhat slows operations but it still permits cutting of good serial sections in ribbon form (Fig.4). Operation is simply by hand pulling the string attached through an eyelet in the base to a bolt threaded into the end of the rocking arm. A knot in the string, which cannot pass the eyelet, and the bolt and locknut allow adjustment of the length of stroke.

I did put in a back-off mechanism used on the return stroke. The feed screw rests it's convex lower end on an anvil consisting of the lapped head of a similar bolt. The bolt head has a side lever, spring loaded against a solid stop. The anvil can be lowered by swinging the lever out about a quarter turn, thereby backing off the sample (Fig.5). I must admit that I have never checked whether this provides any real advantage but it gives me a warm feeling to know that the sample cannot wipe against. the razor on the return stroke.

Those essential 4 contact kinematic bearings which are the key to the precise operation of the rocker have been carefully preserved but in slightly different form. For the rocking arm, the axle is supported on 4 ball bearings soldered into holes in steel plates. The feed arm bearing (inverted with respect to the original) consists of an axle, firmly bolted to the arm, supported on 4 fixed bolt heads which have been filed to conical shape. In any kinematic 4 point support of a circular rod, the contact points should be 90• apart on the circumference.

This has been achieved by mounting the balls in holes centred root 2 times the combined radii (ball+rod) apart, and by filing the cones to a 45• slope. End stops for the axles are steel brackets which allow a few mils clearance for easy turning (i.e. they are not kinematic) and serve only to prevent the axles from gradual sideways drift. Any end play, is parallel to the cutting edge and does not affect the precision of sectioning.

MATERIALS AND METHODS

The base is a length of 4" U channel iron. The conical bearings are 5/16"NF bolts with lock nuts, filed to shape whilst rotating in a power drill. The rocking arm is rigid copper plumbing tube with brass end plugs and it's axle is 1/4" silver steel rod soldered in place.

The feed arm is made from pieces of steel mending plate (obtainable at any hardware store) extended with a length of U channel steel sold for book shelf supports. The holder for the flea market cutthroat razor is also made from mending plates. The additional screws (added after fig.2 was taken) provide some adjustment of the cutting angle whilst the main hold down bolt holes are slotted to give rough position adjustment.

The feed screw and back-off anvil are both 5/16NF (24TPI) machine bolts and run in threaded holes cut in pieces of 1/4" X 1/2" brass bar. The threads were lapped for precise fit in the following way. A standard steel nut was sawn through on one side so that it could be sprung tighter in a vise. It was first held lightly in the vise and the bolt worked back and forth through it with an oil slurry of fine carborundum (grade 600 I think; obtainable at hobby shops dealing in lapidary supplies). The nut was gradually tightened and the lapping continued until the bolt thread ran equally smoothly from end to end. The brass nuts were tapped by hand as nearly square as possible. They were sawn through at the ends and a tightening screw fitted (see fig.5). Each nut was then lapped with it's own bolt using household brass polish. After assembly the screws were adjusted to give a slight resistance to rotation and virtually zero sideways play.

PERFORMANCE. Optical interference measurements showed that the sample tracked with a precision of better than 0.2 microns during repeated rocking and back-off cycles (Ref.5). With the razor honed and stropped to a good edge and set at about 7 deg. cutting clearance angle, sectioning of paraffin embedded botanical samples was a breeze

And now for the unsolicited testimonial. I took a university course in Practical Plant Microtechnique which required the preparation of many botanical sections. After the first day, having fun with the university microtomes, I ran the rest of the course using only my rocker. The instructor was most impressed with the sections and declared them indistinguishable from those cut on the modern rotary microtomes.

It may look like a Victorian nightmare but it performs like a dream. Another triumph for Horace Darwin!

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Note: Reference 4 is highly recommended reading.

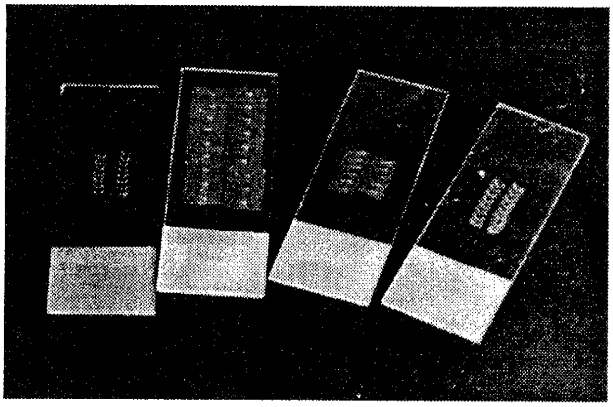


Fig. 4. Serial Sections Ready for Dewaxing

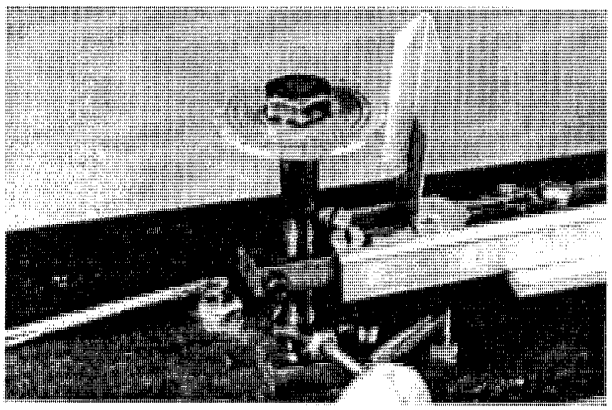
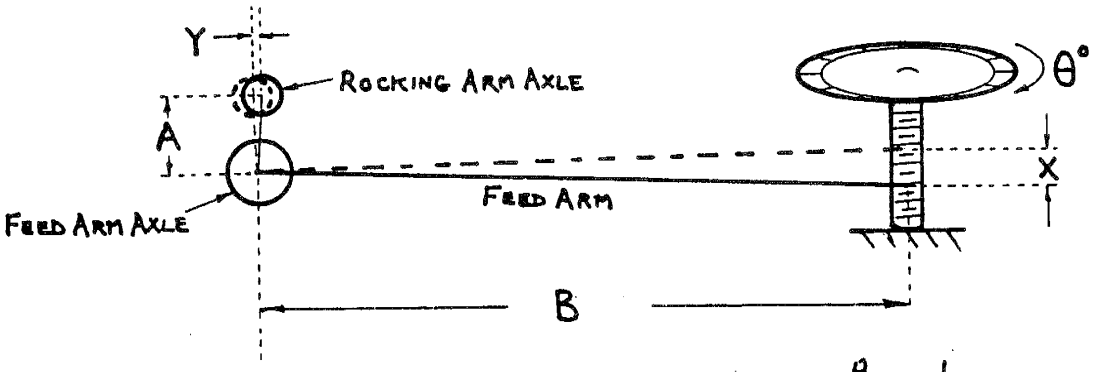


Fig. 5. Feed and Back-Off Mechanism

MICROTOME PARAMETERS



ROTATION OF FEED SCREW $\theta°$ RAISES FEED ARM $X = \frac{\theta}{360} \times \frac{1}{TPI}$

THIS FEEDS ROCKING BEARING TOWARDS RAZOR $Y = X\frac{A}{B} = \frac{\theta}{360} \times \frac{1}{TPI} \times \frac{A}{B}$ INCHES

$= \frac{\theta}{360} \times \frac{1}{TPI} \times \frac{A}{B} \times 25400$ MICRONS

	A	B	A/B	TPI	Y/DEGREE (MICRONS)
CAMBRIDGE	1.0"	6.25"	0.16	25	0.45
LORO	0.65"	6.50"	0.10	24	0.29

Some further comments in answer to questions.

My first sections cut were of colour film held in a microvise-like chuck. They were 3 and 4 microns thick which gave adequate visible colour in the various emulsion layers. My botanical sections, such as mitosis in root tips were 10 microns and up in order to include complete cells. I never have tried to push the lower limits but speaking from a firm base of ignorance I would think that factors such as sample type and preparation, wax formulation and temperature and knife edge angle, setting angle and quality of honing would all require careful optimisation before one could tax the mechanical precision of the machine.

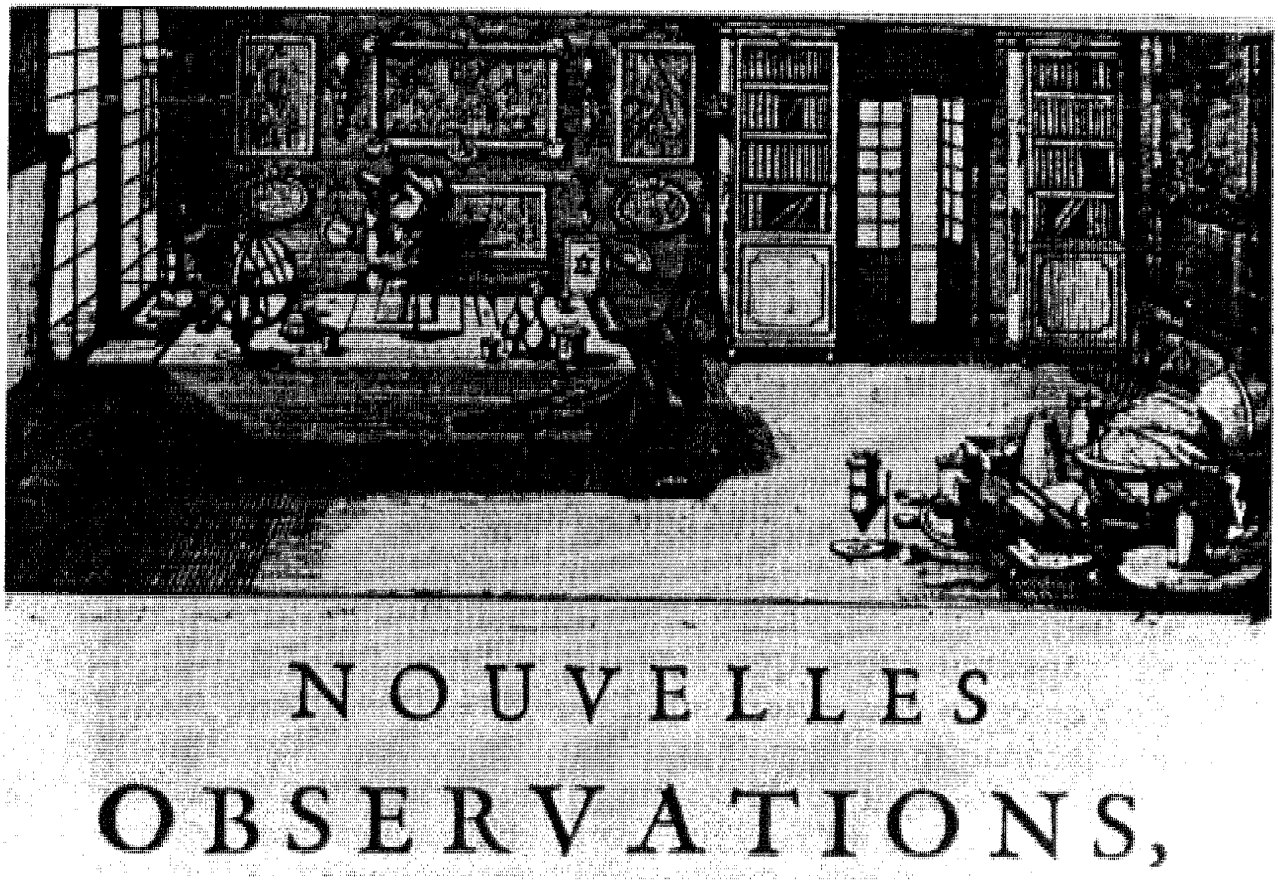
Four balls would certainly work very well as the bearing for the feed arm. The reason I used coned bolt heads was that I usually develop the design as I go along and early on I neither had the razor nor had designed a holder, so I hadn't much idea at what level the edge would be. The cone bearings give the option of adjusting levels at any time.

Book Review

JOBLOT: IN TRANSITION FROM 17TH TO 18TH CENTURY MICROSCOPY

by Norman H. Blitch

Our previous reviews of the microscopical literature were designed to provide information to microscopists who might wish to acquire books, usually current, for their own libraries. This review is the first of a new series that will concentrate on the earlier literature covering the classical development of microscopy. Included will be older (and sometimes rare) books that are not always available outside of specialized libraries.



Chapter Header from Part II of Joblot's "Plusieurs Nouveaux Microscopes" depicts a typical microscopist's laboratory in the 17th century

In 1860, when Dr. Edwin Lankester was preparing his final address as President of the Microscopical Society of London, he decided to review the microscopical literature that had been published in the two hundred years since formation of the Royal Society in 1660. He looked over the inventory of the holdings in the Library of the Society (See "Catalogue of the Books in the Library of the Microscopical Society of London" for the year 1859 as published in the Transactions of the Society, Volume VIII, 1860) and selected several works worthy of mention in his review.

The 17th Century authors and works chosen by Lankester included: the great scientific classic "Micrographia," by Robert Hooke (1635-1703); the works of Nehemiah Grew (1641
-1712) and Marcello Malpighi (1628-1694) on the anatomy of plants, which established the science of plant physiology; the communications of Antonii Van Leeuwenhoek (1632-1723), with "an astonishing variety of observations on animal and vegetable structures"; and finally the work of the great microscopist and engraver, Jan Swammerdam (1637-1680).

Dr. Lankester could have mentioned other contemporaries, notable omissions being Athanasius Kircher (1602-1680), a Jesuit priest who was probably the first to employ microscopy in the practice of medicine and who was able to discern "little worms " associated with infectious diseases; and Fillipo Bonanni (1638-1725), who gave us rack-and-pinion focussing, a compound sub-stage condenser with focussing, the spring stage and the "slider," all of which were depicted in his 1691 treatise, "Observationes Circa Viventia." His large horizontal microscope was perhaps the most innovative microscope of the 17th Century.

Bonanni was well acquainted with the work of Boyle, Borelli, Kircher, Malpighi and Swammerdam. He was never reluctant to copy illustrations from the work of others, in particular from Hooke's "Micrographia." (As a footnote, it should be mentioned that this practice continued well into the 19th Century. A particularly egregious example was Wythes' 1851 " The Microscopist," a contender for the title of first book on microscopy published in the United States. It is almost entirely plagiarized from various English authors). The Hooke Louse as re-engraved by Bonanni (Fig. 7) is typical.

Louis Joblot (1645-1723) was a 17th Century French microscopist whose chief work, "Descriptions et Usages de Plusieurs Nouveaux Microscopes," was published in the 18th Century (1718), and established him as the first French microscopist. The second edition followed posthumously in 1755, and repeated his instrument designs as well as publishing for the first time many of the microscopical observations completed before his death. The work is an exceptional summary of the state of French microscopical design, which was to remain unchallenged for almost half a century. It also reflects the pioneering studies of protozoa which followed upon his original work on nematodes. His drawings of protozoa, unlike his drawings of microscope designs, were unfortunately afflicted with the lumpiness typical of such depictions at the time. As for the microscope designs, Disney (1928) points out that the ornate decorations added to Joblot's designs do not appear in Joblot's depictions. One can only speculate whether the baroque ornamentation was added at the time of manufacture, which Joblot says was carried out by Le Febvre. (Fig. 3)

The plates: Part I contains 22 full page plates of single lens and compound microscope design and are superbly drawn. There are a few oddities; reposing on the stage of Joblot's "Porte Loupe" is a small dragon-like creature which appears to be alive but unhappy (it is referred to by the author as "very remarkable"). The lens of this simple microscope is supported above the stage by "Musschenbroek Nuts." (Fig.1 and Fig. 2)

Part II presents 12 full page plates of various members of the nematode and protozoa families, including "vinegar eels" that are complete with heads and mouths like snakes. These observations, by the way, were made in 1680 and we must allow for a bit of visual embellishment. There is also at least one six-legged insect complete with a very human face on its back. (Figs. 4-6)

We must conclude, however, that in spite of the whimsey, Joblot's work deserves to be included with that of other early microscopists and that he was indeed a worthy transitional figure between the microscopical state-of-the-art of the 17th and 18th centuries.

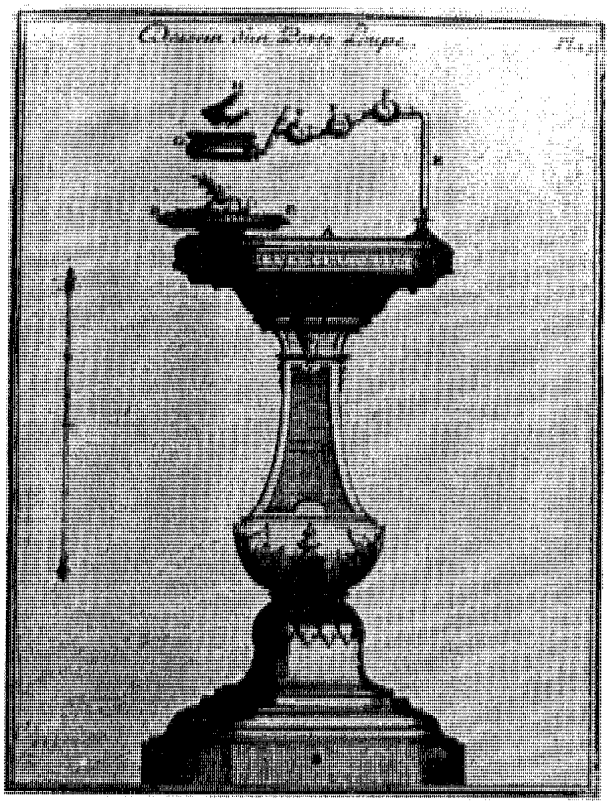


Fig. 1 Joblot - A Design for a "Porte Loupe"

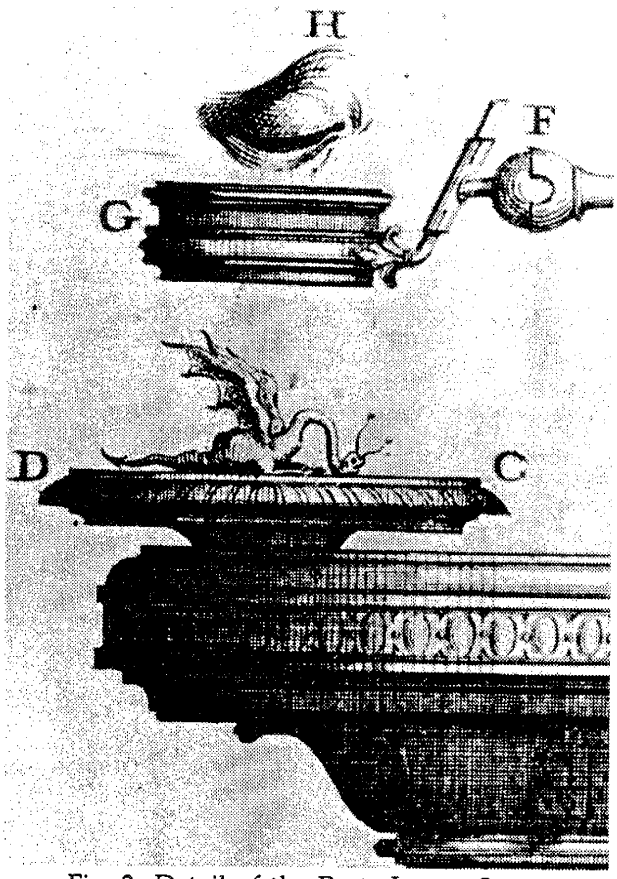


Fig. 2 Detail of the Porte Loupe Stage

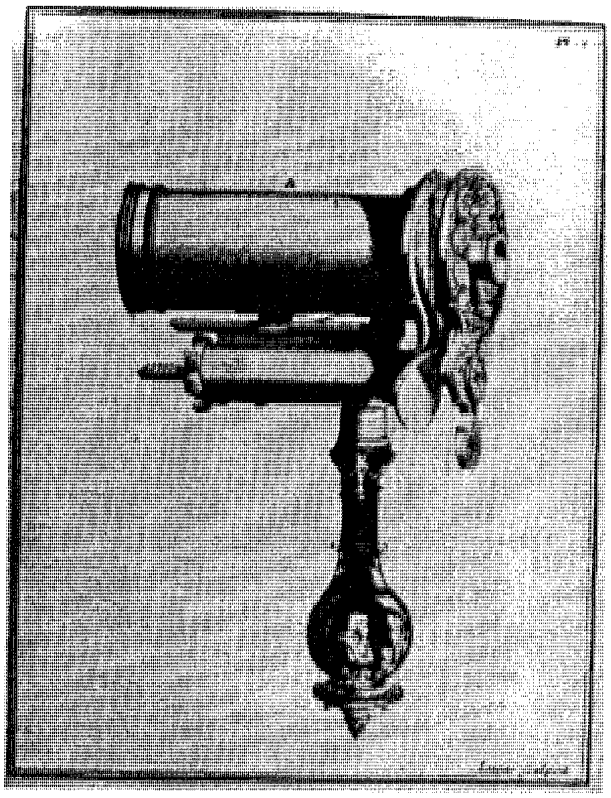


Fig. 3 Joblot's Plate 1 - Drawing of one of his microscopes

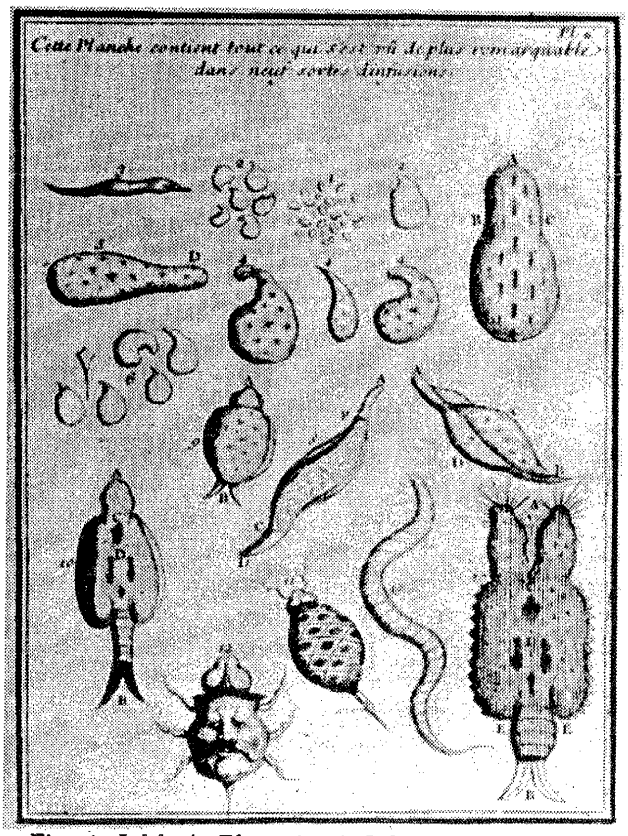


Fig. 4 Joblot's Plate 6 - A Selection from his Best Nine Diffusions

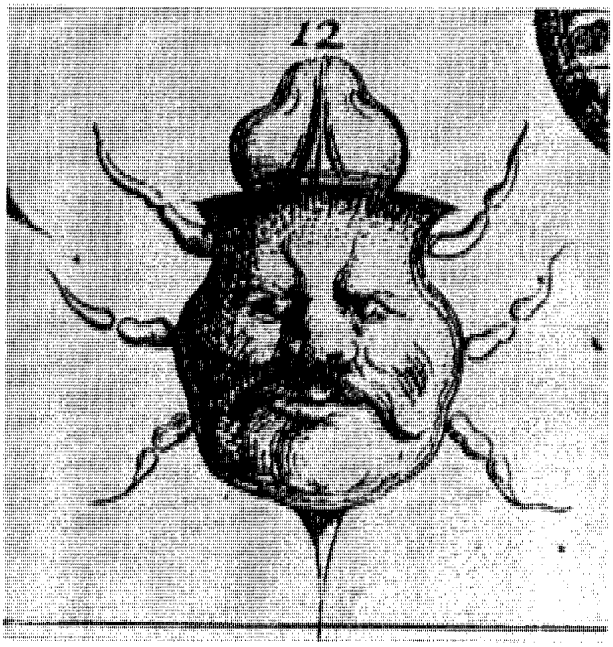


Fig. 5 Joblot: A Very Remarkable Insect

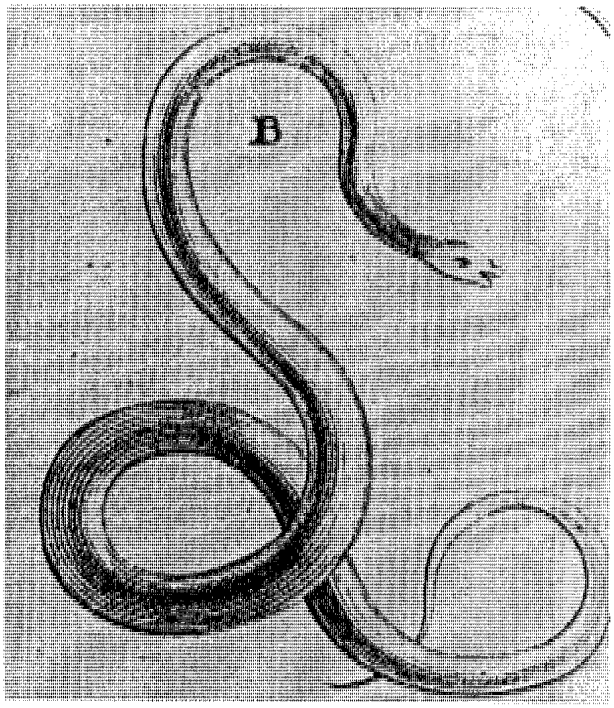


Fig. 6 Joblot's Vinegar Eel

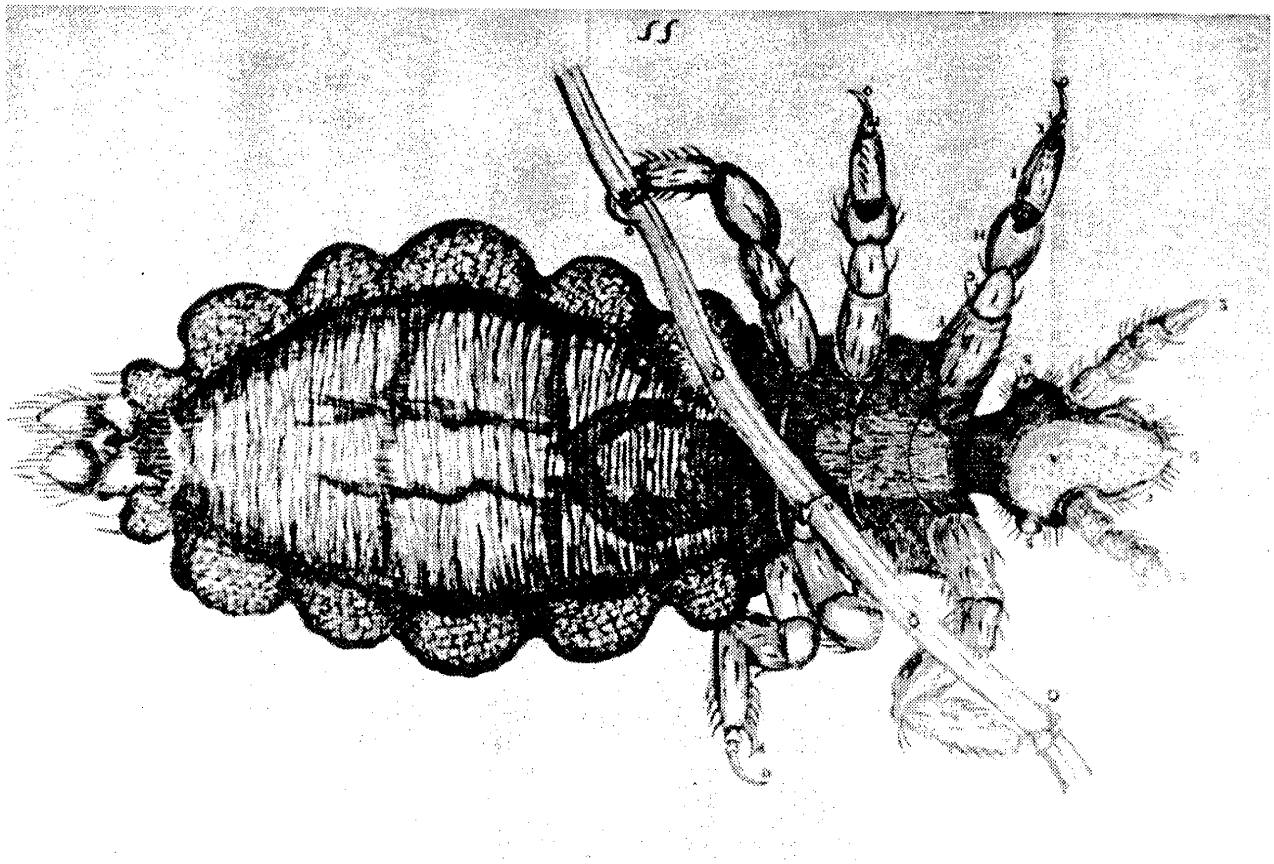
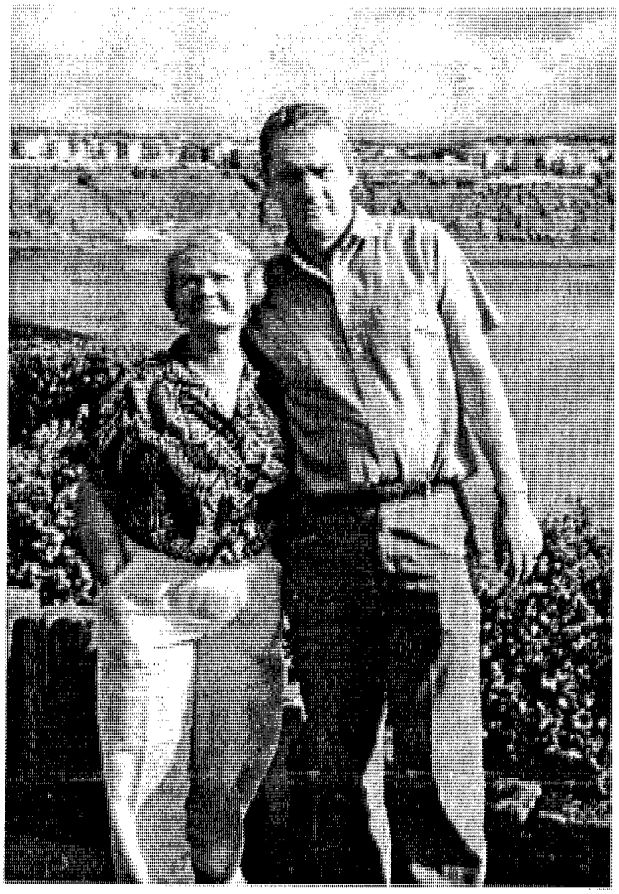


Fig. 7 Bonanni's Engraving of Hooke's Louse

KLAUS KEMP'S VISIT

by John Field



John and Sheila Kemp
photograph by James Solliday

This corresponding member would like to report to the club that from my perspective, Klaus Kemp 's visit was a great success. Many of you know this was Klaus' first trip to the U.S.A., and he very much enjoyed himself the week he spent in California. I took him to the California Academy of Science, where he discussed very fine points of diatom anatomy with the career Diatomists there, and all enjoyed this meeting of strangers with deep common interest. We went to the Monterey Bay aquarium, and Klaus will soon be getting some of their bay water filtrate, and hopes to make them a type slide of Monterey Bay Diatoms. Jim Solliday took Klaus climbing for diatom deposits in the coastal hills, and gave Klaus a real scare on one high, narrow trail, muddy in the rain - is there any limit to the risks taken in pursuit of new forms of Diatoms? I took Klaus to some quiet stagnant water, where he happily scooped up some of the brown scum on top, hoping for uncommon forms.

As nearly as I can tell, for all concerned, this was a fine time.

I did mention that Klaus was born in Berlin, in 1937, which led to a rough childhood, losing his father early, and moving with his mother to Czechoslovakia, then after the war he was an East European child, crossing to the West as a boy, at real risk of being shot, and all alone at that, then going to England with his mother, who married a British Citizen. England was not easy, at first, on a German speaking boy in the first years after the war, but Klaus has made England his home ever since, and has a good North England accent (his first home there), though now he lives in the West of England, near Bristol, and near Wales. The exams which determine a child's educational track were given to him after just a year in England, while he was still not adept with the language, so he did not manage the "academic" pathway, and after school, took a position with Flatters and Garnett, which proved a wonderful education for him into natural science, and, after he learned of them, into Diatoms. It was here, too, that he met his wife, and life's best friend, Sheila, through her brother, who worked with Klaus. They were married after an eight year courtship, and remain a most happy, cheerful and loving pair. It may be that this trip, which included their first small plane experience (from San Jose to Los Angeles), has finally eased Sheila's fear of flying - she loved the small airplane ride!

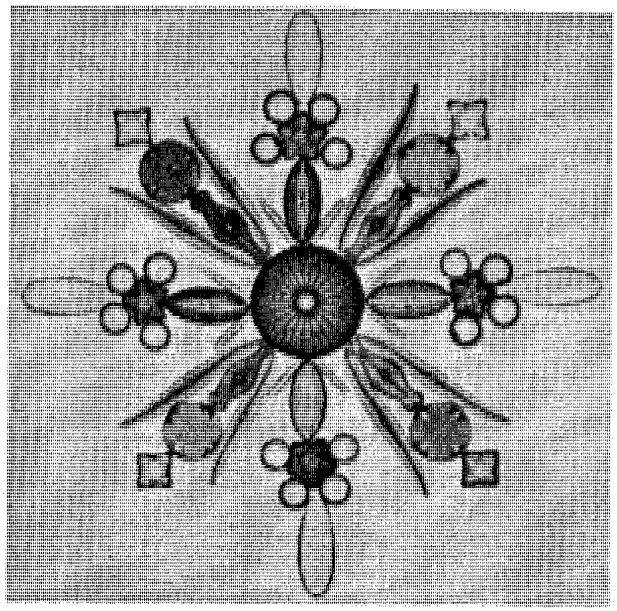
Diatoms were part of Klaus's work, at the naturalists store, but as soon as he "discovered" them, they also became a passion, which he studied with great, and continuing diligence. Though a very serious diatomist and Taxonomist, he began his artistic arrangements first to type slides, then, just for fun, making artistic arrangements - and gradually gaining confidence. Several friends who admired his work, and asked him to make slides of subjects of interest to them, kept encouraging him to make more and more complex arrangements, and we have nearly all seen how his work is now fully on a par with the great arrangers of the past. It was also at the urging of friends that he began to make arrangements of butterfly scales - and in the few years he has been doing that, I have seen him develop into a breathtakingly good artist with that work as well. He is considering several other avenues of micro-arranged art, which is very exciting to me.
I greatly treasure the slides Klaus has made for me, and I know that to all those who have any appreciation of this subject, we have had the privilege of seeing, enjoying, and purchasing works by the greatest arranger of the 20th, and most likely, the 21st Centuries. Just as anyone can buy paint and canvas, but relatively few really upgrade the canvas with their paint - so we all can clean, and mount diatoms; and as we watch Klaus push them so apparently easily into perfectly formed work, it does look easy - most great artists, and athletes, and actors, etc. make their work look easy - it is not!

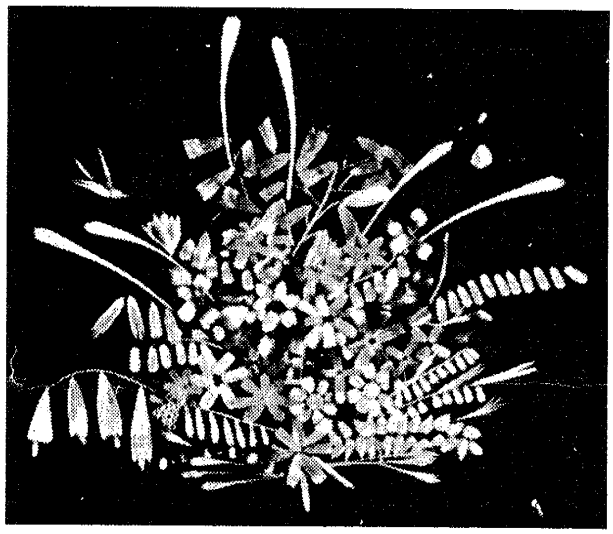
For many years, Klaus has spent over half his waking hours, working with one relatively simple Russian microscope, with his home-made diatom mounting "finger". Many, if not most, of us possess many far more elaborate, expensive, and perfect microscopes, - it is very impressive, I think, to see a man do so much with so little. This is no suggestion that it is wrong for us to collect, restore, admire and love fine instruments of the recent and far past - far from it - if we did not, many would be lost to the future ; however, we ought, honestly to give very great admiration to people who do so much good work, with so little in the way of tools. This, by the way, has been true since the beginning of microscope, for while Brian Ford points out that Leeuwenhoek's instruments were very impressive optically, they were unadorned simple lenses in simple holders, with apertures and object pins. Many great discoveries since have been made with simple equipment - one is again humbled to see the modest tools of Pasteur, Darwin, and other names never to be forgotten. Part of my enjoyment of Klaus' work is in this spirit.

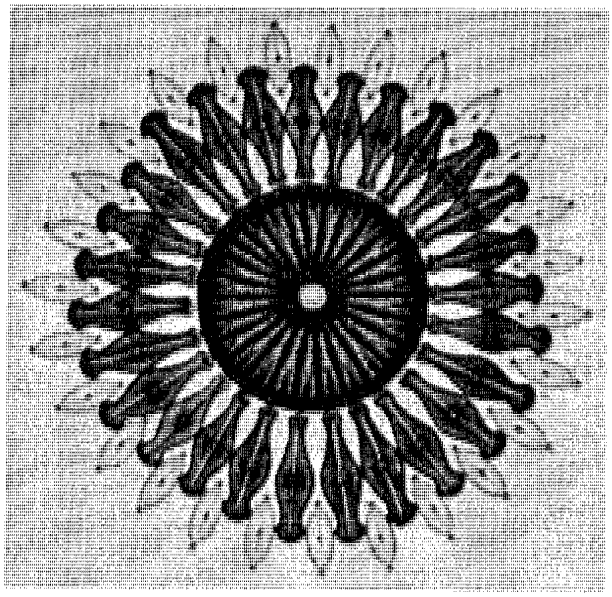
I thank all the members who came to show interest in this work, and thank, verymuch, those who contributed to the tickets to bring Klaus and Sheila here from Philadelphia.

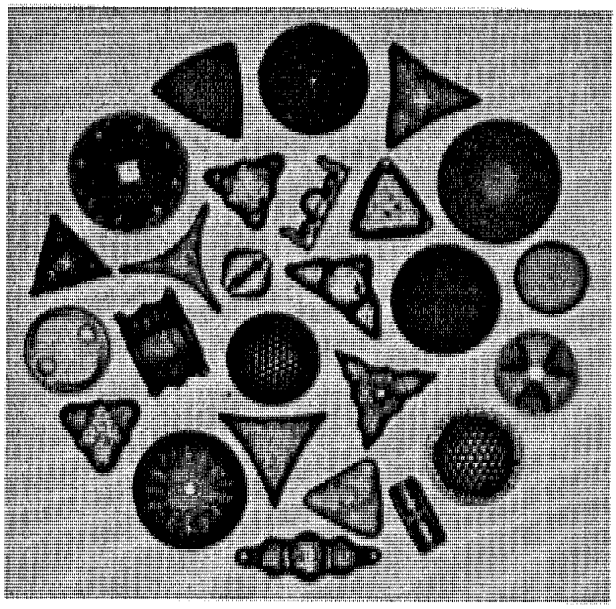
Sincerely

John Field









Three diatom arrangements and one butterfly scale arrangement by Klaus Kemp

Photographs by Leo Milan

WORKSHOP of the Microscopical Society of Southern California

by: George G. Vitt, Jr.
Date: Saturday, 7 December 1996
Location: Steve Craig's Lab, 22 persons attended.

1. The group observed a moment of silent meditation in commemoration of Pearl Harbor and the first day of America's entering World War II.

2. **George Vitt** displayed a complete kit of a children's microscope made by LOMO in St. Petersburg,, Russia. This diminutive microscope features a 3-objective turret, a 15-30X zoom eyepiece and a removable double-mirrored projection screen with integral hood. Substage illumination is provided by a standard type-of plane mirror, the back side of which contains a lensed penlight bulb powered by two AA cells located in the hollow foot of the microscope. The bulb is activated when this assembly is brought to the correct position. The kit contains several prepared slides, blank slides, cover glasses, balsam, eggs of artemia saline sea salt crystals for making a 0.9% solution, a plastic incubator for hatching and raising, and an instruction booklet. The microscope. was presented to George by the 11 and 14 year old daughters of his niece, Katherine, who recently immigrated to the USA.

3. **Steve Craig** described the show that would be presented at the MSSC Christmas party on 8 December. Jim Solliday plans to show slides that he had prepared illustrating the early history of the Society, its early founders and members - along with Jim's photomicrographs of the crystal slides that had been prepared by them. This would be followed by some spectacular color photomicro-cinematography, under polarized light, of actual crystal growth that Steve had done some years ago.

4. **Richard Jefts** showed reproductions from the book *The Leeuwenhoeck Letter, by* Barnett Cohen, Soc. of American Bacteriologists, Baltimore, MD; 1937. On 9 October 1676, Leeuwenhoeck had sent his text, along with an English translation, to the President of the Royal Society, London. It is important because it describes bacteria for the first time, and makes allusion to a method of enhancing resolution, which may indicate that he had discovered the use of dark field illumination. The book includes photomicrographs taken through a reproduction microscope. of his, showing diatoms, staphylococcus, and a diffraction plate of Norbert.

5. **Fred Hantsch** showed a copy *of Advanced Imaging* magazine with an article on CCD video cameras

6. **Dave Hirsch** stated that the Venice Oceanarium project, which had been started by MSSC member **Tim Rudnick,** had been written up in the *Evening Outlook* newspaper. He then showed a cased, unmarked dissecting microscope. with helical focus.

7. **Jim Solliday** gave a synopsis of his research into the early history of the Society. He then showed *an American Histological Microscope* c.1885-1888 by Zentmayer of Philadelphia. The instrument features a very sturdy brass conical pillar which is a hallmark of this model.

8. **Stuart Warter** displayed a *Centennial Model* microscope. made by Zentmayer in 1876 for the Philadelphia Centennial Exhibition. He also showed Zentmayer's *American Columbia Model* microscope. made during 1895-1897 for the Columbia Exhibition. This featured an unusual design of a right angle prism within the upper part of the body tube, which directed the light horizontally to the eyepiece, enabling convenient viewing. Stuart also showed a small cased portable French microscope signed *''Jos. Amadeo"* (1854-1862), which had been widely exported from France. It features a geared focus and a fine focus which moves the stage, somewhat like the drum microscopes. of the 1840s.

9. **Ken Gregory** distributed glass capillary tubes that are suitable for making the extremely fine filament-like probes for the type of micro manipulator used by Klaus Kemp in making his arranged diatom slides.

10. **Leo Milan** told how he identified the various diatom species, in the arranged PMS diatom slides of Klaus Kemp, by making reference to the book *Atlas of Diatoms of Great Britain.* Leo then displayed a marvelous Chinese "Cricket Box" (gotten on a recent trip to China) which contained two model crickets which chirped their distinct electronic calls whenever the lid was opened. Leo also showed a spectacular enlarged 'portrait' photo of himself reflected many times in the mirrors of a stateroom aboard the ship that transported him up the Yangtze River.

11. **Ed Jones** reported that his forensic lab is about to get an SEM and showed some SEM photomicrographs of samples taken in the ''environmental mode", i.e., of non-coated specimens.

12. **John De Haas** displayed two fine microscopes: The first was a 1924 B&L "CAS Microscope" that he had restored some 10 years ago. It features a large body

tube and four APO objectives in revolving turret. The second was a very finely constructed and finished 1940s microscope by Officine Galileo, Italy. It featured an inclined binocular head, and a graduated revolving stage with an integral Tolles-type graduated x-y stage, having the y- movement dovetail flush with the surface of the rotating stage, and a double-cone type of fine focus adjustment. The entire head and substage complement of parts are designed to be quickly removable. The workmanship and finish were of the best quality. John also passed out a list of B&L microscope serial numbers and their years of manufacture.

13. **Gaylord Moss** exhibited a newly acquired excellent slide storage cabinet (about 8x8x10") containing a multitude of shallow aluminum drawers which hold the slides in a horizontal position, facilitating the reading of labels. Gaylord had refinished the fine white oak cabinet with Minwax polyurethane varnish containing a maple stain, which produced superb results and gave a rich uniform coloration. Gaylord then demonstrated his *Workmate* Stand by Black and Decker, obtained from True Value Hardware for a most reasonable price of $59 . This handy, practical, foldable work stand, invented by an Englishman, can hold any conceivable shape of workpiece in a multiplicity of positions while being worked by hand or machine tools. He then passed out, as freebies some excellent rubber latex gloves that have been especially treated so that they can be slipped on the hands with the greatest of ease. There followed a general discussion on the preservation of rubber gloves, which concluded that storing such gloves in a freezer lengthened their life immeasurably. Hermetically sealing them in a glass jar was also suggested.

14. **Larry Albright** passed out maps to his home, where the Society's Christmas party would he held the following day, starting at 4pm. Please read Dave Hirsch's report on this extraordinarily fine party which abounded in good fellowship and conversation, great food and drink, and the cozy warm atmosphere emanating from our gracious hosts, Larry and Helen.

15. **Gary Legel** demonstrated a very practical microscope illuminator that he had constructed. It consisted of a helical "flex-arm" attached to an A/O variable voltage transformer and, at the top, with an anodized aluminum lamp housing with a low-voltage lamp and focusable condenser lens.

16. **Ron Morris** reported that he had ordered from England a micro slide cabinet that holds 1,000 slides, and that he has been working on the DVD (digital video disk) project as well as the Kodak read/write CD ROM project.

17. **Bill Hudson** showed a most interesting book on microscopy, which he had recently unearthed at a garage sale - *Le Chambre Noir et le Microscope, Photomicrographie Pratique,* by Jules Girard, Paris, F. SAVY, 1870. This small leather bound volume, in fine condition, showed many illustrations of various apparatus setups and arrangements, and many detailed photomicrographs.

18. **Jerry Bernstein** expressed his heartfelt thanks and appreciation for being a member of the MSSC. We were all touched and grateful for Jerry's sincere and warm sentiments.

19. **Steve Craig** started a discussion on **Stan Baird's** diverse and excellent stereo techniques and apparatus. **George Vitt** recalled a spectacular stereo slide of Stan's of the LA Civic Center at twilight - taken from a hilltop, several miles SE of the Center, using a 200mm lens, and an "interpupillary distance" of about 20-feet,

We all thank **Steve and Millie Craig** for their boundless hospitality and the coffee and goodies served during the workshop. After the meeting, 9 members met at Coco's for lunch and more conversation.

MEMBER PROFILE

Bert Loro

Bert and Freda Loro

I think I discovered aeroplanes even before I discovered microscopes. When I was seven my parents moved from SW to NW London and I was delighted to find that from my bedroom window I could see the old biplane fighters almost touch down at Hendon RAF airfield. Every year they put on a major public air display and at the last one before the war, in 1936, I gazed in awe as the prototypes of the RAF's first monoplane fighters, the Spitfire and Hurricane, roared across at over 300 mph. In my wildest dreams I would never have guessed that in a few years I would have flown them both.

When war came I was just finishing high school and I went to work in Kodak's paper testing laboratory at their works at Harrow. There I received a thorough grounding in photographic theory and practice which has stood me in good stead throughout the years. Life became quite hectic as London began to take a pounding from the Luftwaffe. Often air raids were in progress whilst I travelled to and from work. The famous photograph of St. Paul's Cathedral standing defiantly amidst the smoke and flames was printed first in our darkrooms, the morning after the raid.

When I was old enough I joined the RAF and was whisked away to S. Rhodesia (Zimbabwe) to train. Then off to Palestine (Israel) for operational training on, you guessed it, Spitfires and Hurricanes!

I joined a Hurricane squadron in Assam just as the allies had begun to reverse the long series of retreats that followed the fall of Hongkong and Singapore. After Burma was retaken and as the monsoon threatened to turn our temporary paddyfield strips into swamps, the squadron was withdrawn to S. India to re-equip with P47 Thunderbolts and train for the assault on Malaysia.

As training progressed and we were given some idea of what was expected of us, we became increasingly uneasy and wondered if our commanders had, like Noel Coward's mad dogs and Englishmen, been out in the noonday sun a little too long. Our role was to give close support to a combined ops landing located at the limit of our range and the only hope of landing again was if the surface forces had captured a suitable airstrip before we ran out of fuel. If not, "you may have to bail out over the sea and the navy will try to pick you up. Watch out for sharks and good luck chaps!" Small wonder that when the war came to an abrupt end we went on a wild four day alcoholic binge. Even now I have strangely mixed feelings whenever I think about THE BOMB.

After the war, I returned to Kodak Research Labs but the very modest salary they paid convinced me that I sorely needed some professional qualification if I was ever to rise above lab technician. So I acquired a degree in chemistry with the aid of an ex-service grant, but just one year working as an analytical chemist proved to me that chemistry was not my forte. However I never regretted having studied chemistry which proved to be very good groundwork for a career in the process side of micro-electronics.

I met my wife Freda, a local girl from Hendon, in 1953 and we were married early the next year. Just over three years later I got a job with Northern Electric (now Northern Telecom) and we emigrated to Canada. The Canadian air (or the long eastern winters!) must have agreed with us because we soon had a family of two boys and two girls. In 1985, when I retired from Northern Telecom after spending most of my career at the microscope, we came to the beautiful west coast, found a nice bungalow and settled down to enjoy our hobbies: microscopy and gardening for me and embroidery and fiendish word puzzles for Freda.

During my time in high technology I managed to collect 28 patents. Like the vast majority of patents, these never made a dollar directly for my employers. These were just so much make-weight in intercompany wheeling and dealing. But my last patent was my own personal thing. I succeeded in making plastic components which worked like the quartz prisms of DIC and decided to go ahead, with the aid of a retired patent agent friend, to try for a patent. We wrote a great application with one broad basic claim and 21 dependent claims. The examiner rejected claim 1,

Continued on Page 73

1996 MSSC CHRISTMAS PARTY

by Dave Hirsch

An unprecedented spirit of tension-free conviviality highlighted our first 'official' MICROSCOPICAL SOCIETY OF SOUTHERN CALIFORNIA Christmas party on Sunday, December 8, 1996. With more than sixty people in attendance, this memorable bash took place at the home of the Helen and Larry Albright in the rustic setting of Mandeville Canyon. Unlike Christmas parties of the past, more wives and other members of the distaff side were in attendance. For all of our members and guests who travelled great distances in past years, the conveniently located Albright residence was a godsend.

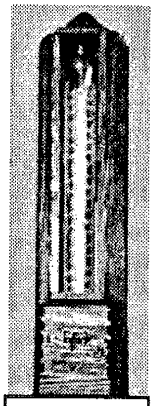
As in past years, Beverly Black, ably assisted by parents Steve and Millie Craig, and Helen Albright provided the delicious and ample hors d'oeuvres, plus the bountiful and savory main feast. The traditional contributions of the members, consisting of sinfully rich and mouth watering desserts that followed, tested to the limit the gustatory disciplines of both dieters and trenchermen in attendance.

Most significant, was the fact that unlike in previous years, almost all of the attendees remained after the meal to hear the speakers of the evening; Jim Solliday and Steve Craig. Jim's talk was in two parts. The first part dealt with an in-depth history of the Los Angeles Microscopical Society which proved without a doubt that at its onset, LAMS was a dynamic, innovative and efficiently run Society. Our rebirth as The Microscopical Society of Southern California will re-establish that society which, once again, has become a Society of, by, and for the members.

The second part of Jim's presentation was a slide show based on the work of an esteemed member, the late Bill Sokol. A series of Bill's photomicrographs of various crystalline substances were prepared in the form of transparencies, skilfully edited by Jim and augmented by a dramatic musical score.

Immediately following Jim's presentation was a video prepared by Steve Craig. He showed scenes based on the formation of crystals. These were organic compounds under cover glass heated to melt the compound which then crystallized under Steve's controlled cooling to exhibit the dynamic motion of crystal growth. Steve photographed this motion with a Kodak CINE SPECIAL 16 mm movie camera setup. In cases where the crystal growth was very slow, Steve used time lapse photography. In other cases, it was remarkable how quickly the growth occurred in real time.

The Albright home provided an exciting mix of "Show and Tell" material. Most noticable, was the stock-in-trade of Larry's business; an 'electrifying' array of high voltage discharge devices. Strategically located throughout the area,were transparent spheres. From the center to the inner surfaces of each sphere appeared numerous lightning strikes in miniature. Several other novel gaseous discharge devices, some with sinuous constantly changing electric arcs, all creations of Larry's, were in evidence. A number of masks and carvings of Balinese origin added to the decor. The eclectic array included several Victorian era brass microscopes as well as the laboratory filled with working microscopes and related paraphenalia.



Tall Bubbler High Voltage Display by Larry Albright

We thank Helen and Larry for hosting our first MSSC Christmas Party. We also thank our members and guests for being there to make this important affair a great and memorable success.

Bert Loro Profile - Continued from page 72

thereby also rejecting all dependent claims. My friend was quite unfazed by this. He looked it over carefully, changed one word from plural to singular and resubmitted the application. It came back with all 22 claims allowed. But you can't win 'em all. When the patent finally issued, the inventor's name appeared as Albert Lord!

This one also never made a cent. Despite an impressive demonstration of DIC, I could never equal the image quality given by quartz prisms. But it was fun trying.

When it comes to microscopes I have always been something of a 'glass and brass' man. My main interests have been image contrast enhancement (dark field, phase, DIC, modulation contrast etc) and micro-interferometry though I have also dabbled in many other areas. Since 1975 I have also been interested in antique microscopes but collecting is a very slow hobby in Canada. The result is that I now have several nice stands and an eclectic assortment of microscopical junk. I have had more success in putting together a modest microscopical library.

I have been a member of the Quekett since 1950 (except for a small lapse from 1957 to 1980 after emigrating!) and have had a number of papers published in their journal. I was a member of LAMS from 1991 and of the PMS since 1994. I greatly appreciate the opportunity to be a member of the MSSC. I am confident it has a great future.

BREAK THROUGH ?

Cross Hills Naturalists' Society- Microscope Group

by Douglas T. Richardson
Postal Microscopical Society - England

A perennial problem facing societies is ageing of members and dwindling numbers. Over the last decade or so there have been many discussions and inter-society conferences devoted to the problem of how to attract new and, in particular, younger members. Experience shows that despite the efforts which have been made, nothing of substance has emerged.

A chance introduction in 1994 to sell off surplus equipment by the Open University(OU) has reversed our Society's fortunes. I purchased a number of x20 stereoscopic dissecting microscopes from the OU and laid on a demonstration at the Society's 90th celebration in September 1994. The end result was 20 members bought microscopes and with the blessing of the Society we set up a 'Microscope Group'. Six adults and two children attended our first meeting in March 1995. Numbers have steadily increased and it is now not uncommon to find 24 members at a meeting, 8 of which can be children aged 8 to 14 years.

We have a central theme for each meeting the choice of subject matter being left to the children who also give a report at the Society's AGM and put on practical demonstrations at member's evenings. So far we have looked at, amongst other things, pond life, seeds, insects, minerals, owl pellets and sands.

Slide making is limited to mounting on 3" x 1" card slips, glass slides and their associated problems will follow when the time is ripe. Some themes are introduced/enhanced by means of short talks and 35mm slide shows.

For the time being we are sticking to the simple OU microscope and thereby avoiding the possibility of the 'wish I had one like that' syndrome.

Thanks to the generosity of a Society member we have been able to purchase two microscopes and lamps and are able to bridge the gap for those who wish 'to have a go' before buying an instrument of their own.

The arrangement has one major advantage; it allows parents to participate. This means that younger people are being drawn into the Society. Hopefully they will, in the fullness of time, take over administrative responsibilities, sow the seeds which will enable their protege to follow in their footsteps and, last but not least, bring the fascination associated with microscopy to the next generation at a very early age.

It is hoped that the lessons learned from this venture can be adapted and be of use to others. Our reputation is spreading and we have already had observers from other societies coming along to see what we are up to and how we do things. Copies of "Balsam Post" are being circulated and, given time, I am sure the PMS will benefit. Success of the venture can be attributed to three things:

1. Availability of low cost uncomplicated equipment.
2. A very understanding Society Committee.
3. People willing to put in more than their share of effort in organising things.

Reprinted from The Balsam Post: Issue No. 33. October 1996.

MENTORING

In the November regular meeting at which Klaus Kemp demonstrated his superb arranging techniques, Klaus started his presentation by looking out at the membership audience and remarking that he saw no younger members. He said that this was also a problem in England in that children are not taught to observe nature. Walking down a lane, he finds that they do not notice flowers or insects. He felt that this is a tragedy in many childhoods today. He recalled his own mentor who changed his life by teaching him to see the depths and beauty in the world. Mindless looking at TV or playing computer games confers questionable benefit. Klaus asked our indulgence in spending a little time emphasizing this problem since he considers it so important to the future of the world.

There has been some discussion within the MSSC even before Kemp's visit on the possibility of interesting youngsters in microscopy. Several of us who go to the Lorquin entomological Society meetings are struck by the participation of children and whole families in activities. There are surely some aspects of microscopy that would be of benefit in introducing youth to science and the wonder of the natural world.

The PMS article reprinted on this page is an example of what one group is doing in England. It may provide ideas for those within the MSSC who would like to participate in some sort of mentoring activity for young persons.

Ed.

AN UPCOMING SHOW

Following last February's successful premiere of the West Coast Scientific & Technical Antique and Collectible Show, two annual shows are planned for enthusiasts. The Southern California Area Show will be held in Los Angeles on Saturday January 25, 1997. Organized by Al and Bobbie Roberts of The Rational Past, the one-day event offers an unique opportunity to learn about this fascinating area of collecting, which combines science, history and art. Attendees will have an opportunity to meet with knowledgeable dealers in every aspect of the field and inspect many museum quality pieces. Follow the course of the planets, chart the seven seas, meet the ancestors of the computer, equip a nineteenth century laboratory, find the cure for boredom with quack medical devices.

Among the exhibitors will be representatives of various organizations including the prestigious Scientific Instrument Society and the Oughtred Society. Visitors will find ample information on the California gatherings of radio enthusiasts, microscope clubs. tool collectors, medical devotees and more.

The Second Annual Southern California Scientific and Technical Antique and Collectible Show will be held January 25, 1997 from 10 to 4 at The Antique Guild in the historic Helms Bakery Building, 3225 Helms Avenue, West Los Angeles,. Admission is free and there is ample parking. Dollond telescopes, vacuum jars, sterling medical instruments, candle lit planetaria, drafting sets from the 1700's, brass surveying levels, diver's helmets, books on trades, delicate lace bobbins, sovereign scales, compasses and sundials... dealers will be happy to explain nuances to novices or trade tales with veteran collectors. Another show is planned for the summer in the San Francisco Bay Area.

KLAUS KEMP ARRANGEMENT TECHNIQUES

After having seen the perfection of Klaus Kemp's diatom arrangements, I looked forward to seeing at the November meeting what sort of complex servomechanism he had devised to perform his micro-manipulations. It was a shock to find when Klaus demonstrated his methods that he had no sophisticated apparatus at all; but his incredible work was the result of his own superlative manual and eyeball dexterity. Mr. Kemp does not even use the micrometer stage adjustments, but moves the working slide about with his fingertips. He explained how, by using the indentation of the flesh in the fingers, one can obtain very small controlled movements. The movements of the probe itself were controlled with a sliding, rotating sleeve whose simple appearance may have concealed some subtle design parameters that were not obvious to me. Klaus constructed a pointed probe from a glass capillary tube. He heated the center with a small alcohol lamp and then drew the tube out to a thin diameter section, but not to the breaking point. He then turned the alcohol flame down as low as possible and reheated the drawn center section, pulling this apart rapidly until it separated, leaving a point so fine that even magnified alongside a diatom, its radius looked extremely small. Klaus mentioned that advantages of glass as opposed to metal are that it does not corrode and it is extremely strong and flexibile. He uses it to make small sliding motions when the tip is set at an angle to the surface and pushed down. The tip then slides across the surface as it bends. He demonstrated how he could separate the upper and lower diatom sections from the center girdle. He also propped a long diatom onto a round one and by pressing on the center of the long one broke it into the length needed to form part of his arrangement. He also described the critical surface preparation needed to make the diatoms or scales adhere in place without being overwhelmed by the adhesive material. He wiped off all the surface preparation material with his fingers, leaving a minimum invisible film.

All Mr. Kemp's demonstrations were clearly visible to the audience on a massive 39 inch Mitsubishi monitor kindly loaned by Tom McCormick for the event, with the picture coming from John Ewart's video camera mounted on the trinocular head of Klaus's Russian BIOLAM microscope. His demonstration left me with the sense of wonder that one has for the skills of a sleight of hand magician. It looks so easy when one knows that it is incredibly difficult.

We are all indebted to Mr Kemp's kindness in sharing his techniques and leaving us the challenge of trying to make some arrangements ourselves. As John Field says on page 68, we are fortunate to be able to buy samples of Klaus Kemp's work either from Klaus directly in England, or from John Ewart who stocks examples at his store in Santa Clara.

Ed.

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KEYWORD INDEX

WANT LIST

"Polyphos" substage condenser for Zetopan microscope. George G. Vitt Jr. 2127 Canyon Drive Los Angeles, CA 90068

FOR SALE OR TRADE

Bausch & Lomb (Leitz) Stereo Zoom 7 Microscope. On Model A-B Stand. (Reflected and Transmitted Light). 10X Widefield Eyepieces. Includes 2X to 0.5X objectives. Bought new in 1995. $1500.Gary Legal1306 Sheppard Street
Fullerton, CA 92631

The Geological Story, (1875) by James Dana. This is a well illustrated publication with examples of the Diatoms, Polycistines, Forams and Fossils. Bound in green cloth with gold gilt stamps. (rare) $12.00

The Voyage of the Challenger, (1972) by Eric Linklater. Very well illustrated with soft cover, 4to. Many of the samples collected on the voyage were studied and published by members of the Royal Microscopical Society. Considered the best historical publication on the subject. $30.00.

The Microscope, Simple Handbook, (1923) by Conrad Beck. Many microscopes are illustrated. $30.00
James D. Solliday
(714) 775-1575 Home
(714) 546-1315 Work

Microcircuit Slide Set

Due to the tremendous response to my offerings of micro-chips, I have been swamped with requests for a set of slides similar to those I made up for the Postal Microscopical Society (PMS).

I plan to make up boxes of about 12 slides each of different kinds of mounted electronic and microelectronic components, such as those found inside a typical microcomputer. Each slide will be labeled and a description of each component will be enclosed.

This is a wonderful opportunity for you to get accquainted with the fascinating world of microelectronics. These slides can be viewed with a stereo microscope or an incident illumination microscope.

I am offering these sets of slides for only $25.00 to members of the Microscopical Society of Southern California. Make checks out to:

Ronald F. Morris
1561 Mesa drive, Apt. 25
Santa Ana Heights, CA. 92707-5646

Please allow 4 weeks for delivery, starting in January 1997.

MATERIAL EXCHANGE

To obtain samples from the members listed below, send them a stamped self addressed envelope with your request.
Many thanks to those who volunteer to share these materials.

Microcircuit chips offered by Ron Morris. Ron has prepared a set of slides for the Postal Microscopical Society showing the development of the microcircuit. These were of intense interest to many who had no access to such materials. Letters from England were very appreciative of the chance to study these complex silicon circuits. Ron has given out some of these samples at Steve Craig's workshop to the delight of the attendees, and offers microcircuit chips to any other member who would like to have them.

Ronald F. Morris
1561 Mesa Drive # 25
Santa Ana Heights, CA 92707

Sand from Rincon Hill in Ventura offered by Ed Jones. Ed contributed the sand that was used in the latest Craig workshop to study cleaning techniques. Ed has more of this uncleaned sand from Rincon that he offers to anyone who was not at the workshop, but who would like to try the cleaning technique. See page 8 in the October 1996 issue of this bulletin for a description of the material.

Edwin L. Jones, Jr.
2425 Scoter Avenue
Ventura, CA 93003

Movie Digital and Analog Sound Tracks offered by Tom McCormick. Tom has some extremely interesting commercial movie sound track film that has the sound recorded in several digital and analog formats. One of the digital formats contains a 70 x 70 array of dots in the sections between the sprocket holes.

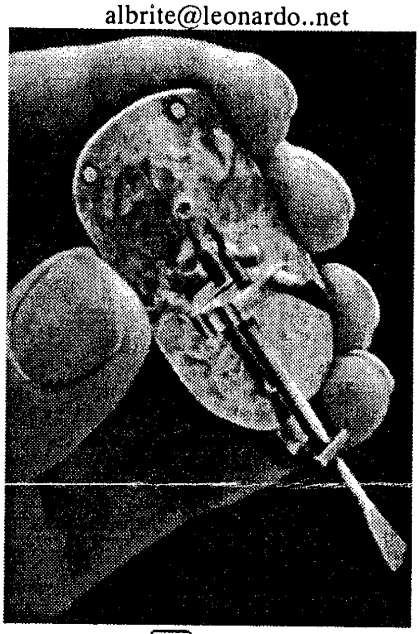
Thomas J. McCormick
5924 Bonsall Drive
Malibu, California 90265

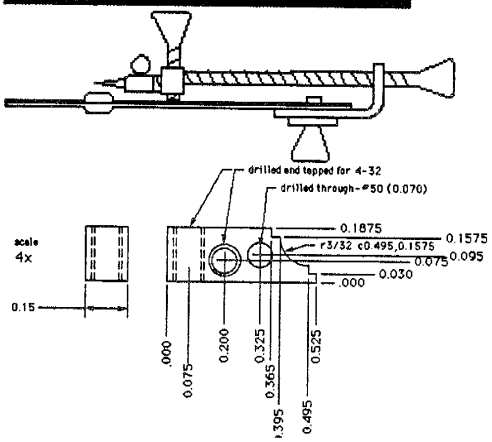
Next Meeting at Crossroads School Jan 15, 1997
Doors Open at 7 PM Meeting at 7:30

Demonstration of
Leeuwenhoek Microscope Condstruction
by Al Shinn

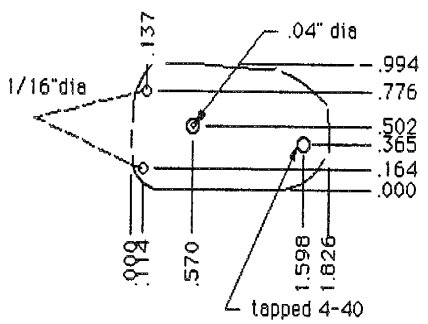
The January Meeting will feature a demonstration of the construction of a Leeuwenhoek microscope by Al Shinn who builds the fine kits illustrated below. Al will demonstrate the construction including the formation of a glass lens. Anyone wanting to order a kit of their own can contact Larry Albright and Al will make up a kit for delivery at the meeting. Cost $50.

Contact: Larry Albright, 1704 Mandeville Lane,
Los Angeles, CA 90049. 310-399-0865
albrite@leonardo..net





Leeuwenhoek Main Plate



Editor's Notes

In this last issue of 1996, I would like to thank all those who have contributed articles to make our new bulletin a success. As anticipated, the wealth of interesting knowledge and experiences among the members has made the assembling of the monthly bulletin a very rewarding project. I encourage everyone to share their knowledge and experiences with the membership. Remember that your information is the important thing. Probably anything microscopical that is of use or interest to you will be of interest to others. Please send even short notes regarding your experiences, projects, working tips and such; brief topics such as a description of a better cement for slide preparation or a technique for restoring finishes or a location to collect specimens. The round robin discussion at the workshops so ably recorded by George Vitt shows how interesting all sorts of microscopical tidbits can be. The bulletin can serve as a forum, especially for corresponding members, to share the same sort of useful information with us all.

In order to make it easier to find those who have the same interests, MSSC will be sending out new membership forms which will include a section for each member to note his particular interests. This data will be included in an updated membership address listing. The new listing will also contain e-mail addresses for those who are connected online. As you may know, e-mail enables one to instantly communicate around the world at no incremental cost. If you send e-mail addresses, I will post new ones in the bulletin.

Since each year's bulletin is formatted as a separate volume with a yearly index, anyone joining during a given year can receive the back issues for that year to make up a complete set. If anyone who is a member now has not received any of the first three issues of the 1996 bulletin, please let me know and I will send them copies. The gutter margins are of course provided so that each year's volume can be either hole punched in a loose leaf notebook or bound with a spiral or other binding. Some of the copy services like Kinko's do serviceable low cost bindings.

I look forward to another year of receiving fascinating articles on microscopy and sharing the fellowship of mutual interests. In the world so often full of violence and meaningless trivia, it is a great privilege to be able to discuss, in a group, things of permanent interest such as the wondrous structure of the world and the creatures in it. It seems true that; to be fulfilling, a discovery does not have to be new to mankind, but only to oneself. The revelation of a detail of nature brings one a reverence for powers far beyond our own and a sense of beauty and mystery that can enfold us more closely in whatever source of love and harmony we believe to exist.

Gaylord Moss